An empirical assessment on provincial governance quality in China

Jiandang Liu¹, Huaxi Yuan², ⁴, Dong Wang¹, Jie Tang¹ and Yunyun Qi³

¹School of Economics and Management, Harbin Institute of Technology (Shenzhen), Shenzhen, China
²School of Economics and Management, Nanchang University, Nanchang, China
³College of Economics & Management, Anhui Agricultural University, Hefei, China
⁴Email: yuanhuaxi2014@163.com

Abstract. Based on the existing literatures, this paper analyzes the panel data of provincial regions in China by using the global factor analysis method and the weighted average method. The results show that both the absolute and the relative improvements in government capacity, market ability and rule of law were higher in the majority of provinces studied in the central and western China between 2001 and 2015, while they were lower in most of provinces researched in the northeastern China.

1. Introduction

The original meaning of governance in English was guidance, control or manipulation (Jessop, 1999; Yu, 1999) [1, 2]. Most scholars traced this word back to 18th century when the Enlightenment Philosophy covered elements like “gouvernance” in French which was later translated into “governance” in English and applied in various contexts (Gaudin, 1998) [3]. In 1989, the World Bank released the report: "Sub-Saharan: From Crisis to Sustainable Development", which was the first time to use the term "Crisis in Governance", after which "governance" was used to describe the political situation in post colonials and developing countries (Yu, 1999) [2]. In 1998, the International Journal of Social Sciences published the first special issue on governance, after which "governance" formally entered the field of global political science (Xue et al., 2015) [4]. With the extensive application of the concept of governance in various fields, the quantification of the concept seems to be very necessary. Therefore, the quantitative research on governance becomes a new focus of political science (Zang, 2012) [5].

Some scholars sorted out the connotation of governance from five perspectives separately: supervising power, balancing power, bureaucracy, government ability, and government performance (output measure), which laid a good foundation for the empirical study on governance (Liu et al., 2016) [6]. Accordingly, at the very beginning, researches on governance assessment focused on single perspective, including five perspectives (Fukuyama, 2013; Rotberg, 2014; Faguet, 2014; Liu et al., 2018) [7-10]: check of power, bureaucracy, bureaucratic autonomy, capacity, and output, which resulted in two important governance indexes (Olson et al., 2000; Seldadyo et al., 2007) [11, 12]: Freedom Index and ICRG (International Country Risk Guide). Further, in 1996, Kaufmann et al. developed the WGI(World Governance Index) paying attention to the multi-perspective of governance evaluation(bureaucratic capacity + check of power) which belongs to input measures (Lawson and Bo, 2012) [13], and published annual report on state governance around the world since then, which made...
WGI into the most popular comprehensive index in the world. Clearly, the three indexes above focus on state governance, while some scholars pay attention to local governance. UN-HABITAT (2004) [14] developed Urban Governance Index (UGI), including 18 core indicators to describe the common features of cities and 7 indicators to describe the special features. Puppim et al. (2013) [15] studied green economy and governance in cities, and put forward four dimensions to assess good governance: process, capacity, green economy and socio-ecological, showing the multi-perspective of governance assessment (implementation capacity + check of power + output). Hendriks (2014) [16] discussed 5 core values of good urban governance: responsiveness, effectiveness, procedural justice, resilience and counterbalance, implying the multi-perspective of governance assessment (bureaucracy + check of power + output).

As for the researches on provincial governance quality assessment in China, Shi and Fang (2010) [17] put forward the assessment system of public governance efficiency from three aspects, emphasized on "government capacity + rule of law + output", but only covered the cross-sectional data of five provincial regions in China. Wilson (2016) [18] assessed the quality of governance at the provincial level in mainland China, focused on "government capacity + output", and got the composite indexes of governance, but the indexes were not comparable between different years. Tian and Zhou (2016) [19] measured the social governance level index of 31 provinces in China, and got the comprehensive indexes which were comparable between different years, but the indexes only focused on "output". Tang et al. (2018) [20] designed the index system of China’s local governance assessment based on literature investigation and coefficient of variation, which means a new multidimensional perspective on local governance assessment: "power allocation + governance capacity + rule of law", and calculated the comprehensive governance index in China’s provincial regions by utilizing global factor analysis and weighted average, but only focused on the rankings of provincial regions.

In summary, the existing empirical papers have gotten some progress on provincial governance quality evaluation in China, however, there are still some space for further study. Therefore, this paper will focus on improvement of governance quality in China’s provincial regions, and investigate the provincial panel data in China by using the index system and calculation methods developed by Tang et al. (2018) [20].

