

## An Empirical Study on Balanced Development of Region-level Compulsory Education in China—Based on Analyses of Their Indexes from 2003 to 2012

**Yongfeng Fan**

Doctoral Candidate  
School of Mathematics and Statistics  
Southwest University  
Chongqing, China.  
Teachers College  
Columbia University  
New York, NY, United States.

**Naiqing Song**

Professor and Director  
National Research Center for Basic Education  
Southwest University  
Chongqing, China.

### Abstract

---

*Balanced development of compulsory education is currently the most important strategic task in education for Chinese government. For measuring the balance level and its structure of Chinese compulsory education, Theil indexes of twelve indicators of three dimensions from 2003 to 2012 were analyzed. The following conclusions were obtained—the balance level of compulsory education in China presented a growing trend as a whole, however, there were structural differences in terms of dimensions, indicators, educational stages and regions: 1) The balance levels of educational expenditures were the highest, followed by teacher resources and material resources; 2) the balance levels of teacher qualifications compliance rate and senior teacher rate were improved significantly, but the balance level of pupil-teacher ratio for junior secondary education declined dramatically and continuously; 3) junior education' balance levels were higher than primary education; 4) northeast China's balance levels were the highest, east China's balance levels were significantly lower than other regions. Meanwhile, the inter-regional differences' contributing rate to the total unbalance was greater than intra-regional differences.*

---

**Key Words:** Chinese Compulsory Education, Balanced Development, Empirical Study, Theil Index

### 1. Introduction

After the popularization of compulsory education, the strategic focus of the development of Chinese compulsory education shifted to improving the balanced development of compulsory education (Zhai B, 2013; Fan Y, 2014). Balanced development of compulsory education has drawn great attention from the theoretical and academic fields in the past ten years since the first dedicated document, “*Several Opinions on further Promoting the Balanced Development of Compulsory Education*,” was issued by the Ministry of Education of PRC. Balanced development is the strategic task of Chinese compulsory education, and empirical analysis on the status and trend of the development of Chinese compulsory education is of great importance for both promoting balanced development of education and ensuring the timely and effective measurement, monitoring and adjusting of unbalance and error of education (Zhai B, 2007). However, literature review revealed that the existing research mainly focuses on the intra-regional level, especially the county-level measurement of balanced development of compulsory education (Yu F, 2011, Li H, 2012, Zhu J, 2010), but the inter-regional level balance of education among the Central, Eastern, Western and Northeastern China was neglected.

Meanwhile, deep quantitative analysis on the structure of unbalance of Chinese compulsory education is deficient. To some extent, the above issues will affect the accuracy of the policy of balanced development of compulsory education, especially the policy of allocating educational sources.

Generally speaking, the methods for measuring the balance level involve Gini coefficient, coefficient of variation and Theil index, etc., among which Gini coefficient and Theil index are widely used in the fields of economy and geographical environment. Compared with Gini coefficient, Theil index can reflect intra-group and inter-group difference; that is to say, the difference on balanced development is divided into intra-group difference and inter-group difference, and the contributions from intra-group and inter-group can be calculated separately. Therefore, based on analyzing the Theil indexes of twelve indicators of Chinese compulsory education from 2003 to 2012, the total balance degree of Chinese compulsory education and its structure were charted, as well as the inter-regional balance level.

## **2. Methodology**

### *2.1 Indicator selection and data source*

Indicators for balanced development of compulsory education usually consist of input indicators and output indicators. The input indicators involve educational resources, which refers to educational expenditure, faculty, facility and equipment, etc. The output indicators involve student achievement, admission rate, enrollment rate, dropout rate, etc. However, after completing the historic task of “Two Basis” (Basic Knowledge/ Basic Skill), there is no national unified test in the period of compulsory education in China, thus, output indicators such as student achievement, admission rate, enrollment rate, dropout rate, are relatively uncomparable and insensitive for measuring the balance level of compulsory education (Liang W, 2008). Relatively speaking, because of China’s vast territory, there are obvious gaps of educational development among different regions and between urban and rural areas, and there are also wide gaps among schools in the same region, especially with regard to allocating resources such as faculty, facility and equipment (Song N, 2014).

