# Journal of Applied Sciences

ISSN 1812-5654

science alert

ANSInet
an open access publisher
http://ansinet.com

Journal of Applied Sciences 13 (16): 3305-3309, 2013
ISSN 1812-5654 / DOI: 10.3923/jas.2013.3305.3309


# A Study on Regional Public Services Demand-supply Equalization Potential

[1]F.H. Wen, [1]L. Jiang, [2]T.Y. Shen and [1]J. Lis
[1]School of Government, Central University of Finance and Economics, Beijing, 100081, China
[2]School of Government, Scientific and Engineering Computing Center,
Peking University, Beijing, 100871, China

**Abstract:** The demand and supply of regional public services has a positive correlation with urban scale and fiscal revenue, this study examines the hierarchical structures of population scale and per capita fiscal revenue of Jing-Jin-Ji region and uses the coupling system model to analyze the coupling degree of these two structures. The results showed that, there are great differences between the variances of the two hierarchical structures within Jing-Jin-Ji region and exists prominent imbalance between supply and demand of regional public services. For the coupling degree of specific cities, Dongli District, Xiqing District of Tianjin and Chaoyang District of Beijing possess the highest potentials of balance between supply and demand of regional public services, while the Boye County, Tang County, Kangbao County and Yingshouyingzi mining area of Hebei Province suffer the lowest potentials of balance. Finally, aiming at improving the potentials of supply and demand balance of public services and transforming balance potentials into balance of reality, the study proposes relevant policy recommendations from the aspects of population policy, industrial policy, fiscal transfer payment, system innovation, etc.

**Key words:** Public services, demand-supply equalization potential, population size, revenue system

## INTRODUCTION

In connection with the very uneven situation of current public services level between urban and rural areas, the China's national 12th five-year-plan clearly puts forward to promote the equalization of basic public services development goals. Equalization of public services goals involve planning, finance, management system and other aspects work, academia has developed systematic studies in these fields. Scholars have finished much research achievement in the field of equalization of public services between urban and rural areas, including the level of urban and rural public service equalization index system (An and Ren, 2008), policy objectives and institutional guarantee (Xiang, 2008), public services supply (Zhou *et al*., 2011; Zhou and Gao, 2011), the spatial layout equalization of public service facilities (Li and Zhang, 2011), the achieving path (Wang, 2006), government tax reform support (Jin, 2006) etc.

Academia not only puts less focus on the public services in the implementation spatial dimensions in a particular area, but also doesn't pay much attention to the conducted systematic research of demand and supply of public services in a large area. Inter-regional equalization of public services is an effective way to eliminate regional differences and achieve coordinated regional development. The limited research achievement mainly focused on the implementation path of the equalization. For example, there are scholars put forwards the pathway to achieve regional equalization of public services through interval transfer payments (Guo, 2006), some scholars investigate the path of China's regional equalization of public services from the perspective of fiscal system reform, their reform measures includes to raise the proportion of national taxes, to increase the sources of national transfer payments funding and to adjust the structure of interval transfer payments (Chen, 2008). These studies are basically standing on the national scale to research the transfer payment problems between the developed areas and underdeveloped areas or between eastern and western regions, however, the inter-regional equalization of public services issues and other related problems within internally developed regions have rarely involved.

Jing (Beijing)-Jin(Tianjin)-Ji(Hebei) area is one of China's three major metropolitan areas. To promote the regional economic integration within Beijing, Tianjin and Hebei and build the capital economic circle and promote the development of Hebei coastal area is an important task of the China's 12th five-year-plan period. However, the region equalization of public services level within Beijing Tianjin and Hebei is still relatively low (Ye *et al*., 2008), the public services balance of demand and supply within

**Corresponding Author:** L. Jiang, School of Government, Central University of Finance and Economics, Beijing, 100081, China

this region directly affects the level of coordinated development, to research the demand and supply potential of this area has a positive meaning.

The existing studies achievements have shown that the demand for urban public services and urban population size are highly correlated, the city's municipal finance income levels especially the urban per capita income levels and the supply of urban public services is also highly correlated (Yuan *et al*., 2008). In this study, the author takes this assumption as the premise to study the public services demand-supply equalization potential of Beijing, Tianjin and Hebei region in two directions including the size of the population and per capita income scale, in order to further investigate the demand and supply of public services equilibrium paths foundation and for the provide policy coordination of regional urban population size optimization coupled with per capita.