2. Global factor analysis

With some indicators’ original data unavailable in Gansu, Guangxi, Inner Mongolia, and Tibet, this article only focuses on the other 27 provincial regions in mainland China. Taking the consistency of data into consideration, the period is 15 years (2001-2015). The original data comes from: China Statistical Yearbook (2002-2016), China Science and Technology Statistical Yearbook (2002-2016), Statistical Yearbook (2002-2016) in each provincial region.

2.1. Extracting global common factors

In the global factor analysis of time series, there are two principles for extracting global factors: one is that the eigenvalue is greater than 1, and the other is that the cumulative variance contribution rate is greater than 80%. According to the analysis results, there are two factors whose eigenvalue is greater than 1, and their cumulative variance contribution rate is about 85%. Therefore, these two factors are extracted as global principal factors demonstrated in Table 1.

| Global Factor | Eigenvalue | Variance Contribution Rate (%) | Cumulative Rate (%) |
|---------------|------------|--------------------------------|---------------------|
| 1             | 9.82       | 70.16                          | 70.16               |
| 2             | 2.12       | 15.13                          | 85.29               |
| 3             | 0.73       | 5.23                           | 90.52               |
2.2. Determining function expressions
The maximum variance method is used to rotate the factors. According to the factor score coefficient matrix, the score functions are as follows.

\[ F_1 = 0.135 \times X_1 - 0.136 \times X_2 + 0.153 \times X_3 + 0.165 \times X_4 + 0.220 \times X_5 - 0.087 \times X_6 - 0.049 \times X_7 + 0.129 \times X_8 - 0.089 \times X_9 - 0.080 \times X_{10} + 0.160 \times X_{11} + 0.110 \times X_{12} + 0.204 \times X_{13} + 0.071 \times X_{14} \]

\[ F_2 = -0.014 \times X_1 + 0.270 \times X_2 - 0.040 \times X_3 - 0.077 \times X_4 - 0.136 \times X_5 + 0.230 \times X_6 + 0.197 \times X_7 - 0.015 \times X_8 + 0.233 \times X_9 + 0.222 \times X_{10} - 0.046 \times X_{11} - 0.010 \times X_{12} - 0.108 \times X_{13} + 0.065 \times X_{14} \]

Where \( F_1 \) and \( F_2 \) are expressed as the first and second global principal factor, \( X_1 - X_{14} \) are the dimensionless value of the original 14 variables.

2.3. Weight equation expressions
According to the variance contribution rate and expression of global principal common factors, the equation expression of comprehensive evaluation score can be obtained as follow:

\[ ZF = \frac{(0.4652 \times F_1 + 0.3876 \times F_2)}{0.4652 + 0.3876} \]

\[ = 0.0672 \times X_1 + 0.0489 \times X_2 + 0.0650 \times X_3 + 0.0552 \times X_4 + 0.0582 \times X_5 + 0.0573 \times X_6 + 0.0627 \times X_7 + 0.0635 \times X_8 + 0.0578 \times X_9 + 0.0572 \times X_{10} + 0.0664 \times X_{11} + 0.0555 \times X_{12} + 0.0108 \times X_{13} + 0.0662 \times X_{14} \]

Where \( ZF \) is the comprehensive assessment score of governance quality.

The initial variables corresponding to government capacity, market capacity and rule of law are normalized, and the relative weights of the corresponding initial variables are obtained in turn. The weight equation expressions of can be obtained, as shown below.

\[ G1 = 0.2282 \times X_1 + 0.1660 \times X_2 + 0.2206 \times X_3 + 0.1875 \times X_4 + 0.1978 \times X_5 \]

\[ G2 = 0.1918 \times X_6 + 0.2100 \times X_7 + 0.2129 \times X_8 + 0.1936 \times X_9 + 0.1917 \times X_{10} \]

\[ G3 = 0.2635 \times X_{11} + 0.2203 \times X_{12} + 0.2458 \times X_{13} + 0.2706 \times X_{14} \]

Where \( G1, G2 \) and \( G3 \) are the sub-index scores of government capacity, market capacity and rule of law.

3. Governance quality
3.1. Government capacity
In the aspect of absolute improvement between 2001 and 2015, among provinces ranking top 50% (top 13), Shandong, Zhejiang, Jiangsu and Fujian belong to eastern China, accounting for 40% of provinces investigated in the region; Anhui, Hunan, Jiangxi and Henan are in central China, 2/3 of provinces studied; Guizhou, Chongqing, Shaanxi, Sichuan, Qinghai, Ningxia are in the west of China, 3/4 of provinces researched. Briefly, the absolute improvement of government capacity was big in most of provinces studied in central and western China due to the finance support from central government, which was similar with the finding in previous content.