Therefore, input indicators were selected and used for measuring the balance level of compulsory education. Comprehensively taking into consideration of the comparability, representativeness, accessibility of the indicators, twelve indicators of three dimensions, which are educational expenditure (financial resources), teacher resource (human resources), material resource, were selected. Among these, the dimension of educational expenditure includes four indicators, which are per-student public expenditure (PPE), per-student recurrent expenditure (PRE), budgetary per-student public expenditure (BPPE), budgetary per-student recurrent expenditure (BPPE). The dimension of teacher resource includes three indicators, which are pupil-teacher ratio (PTR), teacher academic qualifications compliance rate (TAQCR), and senior teacher rate (STR). The dimension of material resources includes five indicators, which are per-student area of school sites (PAOSS), per-student floor area of school building (PFAOSB), per-student sports area (PSA), per-student number of computers (PNOC), per-student number of books and magazines in libraries (PNOBM).

The data of educational expenditure is from “Statistical Annual of Chinese Educational Expenditure,” and the data ranges from 2003 to 2011, as the consideration of its accessibility. The data of teacher resource and material resource are from “Statistical Annual of Chinese Education,” and the range is from 2003 to 2012. Because the standard of allocating resources is quite different between primary education and secondary education, and for reflecting the status of balance of Chinese compulsory education all-round, the data of primary education and secondary education were collected and calculated separately.

### *2.2 Method of dividing Chinese regions*

According to the dividing way of National Bureau of Statistics of PRC in 2011, the economic regions of China were divided into four, which were the East, Central, West and Northeast. The East included ten provinces and municipalities: Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan. The Central includes six provinces: Shanxi, Anhui, Jiangxi, Henan, Hebei, and Hunan. The West includes twelve provinces, municipalities and autonomous regions, which are Inner Mongolia, Guangxi, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shanxi, Gansu, Qinghai, Ningxia, and Xinjiang. The Northeast includes three provinces: Liaoning, Jilin, and Heilongjiang. The dividing method was used in our research, and Taiwan, Macao, and Hong Kong are not included in the research-- only the data of mainland China’s thirty-one provinces, municipalities, and autonomous regions were analyzed.

### 2.3 Method of Measurement

The Theil index was used in the research for measuring the balance level of Chinese compulsory education. In 1967, the Dutch econometrician Henri Theil developed an index of inequality that can be divided with addition. The index can satisfy the “Pi-gou – Dalton” transfer payment criteria and homogeneity of population and income, etc. (Shor-Rocks, 1987) In the research, the first order Theil index was used (Gibson J, Huang J, Rozelle S 2001). The total balance level of Chinese compulsory education, the inter-regional and intra-regional balance level of the East, Central, West, and Northeast in the three dimensions, which are educational expenditure, educational personnel and material resource, can be analyzed and charted with this index. The equation of the first order Theil index “I” is given by the equation,

$$I = I_w + I_b \quad (1)$$

“I” is the total unbalance level. “ $I_w$ ” is the inter-regional unbalance level, and “ $I_b$ ” is the intra-regional unbalance level.

$$I_w = \sum_{i=1}^4 i \cdot I_i = \left(\frac{P_i}{P}\right) \sum_{j=1}^{N_i} \left(\frac{p_j}{p_i}\right) \ln\left(\frac{p_j / P_i}{y_j / Y_i}\right) \quad (2)$$

$P_i = \sum_{j=1}^{N_i} p_j$  is the total number of enrollment of the  $i^{\text{th}}$  region;  $p_j$  is the number of enrollment of the  $j^{\text{th}}$  province in the  $i^{\text{th}}$  region,  $N_i$  is the number of provinces the  $i^{\text{th}}$  region includes,  $P = \sum_{i=1}^4 P_i$  is the total number of enrollments of the four regions in China.

$$I_b = \sum_{i=1}^4 \left(\frac{P_i}{P}\right) \ln\left(\frac{P_i / P}{Y_i / Y}\right) \quad (3)$$

$y_j = x_j p_j$  and  $x_i$  represent the total educational resources and average educational resources of the  $j^{\text{th}}$  province in the  $i^{\text{th}}$  region.  $Y_i = \sum_{j=1}^{N_i} y_j$  is the total educational resource in the  $i^{\text{th}}$  region,  $Y = \sum_{i=1}^4 Y_i$  is the total education resource of the four regions in China.