## METAPHORS AND DATA

**Metaphors:** The urban primacy ratio refers to within a specific regional, the urban scale ratio of the first largest city and the second largest city, which reflecting the gap of the region's largest city and the second city, when the urban primacy ratio in a particular urban system is 2-3 we say it is a moderate range (Xu and Ye, 1986). In order to better reflect the scale of urban system characteristics, this study tries to calculate the urban primacy ratio, meanwhile the author subjoin two indicators including 4 cities and 11 cities urban primacy ratio, i.e. $S_2$ is defined as the urban primacy ratio, at the same time $S_4$ is defined as the ratio between the urban population scale of the first place city and the sum from the 2nd to the 4th city in the size of the urban population, i.e., 4 city urban primacy ratio; $S_{11}$ is defined as the ratio between the urban population scale of the first place city and the sum from the 2nd to the 11th city in the size of the urban population, i.e., 11 city urban primacy ratio. The calculation formulas are as follow (Xu *et al*., 1997):

$$S2 = \frac{P_1}{P_2} \quad (1)$$

$$S_4 = \frac{P_1}{P_2+P_3+P_4} \quad (2)$$

$$S_{11} = \frac{2*P_1}{(P_2+P_3+P_4+P_5+P_6+P_7+P_8+P_9+P_{10})} \quad (3)$$

In the equation, $P_i$ represents the ith city's population size and financial income. By calculating the above-mentioned three years of urban primacy ratio data of Beijing, Tianjin and Hebei, reflecting this region's urban population size and the level of fiscal revenue situation and indirectly reflecting the demand and supply of public services level.

By aapplying the urban primacy ratio indicators, the vertical movements of population size and per capita income scale are discussed in order to observe the level of internal changes through stratifying the hierarchical structure of the relevant scale. Meanwhile, by analyzing two indicators of population and per capita revenue coupling degree and comparing the synchronization of the above two indicators in order to investigate the possible problems in the regional public service demand and supply balancing process.

In order to measure the equilibrium level of the above two indicators, the coupling system model uses spatial coupling system model to calculate the coupling degree of the two indicators, which can be used to analyze the interaction amount the different variables of the overall state of the system. The high degree of coupling reveals that the variable mutual promotion and indicators relationships are reasonable match to achieve positive resonance; while low degree of coupling means that the irrational allocation of variables, there is greater integration improvement of the system (Zuo and Chen, 2001).

Firstly, the author standardizes the data by handling the following Eq. 4 and 5 so as to eliminate the influence of data units, where $P_i$ represents the total population in region i, $p_i$ represents the standardized population size in region i; $F_i$ represent the local fiscal revenue in region i, $f_i$ represents a standardized financial scale region i.

$$P_i = \frac{P_i - \min(P_i)}{\max(P_i) - \min(P_i)} \quad (4)$$

$$f_i = \frac{f_i - \min(f_i)}{\max(f_i) - \min(f_i)} \quad (5)$$

Secondly, by referencing the coupling system model, the author gets the population-financial scale structure coupling Eq. 6, where $C_i$ represents the i region's population-financial scale structural coupling degree which ranges in (0,1). The high $C_i$ value indicates that the population and revenue virtuous resonance and jointly promote regional economic rationalization and harmonization; conversely, the low $C_i$ value indicates the lack of coordination between the population and fiscal revenue and its development policy has to be adjusted and improvement.

$$C_i = \left[\frac{4(p_i \times f_i)}{(p_i + f_i)^2}\right]^2 \quad (6)$$

**Data:** Relevant research data in this study mainly comes from the Chinese regional economy statistical yearbook and selecting municipal cities (Beijing and Tianjin, is respectively calculated as a municipal statistics unit) and the county cell's population and revenue indicators in three characteristics years of 2001, 2006 and 2011 of Jing-Jin-Ji area. In order to ensure the comparability of the selected data, some districts and counties of the relevant data were aggregated according to the administrative divisions' changes in the three characteristics years. The data used are all based on the 2011 administrative division; the data of the previously two years of administrative divisions are merged.