In the aspect of relative improvement during the same period, among provinces ranking top 50%, Shandong, Fujian and Zhejiang are in eastern China, accounting for 30% of provinces studied in the region; Anhui, Henan, Jiangxi and Hunan belong to central China, 2/3 of provinces investigated; Guizhou, Chongqing, Qinghai, Sichuan, Shaanxi, Ningxia is in the west of China, 3/4 of provinces researched. Therefore, the relative improvement was also great in most of provinces researched in the middle and west of China as a result of low government capacity in 2001 and high absolute improvement in the same period. The results are demonstrated in Table 2.
Table 2. The degree of improvement in provincial government capacity in China.

| Regions   | Absolute Improvement | Rankings | Relative Improvement | Rankings |
|-----------|----------------------|----------|----------------------|----------|
| Guizhou   | 37.26                | 1        | 65.75%               | 1        |
| Chongqing | 32.44                | 2        | 50.23%               | 2        |
| Anhui     | 31.21                | 3        | 49.85%               | 3        |
| Jiangxi   | 29.88                | 4        | 47.93%               | 4        |
| Henan     | 29.64                | 5        | 47.92%               | 5        |
| Qinghai   | 29.55                | 6        | 46.27%               | 6        |
| Shandong  | 29.52                | 7        | 43.50%               | 7        |
| Fujian    | 29.41                | 8        | 43.36%               | 8        |
| Zhejiang  | 29.40                | 9        | 40.18%               | 14       |
| Shaanxi   | 29.02                | 10       | 40.74%               | 12       |
| Sichuan   | 28.43                | 11       | 43.12%               | 9        |
| Hainan    | 28.16                | 12       | 41.68%               | 11       |
| Jiangsu   | 28.11                | 13       | 38.22%               | 17       |
| Guangdong | 27.78                | 14       | 38.64%               | 16       |
| Hunan     | 27.70                | 15       | 43.06%               | 10       |
| Ningxia   | 27.57                | 16       | 40.33%               | 13       |
| Hubei     | 26.48                | 17       | 37.57%               | 18       |
| Xinjiang  | 26.13                | 18       | 39.09%               | 15       |
| Hebei     | 24.12                | 19       | 36.54%               | 19       |
| Jilin     | 22.78                | 20       | 31.84%               | 21       |
| Yunnan    | 22.64                | 21       | 34.48%               | 20       |
| Tianjin   | 21.03                | 22       | 24.50%               | 24       |
| Heilongjiang | 20.64              | 23       | 29.51%               | 22       |
| Shanxi    | 20.11                | 24       | 28.11%               | 23       |
| Beijing   | 19.43                | 25       | 19.69%               | 27       |
| Shanghai  | 18.98                | 26       | 20.41%               | 26       |
| Liaoning  | 16.38                | 27       | 21.42%               | 25       |

3.2. Market ability

In the aspect of absolute improvement between 2001 and 2015, among provinces ranking top 50% (top 13), Jiangsu belongs to eastern China, accounting for 1/10 of provinces investigated in the region; Guizhou, Shaanxi, Sichuan, Chongqing, Qinghai, and Yunnan are in the west of China, 3/4 of provinces studied; Jiangxi, Anhui, Shanxi, Hubei, Henan, and Hunan are in central China, 100% of provinces researched. Therefore, the absolute improvement was significant in most of provinces studied in middle and western China because of local governments’ effort in developing market economy.

In the aspect of relative improvement in the same period, among provinces ranking top 50%, Jilin belongs to the northeast of China, accounting for 1/3 of provinces investigated in the region; Shanxi, Jiangxi, Anhui, Henan, and Hubei are in central China, 5/6 of provinces studied; Qinghai, Guizhou, Xinjiang, Shaanxi, Sichuan, Yunnan and Ningxia belong to western China, 7/8 of provinces researched. As a result, the relative improvement was also big in most of regions researched in middle and western China due to low market ability in 2001 and high absolute improvement after 2001. The degree of improvement in provincial market ability is demonstrated in Table 3.
Table 3. The degree of improvement in provincial market ability in China.