Thus, the equation of Theil index for measuring the unbalance level of Chinese compulsory education can be written as,

$$I = \sum_{i=1}^4 \left(\frac{P_i}{P}\right) \sum_{j=1}^{N_i} \left(\frac{p_j}{p_i}\right) \ln\left(\frac{p_j / P_i}{y_j / Y_i}\right) + \sum_{i=1}^4 \left(\frac{P_i}{P}\right) \ln\left(\frac{P_i / P}{Y_i / Y}\right) \quad (4)$$

The bigger the “I” is, the more unbalanced the development of compulsory education is. Contrariwise, the less unbalanced the development of compulsory education is.

## 3. Results

### 3.1 Comparison among different dimensions and indicators

For primary education (table1), the trend of Theil indexes of educational expenditure, teacher resource, and material resource were downward, which meant the balance level of Chinese primary education was increasingly promoted. Among these the Theil indexes of four indicators of educational expenditure were slowly declining since 2003, although they rebounded in 2008 and 2009; as for teacher resources, the Theil indexes of teacher academic qualifications compliance rate, and senior teacher rates presented continuing decline, especially the Theil index of teacher academic qualifications compliance rates, which fell by twenty-five times (from 0.0289 down to 0.0011) in the past ten years; however, the Theil index of pupil- teacher ratio increased during 2003 to 2006, although it decreased after 2006; as for material resource, per-student floor area of school building and per-student number of books and magazines in libraries declined wave upon wave, and there was a continuous drop in the Theil indexes of per-student area of school sites and per-student sports area, the Theil index of per student number of computers rose slightly in the mass.

For junior secondary education (table2), the Theil index of educational expenditure declined greatly; as for teacher resource, the Theil index of teacher academic qualifications compliance rate declined significantly; in particular, the Theil index of TAQCR in 2003 was forty-eight times that of 2012, and the Theil index of senior teacher rate fell nearly 1 time. However, the Theil index of pupil-teacher ratio increased by nearly 20 times; as for material resources, the Theil Indexes first increased and then fell in four indicators, which were per-student number of books and magazines in libraries, per-student sports area, per-student area of school sites, and per-student floor area of school building, although it first fell and then increased in per-student number of computers.

The continuous descent of the balance level of pupil-teacher ratio should be focused on in particular. In 2010, the pupil-teacher ratio of Chinese compulsory education was 17.5:1. The gap between *Beijing* (11.9:1), which was at the bottom, and *Guizhou* province (22.1:1), which was at the top, was very significant (Yang X, 2013). In the period of junior secondary education, the gap between Beijing (13.23:1) that was the minimum and *Anhui* province (24.42:1) that was the maximum was 11.19 in 2003, and in 2012 the gap between Beijing (9.83:1) that was the minimum and *Guizhou* province (18.31:1) that was the maximum was 8.38, in another word, the gap decreased from 19.09 to 13.59. Overall, the pupil-teacher ratio issue has been paid a lot of attention, the main reason for the decent of its balance level is the intra-regional difference. It is found that, for primary education, the contribution of intra-regional difference to the total unbalance was kept above 50% in the ten years, which was above 70% in junior secondary education (as chart4 and chart 5). There are many reasons for the phenomenon, but one of the most important reasons is, in the past few years, as the urbanization in China, the students from rural areas rushed into the urban schools, which resulted in forming many “super schools” in urban areas with eight thousand or more students, and many “sparrow schools” with fifty or less students in rural areas. That meant the pupil-teacher ratio in urban areas became bigger and bigger, and the pupil-teacher ratio in rural areas became smaller and smaller.

In addition, teacher academic qualifications compliance rate was the fastest growing indicator in the balance level for both primary education and junior secondary education, however, the absolute gap for TQCR still existed. Such as 2003, the maximum of TQCR of Junior secondary education was 71.53% (*Beijing*), and the minimum was 13.29% (*Gansu* Province), the maximum of TQCR of primary education was 72.17% (*Beijing*), and the minimum was 16.59% (*Tibet*). While in 2012, the maximum of TQCR of Junior secondary education was 97.06% (*Beijing*), and the minimum was 59.96% (*Henan* province), the maximum of TQCR of primary education was 97.48 % (*Beijing*), and the minimum was 75% (*Jiangxi* province).