## RESULTS AND DISCUSSION

**Demand structure of public services in Jing-Jin-Ji region:** According to Chinese statistics standard for the city division and referencing the World Bank's urbanization studies about major countries or regions, combining with the population situation of Jing-Jin-Ji area and making the county (district) household population as a division basis, the JingJinJi region is divided into five type's districts including super-mega cities, mega cities, big cities, medium-sized cities, small cities. The urbanization of Jing-Jin-Ji region can be divided into five categories basing on the standard of population size and then the urban scale of the urban area then can be classified. It can be seen that the vast majority cities which have a larger population size towns are located in Beijing and Tianjin and the surrounding areas, reflecting the concentration of population in Beijing and Tianjin in the ability of absolute advantage. On the one hand, Beijing-Tianjin region's advantageous location attracting a large number of labor resource inflows into this area. On the other hand, due to the slow pace of small peripheral urban development and where economic conditions extremely backward, the attractiveness of the population to these outside area is very small, resulting the Matthew in the regional competitiveness sustained significant.

By applying the Eq. 1-3, the following table can be calculated (Table 1). As can be seen from Table 1, the relative advantages of Beijing urban population to the No. 2 city is slowly weakening with the elapse of the time and the 2-city urban primacy ratio coefficient is significantly less than 2, the urban primacy ratio relatively getting low, indicating that the second urban population scale is rising and gradually tend to form two-center mode. The urban primacy ratio of 4-city and 11-city were hovering around 0.4. From 2002 to 2005, the S11 coefficient has exceeded S4 coefficient, indicating that the 2nd-11th city's urban population growth rate and the size of the first cities remained the same and in this interval, the 2nd-4th city's urban population growth rate slightly faster than the 5th to 11th cities.

**Supply ability of public services in Jing-Jin-Ji region:** Revenue on the one hand can reflect a certain level of economic development of the region, while a considerable part of the revenue is spent on education, health, social security and employment, housing, security and cultural construction and other public services, which also reflect the region's public services and other social welfare. Therefore, the per capita revenue within the region can be used as another indicator to study the Jing-Jin-Ji region's public services supply ability from the perspective of fiscal revenue.

The author then used the per capita revenue data, applied the principle of primacy ratio to calculate the fiscal urban primacy ratio, i.e., municipal finance primacy $F_2$, four cities fiscal urban primacy ratio $F_4$ and eleven urban primacy ratio $F_{11}$, the calculating method is similar to the urban primacy ratio of population size (Table 1). It can be seen that in the decade from 2001 to 2011, the financial income gap between Beijing and Tianjin was rapidly expanded during the previous 5 years, in the end of 2006, the primacy ratio coefficient reached 2.4. In the latter five years, the fiscal revenue primacy ratio coefficient started to decrease, the gap of capita revenue between Beijing and Tianjin tends to shrink and the fiscal revenue primacy ratio coefficient was about 1.61 in 2011, which was less than the standard value of 2.

This phenomenon reflects during the previous five years, as the country's capital, Beijing developed much faster than outer areas; the fiscal revenue grew rapidly, its

Table 1: Comparation of the urban population and fiscal revenue primacy ratio

| | 2001 | | 2006 | | 2011 | |
|---|---|---|---|---|---|---|
| Primacy ratio | Population primacy ratio | Fiscal revenue primacy ratio | Population primacy ratio | Fiscal revenue primacy ratio | Population primacy ratio | Fiscal revenue primacy ratio |
| $S_2$ | 1.23 | 1.04 | 1.11 | 2.40 | 1.10 | 1.61 |
| $S_4$ | 0.42 | 0.64 | 0.38 | 1.28 | 0.41 | 0.93 |
| $S_{11}$ | 0.40 | 0.60 | 0.39 | 1.23 | 0.41 | 0.97 |