| Regions     | Absolute Improvement | Rankings | Relative Improvement | Rankings |
|-------------|----------------------|----------|----------------------|----------|
| Guizhou     | 33.60                | 1        | 115.31%              | 2        |
| Jiangxi     | 29.73                | 2        | 61.39%               | 5        |
| Anhui       | 29.66                | 3        | 55.41%               | 10       |
| Shaanxi     | 28.75                | 4        | 58.97%               | 6        |
| Shanxi      | 28.52                | 5        | 63.98%               | 4        |
| Sichuan     | 26.39                | 6        | 57.10%               | 7        |
| Hubei       | 26.04                | 7        | 44.38%               | 12       |
| Chongqing   | 25.92                | 8        | 43.95%               | 14       |
| Henan       | 25.16                | 9        | 44.67%               | 11       |
| Hunan       | 23.69                | 10       | 43.66%               | 15       |
| Qinghai     | 23.15                | 11       | 120.13%              | 1        |
| Yunnan      | 22.89                | 12       | 56.97%               | 8        |
| Jiangsu     | 22.72                | 13       | 30.39%               | 20       |
| Beijing     | 22.64                | 14       | 27.41%               | 22       |
| Ningxia     | 22.52                | 15       | 55.86%               | 9        |
| Shandong    | 22.24                | 16       | 33.11%               | 18       |
| Jilin       | 21.69                | 17       | 44.13%               | 13       |
| Liaoning    | 21.28                | 18       | 32.68%               | 19       |
| Tianjin     | 20.61                | 19       | 24.50%               | 24       |
| Hebei       | 19.88                | 20       | 35.13%               | 17       |
| Heilongjiang| 19.51                | 21       | 42.86%               | 16       |
| Fujian      | 19.20                | 22       | 30.32%               | 21       |
| Guangdong   | 17.65                | 23       | 24.54%               | 23       |
| Zhejiang    | 16.39                | 24       | 22.54%               | 25       |
| Xinjiang    | 15.86                | 25       | 67.72%               | 3        |
| Shanghai    | 14.13                | 26       | 14.38%               | 27       |
| Hainan      | 11.76                | 27       | 20.16%               | 26       |

3.3. Rule of law
In the aspect of absolute improvement between 2001 and 2015, among provinces ranking top 50% (top 12), Anhui, Henan and Hubei belong to central China, accounting for 50% of provinces investigated in the region; Guizhou, Sichuan, Chongqing and Shaanxi are in the west of China, 4/7 of provinces studied; Jiangsu, Shandong, Guangdong, Beijing and Zhejiang belong to eastern China, 5/8 of provinces researched. Therefore, the absolute improvement was big in most of provinces studied in the east of China where the per capita GDP rose greatly.

In the aspect of relative improvement during the same period, among provinces ranking top 12, Jiangsu, Shandong and Guangdong belong to eastern China, accounting for 3/8 of provinces studied in the region; Guizhou, Sichuan, Shaanxi and Chongqing is in the west of China, 4/7 of provinces investigated; Anhui, Henan, Hunan, Jiangxi and Hubei belong to central China, 5/6 of provinces researched. Briefly, the relative improvement was great in most of regions investigated in middle and western China due to low rule of law in 2001 and big absolute improvement after 2001. The degree of improvement in provincial rule of law is demonstrated in Table 4.
Table 4. The degree of improvement in provincial rule of law in China.

| Regions   | Absolute Improvement | Rankings | Relative Improvement | Rankings |
|-----------|----------------------|----------|----------------------|----------|
| Guizhou   | 39.36                | 1        | 124.75%              | 1        |
| Jiangsu   | 37.84                | 2        | 61.44%               | 6        |
| Anhui     | 37.27                | 3        | 84.88%               | 2        |
| Sichuan   | 36.17                | 4        | 79.55%               | 3        |
| Chongqing | 34.91                | 5        | 60.48%               | 8        |
| Zhejiang  | 33.87                | 6        | 47.67%               | 13       |
| Shaanxi   | 33.07                | 7        | 65.43%               | 5        |
| Shandong  | 32.99                | 8        | 57.72%               | 9        |
| Guangdong | 32.29                | 9        | 51.78%               | 12       |
| Beijing   | 31.01                | 10       | 32.64%               | 20       |
| Henan     | 30.50                | 11       | 68.93%               | 4        |
| Hubei     | 28.46                | 12       | 57.24%               | 11       |
| Fujian    | 27.81                | 13       | 45.34%               | 14       |
| Hunan     | 27.69                | 14       | 60.70%               | 7        |
| Tianjin   | 25.19                | 15       | 32.71%               | 19       |
| Jiangxi   | 24.89                | 16       | 57.35%               | 10       |
| Ningxia   | 24.50                | 17       | 40.45%               | 16       |
| Shanxi    | 23.57                | 18       | 44.56%               | 15       |
| Liaoning  | 21.40                | 19       | 33.76%               | 18       |
| Shanghai  | 20.89                | 20       | 22.12%               | 24       |
| Xinjiang  | 19.73                | 21       | 32.57%               | 21       |
| Heilongjiang | 19.39          | 22       | 32.39%               | 22       |
| Qinghai   | 17.93                | 23       | 34.70%               | 17       |
| Jilin     | 12.54                | 24       | 22.13%               | 23       |