### 3.2 Comparison between primary education and junior secondary education

With the comparative analysis on the mean values of Theil indexes of twelve indicators from 2003 to 2012, it was found the I-value of senior teacher rate in junior secondary education was greatly higher than primary education (as chart1). Despite of STR, TAQCR and PSFAOSB, the I-values of other nine indicators in primary education were higher than junior secondary education, especially the I-values of PSA and PNOC were greatly higher. Therefore, the balance level of Chinese junior secondary education was higher than primary education. For detail, the balance levels in educational expenditures between primary education and junior secondary education were roughly equivalent, but the differences in teacher resource and material resource should be paid more attention.

### 3.3 Comparison among four regions

With the comparative analysis on the mean values of Theil indexes of twelve indicators of four regions from 2003 to 2012 (chart 2, chart3), it is found the balance level of the Northeast was the highest, followed by the Central, West and East. It is needed to be paid attention on that the balance level of the East was greatly lower than other regions in both primary education and junior secondary education. The reason would be that many provinces of quite different development level were included in the East, both developed provinces (municipalities) such as *Beijing*, *Shanghai*, and developing provinces such as *Hainan* province. In 2012, the GDPs of *Shanghai* and *Hainan* Province were 2010.1 billion yuan and 285.5 billion yuan separately. In contrast, the difference among the Northeast, which include Liaoning province, Heilongjiang province, Jilin province, was much smaller. It should be pointed out that, balance development is not equal to high quality development. Taking per-student expenditure for example, in 2011 the ranking of it from high to low were the East (15603 yuan), the Northeast (9689.23 yuan), the West (8586.02 yuan), the Central (6652.88 yuan), thus the per-student expenditure of the East was much more than other three regions. Relatively speaking, the Central was in the status of balanced development of low level.

### 3.4 Analysis on the structure of unbalance

The status of balanced development of Chinese compulsory education can be more deeply presented and understood, through analyzing the structure of unbalance. The total unbalance reflected by Theil index is constructed with intra-group difference and inter-group difference (Yu L, 2007). Therefore, the proportion of inter-group difference in the total unbalance can be reflected by the contributing rate of inter-group difference, which is given by the equation,

$$P_b = \frac{L_b}{L} \times 100\%,$$

and intra-group difference contributing rate  $P_w = 1 - P_b$

It was shown that, for the primary education (chart 4), the indicator with maximum  $P_b$  is per-student number of computers (PNOC), whose value was 73.55% in 2007.  $P_b$  of per-student sports area, per-student number of computers, per-student number of books and magazines in libraries were kept above 50% or 60%. That is to say, inter-regional difference held dominant position, and the unbalance of the above three indicators were caused by the inter-regional difference among the East, Central, West, Northeast. Meanwhile,  $P_b$  of educational expenditure was relatively high, whose value was 52.21% in 2005. That meant there were big gaps in educational investment among the East, Central, West and Northeast. Relatively speaking,  $P_b$  of per-student floor area of school building was the minimum, and  $P_b$  of per-student area of school sites was low and decreased continuously.

The unbalance of junior secondary education was similar to primary education (chart 5). The indicator with maximum  $P_b$  was per-student number of computers, whose value was 55.3% in 2012, and followed by per-student number of books & magazines in libraries and per-student sports area. From 2003 to 2006, the contributing rate of inter-regional difference for educational expenditure was bigger than the contributing rate of intra-regional difference, but fell down later. However, compared with primary education, the contributing rate of inter-regional difference for the above indicators were lower. The Theil index of teacher academic qualifications compliance rate fell by forty-seven times, while its contributing rate of inter-regional difference was increasing (the  $P_b$  value was 60.30% in 2010), that meant the balance level of TAQCR was improved significantly, but the gap still existed among the four regions. The balance level of pupil-teacher ratio declined significantly, while its contributing rate of inter-regional difference was minimum among the twelve indicators, which was 21.38% in 2008. The balance level of per-student number of computers decreased, while its contributing rate of inter-regional difference was relatively big as well. The balance level of per-student area of school sites, per-student floor area of school building declined slightly, while their contributing rates of inter-regional differences were relatively small.