Chinese regional economy statistical yearbook of 2002, 2007, 2012

Table 2: Urban population-financial income coupling

| No. | Cities | P | F | C |
|---|---|---|---|---|
| 1 | Dongli | 0.13 | 0.14 | 1.00 |
| 2 | Xiqing | 0.14 | 0.13 | 1.00 |
| 3 | Chaoyang | 0.85 | 0.81 | 1.00 |
| 4 | Dongcheng | 0.42 | 0.36 | 0.99 |
| 5 | Tongzhou | 0.24 | 0.20 | 0.99 |
| 6 | Xicheng | 0.60 | 0.75 | 0.98 |
| 7 | Jinnan | 0.16 | 0.13 | 0.97 |
| 8 | Xiahuayuan | 0.00 | 0.00 | 0.93 |
| 9 | Heping | 0.16 | 0.10 | 0.92 |
| 10 | Haidian | 1.00 | 0.66 | 0.92 |
| … | … | … | … | … |
| 45 | Anxin | 0.18 | 0.00 | 0.01 |
| 146 | Guyuan | 0.08 | 0.00 | 0.01 |
| 147 | Xingtang | 0.18 | 0.00 | 0.01 |
| 148 | Lixian | 0.22 | 0.00 | 0.00 |
| 149 | Shangyi | 0.06 | 0.00 | 0.00 |
| 150 | Dingxing | 0.24 | 0.00 | 0.00 |
| 151 | Quyang | 0.26 | 0.00 | 0.00 |
| 152 | Kangbao | 0.10 | 0.00 | 0.00 |
| 153 | Boye | 0.09 | 0.00 | 0.00 |
| 154 | Tangxian | 0.25 | 0.00 | 0.00 |
| 155 | Yingshouyingzi mine | 0.00 | 0.00 | 0.00 |

Chinese regional economy statistical yearbook of 2002, 2007, 2012

center status of Jing-Jin-Ji region was increasingly prominence. And during the latter five years, with the rapid rise of Tianjin, the out areas had a higher growth rate; the average annual growth rate of per capita income of Beijing compared to the previous five years has been slowdown, while the growth rate in Tianjin increased to 122.6%, with a significant catch-up effect. The gap between the two cities continued to narrow, Tianjin was accomplished as the sub center has been consolidated and the two-center development pattern of Jing-Jin-Ji region has become increasingly evident.

**Demand-supply potential balance of the public services:** By summarizing the population size in Jing-Jin-Ji region and observing the sequence of the population size and the financial income per capita in the ten cities in this region (Table 2), we can find that although the primacy ratio of population size in Beijing doesn't change a lot, fluctuating within 10%, the primacy ratio of financial income per capita changes frequently, which rising from 1.04 in 2001 to 2.4 in 2006 (increasing 140%) and dropping to 1.6 in 2011. This change reflects Beijing's advantage of financial income per capita level is no longer outstanding as five years ago. But Beijing's prominent fiscal revenue position reflects Beijing's advantages in the public services provision in the regional aspect, which confirms Beijing has a strong attraction to talents and industries as the country's educational and medical centers.

Tianjin's financial income per capita is much higher than the other eight prefecture-level cities in Hebei province, although Tianjin has relatively small population size, which reflects a significantly higher level of economic development and Tianjin's public services provision leading role. Because of the larger population and the low economic development lever, Cangzhou, Zhangjiakou and Baoding's financial incomes per capita are always lower behind the average, which reflects the low level of public service provision and the imbalance between the public supply and demand.

Spatial differences of population size and financial income per capita reflect the difference of public services provision demand-supply equalization potential in Jing-Jin-Ji region. Beijing and Tianjin have remarkable advantages on economic development and have higher economic development lever than the national average. The cities in Hebei province relatively lag behind, which form a prominent poverty belt around. In another word, Jing-Jin-Ji region lacks effective spatial division of labor and the talent, technology, capital and other resources in Beijing and Tianjin are not playing a significant role of leading the surrounding areas.

To demonstrate the qualitative description above and to characterize the public services provision demand-supply equalization potential in Jing-Jin-Ji region, we calculated the coupling coefficient about the standardized population and standardized financial income per capita at district scale (Eq. 4 and 6), found the relationship between demand and supply of public service (Table 2). The result concludes the following characteristics.

First, the public services provision demand-supply equalization potential is uneven in Jing-Jin-Ji region. Beijing and Tianjin's demand-supply equalization potentials are relatively high. However, in parts of Hebei Province, especially in the northwest region represented by Kangbao and Guyuan as well as the southeastern region represented by Tang and Boye, the population and the economic development lever are not synchronized, the dualistic structure of economic and social is very large, the imbalance of public services provision demand-supply is very serious, the demand is significantly greater than the supply.

Second, areas of the highest public services provision demand-supply equalization potential are Dongli and Xiqing in Tianjin, not in Beijing, which reflects Beijing's advantage of public services provision demand-supply equalization potential be weaken by the persisting exist of public service supply pressure because of high population density and the situation that Beijing's financial advantage is weaker than its population disadvantage, although Beijing has first-class educational, scientific and medical public facilities as the national capital.