4. Conclusions

Based on the existing literatures, by using global factor analysis method and weighted average method (Tang et al., 2018) [20], this paper identifies each indicator’s weight and studies the change trend of three sub-indices of China’s local governance quality. The main conclusions are as follows:

Firstly, the absolute improvement of government capacity was big in most of provinces studied in central and western China due to the finance support from central government between 2001 and 2015, while it was small in most of provinces researched in the rest of China where had limited finance support in northeastern China or had strong government capacity in 2001 in eastern China. Meanwhile, the relative improvement was also significant in most of regions researched in the middle and west of China.

Secondly, the absolute improvement of market ability was great in most of provinces studied in middle and western China due to local governments’ effort in developing market economy between 2001 and 2015. At the same time, the relative improvement was also big in most of regions researched in middle and western China due to low market ability in 2001 and high absolute improvement after 2001.

Thirdly, as for the rule of law, the absolute improvement was big in most of provinces studied in the east of China where the per capita GDP rose greatly between 2001 and 2015, while the relative improvement was significant in most of regions investigated in middle and western China due to low
rule of law in 2001 and local governments' effort to protect private property and to improve business environment.

Acknowledgments
This study was financially supported by Large Data Engineering Laboratory of Shenzhen Low Carbon City (Document No.1089 of Shenzhen Development and Reform Commission [2017]) and Discipline Construction of Addressing Climate Change and Low Carbon Economics (Document No.725 of Shenzhen Development and Reform Commission [2018]).

References
[1] Jessop B 1999 The rise of governance and the risk of its failure: Economic development as an example International Social Science Journal (Chinese Edition) (1) pp 31-48
[2] Yu K P 1999 An introduction to governance and good governance Marxism & Reality (5) pp 37-41
[3] Gaudin J P 1998 Modern governance, yesterday and today: Some clarifications to be gained from French government policies International Social Science Journal 50(155) pp 47-56
[4] Xue L, Zhang F and Wu M Y 2015 Research on governance system and management ability: Reviews and prospects Journal of Public Management 12(3) pp 1-12
[5] Zang L Z 2012 The quantitative study of governance: Theory evolution and reflection-A case of Worldwide Governance Indicators (WGI) Social Sciences Abroad (4) pp 11-16
[6] Liu J D, Tang J, Wang D and Zhu S L 2016 Governance: Origin, connotation and application 2016 5th EEM International Conference on Education Science and Social Science (EEM-ESSS 2016), Sydney: Information Engineering Research Institute 93 pp 228-231
[7] Fukuyama F 2013 What is governance? Governance: An International Journal of Policy, Administration, and Institutions 26(3) pp 347–368
[8] Rotberg R I 2014 Good governance means performance and results Governance: An International Journal of Policy, Administration, and Institutions 27(3) pp 511-518
[9] Faguet J P 2014 Decentralization and overnance World Development 53(1) pp 2-13
[10] Liu J D, Tang J and Wang D 2018 Comparative study on governance quality assessment: A literature review Journal of Dalian Maritime University(Social Science Edition) 17(3) pp 59-65
[11] Olson M, Sarna N and Swamy A V 2000 Governance and growth: A simple hypothesis explaining cross-country differences in productivity growth Public Choice 102(3-4) pp 341-364
[12] Seldadyo H, Nugroho E P and Haan J D 2007 Governance and growth revisited Kyklos 60(2) pp 279-290
[13] Lawson R A and Bo R 2012 The quality of government: corruption, social trust, and inequality in international perspective Public Choice 150(3-4) pp 793-795
[14] UN-HABITAT 2004 Urban indicators guidelines: Monitoring the habitat agenda and the millennium development goals (https://unhabitat.org/urban-indicators-guidelines-monitoring-the-habitat-agenda-and-the-millennium-development-goals/)
[15] Puppim D O J A, Doll C N H, Balaban O, et al. 2013 Green economy and governance in cities: Assessing good governance in key urban economic processes Journal of Cleaner Production 58(58) pp 138-152
[16] Hendriks F 2014 Understanding good urban governance: Essentials, shifts, and values Urban Affair Review 50(4) pp 553-576
[17] Shi X H and Fang S J 2010 Cass Journal of Political Science (2) pp 56-66
[18] Wilson R 2016 World Development 79 pp 138-151
[19] Tian F and Zhou C Y 2016 Public Finance Research (8) pp 54-65
[20] Tang J, Liu J D, Wang D, et al. 2018 International Journal of Sustainable Development and Planning 13(5) pp 773-789