Third, the high level of public services provision in Beijing and Tianjin promote the stronger aggregation than its diffusion at present. The recourses accumulating and the economics activating in the center city bring large urban diseases, as well as making the three million people's poverty belt around Beijing and Tianjin, where there are huge poor population, low revenue and imbalance of public services provision demand-supply potential. It reflects that the development of central cities hasn't driven the development around as expected, however lead serious problem about the low lever public service provision around because center cities suck the resources.

## CONCLUSION

By measuring the lever of population size and the financial income per capita at district scale in Jing-Jin-Ji region, the author ranked the capabilities of public services provision demand-supply and calculated the demand-supply equalization potentials using the Coupling model. The results show that the Jing-Jin-Ji region's public service demand-supply equalization potentials have huge spatial difference. Beijing's public service demand-supply potential is high, but its districts' equalization potentials are not so good as Dongli and Xiqing in Tianjin. The public service provision demand-supply equalization potential is positive correlated to financial scale and negative correlated to population size. In order to promote the capabilities of public services and realizing even public services, the following policy recommended:

- First, optimize the regional public services demand distribution pattern. Through improving the regional industrial structure, promoting the backward areas' public infrastructure and macro-level policy guidance, the governments can increase the talent attraction of backward areas, promoting the rational distribution of population by reducing center city's population density
- Second, enhance the government's ability of public services provision. Through reasonable financial transfer payment, coordinating regional internal revenue and expenditure structure, enhancing the revenue at all levels governments especially in backward areas, to improve the backward areas' public services provision level
- Third, strengthen regional economic cooperation and promote regional public services equalization. The governments should promote the regional intra comprehensive management, urging to establish the overall planning and governance mechanism, clearing the intra-regional division of labor. The governments should exploit the economic advantages in Beijing and Tianjin to the full, urging regional cooperation by enhancing positive externalities of advanced places, promoting financial revenue level of backward areas, forming complementary advantages and mutual support situation, finally promoting public service equalization in Jing-Jin-Ji region

## REFERENCES

An, T.F. and Q. Ren, 2008. China equalization of public services level indicator system-based on quantitative analysis of regional differences in perspective. Finance Trade Econo., 6: 79-82.

Chen, S.D., 2008. Promote regional equalization of public services and taxation system. Tax Res., 10: 42-45.

Guo, Q., 2006. Achieve inter-regional equalization of public services approach-analysis of Chinese intergovernmental equalization transfers. Contemporary Managers, 5.

Jin, R.Q., 2006. Improve the public finance system gradually achieve the equalization of basic public services. Qiushi, 22: 7-9.

Li, A.M. and J.X. Zhang, 2011. Urban and rural equalization of basic public services and facilities research review and prospect. Planners, 27: 6-11.

Wang, J., 2006. Improve intergovernmental transfer payment system, to achieve equalization of public services. Hefei: East China Econo. Manage., 5: 48-51.

Xiang, J.Q., 2008. Equalization of basic public services: Policy objectives and system security. Huazhong Normal Univ.: Humanities Soc. Sci., 1: 1-9.

Xu, X.Q. and J.A. Ye, 1986. Provincial differences of urbanization in China. Geographical Sci., 1: 9-21.

Xu, X.Q., Y.X. Zhou and Y.M. Ning, 1997. Urban Geography. 2nd Edn., Higher Education Press, New York.

Ye, Y.M., Y.J. Li and K. Ni, 2008. Metropolitan migration and inter-regional co-ordinating urban and rural development. Chinese J. Popul. Sci., 2: 57-64.

Yuan, F., R. Tao, Z.G. Xu and M.X. Liu, 2008. Fiscal centralization process of transfer payments and financial dependents of population size expansion. Econo. Res., 5: 70-80.

Zhou, C.S. and J.B. Gao, 2011. Transition Chinese urban public service facilities supply model and its formation mechanism. Geographical Sci., 3: 1272-278.

Zhou, S.H., X. Wang and Y. Nong, 2011. Twelfth Five-Year period, the equalization of public services supply and protection. Planners, 27: 16-20.

Zuo, Q.T. and X. Chen, 2001. Socio-economic environment coupled a system dynamics model. Shanghai Environmental Sci., 12: 592-594.