### 4. Conclusions and Suggestions

Based on analysis of Theil indexes of twelve indicators for three dimensions, which are educational expenditure, teacher resource and material source, of Chinese compulsory education from 2003 to 2012, the conclusions and suggestions are as the following.

Firstly, the strategy of balanced development for Chinese compulsory education obtained significant achievement in the past few years, the balance level of Chinese compulsory education was on the increase, in the background of China's economic gap, among different regions and between urban and rural area, was still relatively large and even expanded. However, there were structural differences among different educational stages, regions, dimensions and indicators. For difference on different educational stages, the balance level of junior secondary school was higher than primary education, while the increase was lower than primary education; for difference on different regions, the balance level of the Northeast was the highest, followed by the Central, West, and East. The balance level of the East was much lower than other regions, for both primary education and junior secondary education. And the Central was at the status of low-level balance. Meanwhile, the increase of the balance level of the Central was very slow, and its intra-regional difference was even expanded; for difference on different dimensions, balance level of educational expenditure was higher than other dimensions, although it increased wavily, followed by teacher resource and material resource; for difference on different indicators, the balance level of teacher academic qualifications compliance rate increased significantly, for both primary education and junior secondary education, also the balance level of senior teacher rate grew comparatively significantly, while the balance level of pupil-teacher ratio experienced continuous sharp decline.

Secondly, as for the structure of unbalance, the contributing rate of intra-regional difference to the total unbalance was higher than inter-region. However, for per-student sports area, per-student number of computers, per-student number of books & magazines in libraries, the inter-regional difference was the main factor resulted in the total difference. Also the contributing rate of intra-regional difference of educational expenditure was relatively high. Thus the inter-regional difference for the above indicators should be paid more attention to, when develop policies for balanced development of compulsory education.

Additionally, the increase of total balance level was not positively or inversely correlated to the inter-regional balanced development. Therefore, the inter-regional balance level may decrease (such as pupil-teacher ratio) or increase (such as teacher academic qualifications compliance rate of junior secondary education) while the total balance level increase. Thus, it is very necessary to analyze the structure of unbalance, which may be divided into intra-regional difference and inter-regional difference.

In conclusion, the balance level of Chinese compulsory education showed an increasing trend, since the strategy of balanced development of compulsory education was implemented. However, the status of balanced development of Chinese compulsory education was very complex, since China has a vast territory, there are significant differences on socio-economy among different regions, and the binary structure of China is still very apparent. Therefore, the static absolute difference of Chinese compulsory education should be analyzed, as well as the dynamic trend; the total balance level of Chinese compulsory education should be analyzed, as well as its structure; analyzing panel data should be conducted, as well as deep field survey, which was not presented in this paper but was an important part in our research program.

### *References*

- Fan Y, Li X, Song N. (2014). The Three Models of Integrating Rural and Urban Education: Forming Mechanism and Problems to be Dealt with: Based on the Analysis of the Practice in Hainan, Chongqing and Chengdu. *Research in Education Development*, 1, 6-11.
- Gibson J, Huang J, Rozelle S. (2001). Why Is Income Inequality So Low in China Compared to other Countries: The Effect of Household Survey Methods. *Economics Letters*, 3, 329-333.
- Hu Z, Ou X. (2007). Analysis on Regional Inequality in Jiangsu Province by Multi-Target Measure Based on Theil Index. *Economic Geography*, 5, 719-724.
- Li H, Liu H. (2012). The Influencing Factors of the Balanced Development of County-level Compulsory Education and Its Solutions. *Educational Research*, 6, 86-90.
- Liang W, Du Y. (2008). Demonstrative Analysis on the Unbalance Problem of Compulsory-Education among Provinces in China. *Educational Science*, 4, 11-16.
- Song N, Zhu Y. (2014). Rural-Urban Gap of Compulsory Education Resources Allocation: Comparison of Chongqing-level and National-level. *Education and Economy*, 4, 3-8.
- Yu F, Zhao H, Zhao C. (2011). The Index System and Norm Construction of Balanced Development of County-level Compulsory Education. *Educational Research*, 4, 50-54.
- Yu L, Jiang Y T. (2007). Spatial and Temporal Analysis on the Regional Economic Disparities in China: Based on the Comparison between the Whole Country and Three Megalopolises. *Journal of Finance and Economics*, 3, 17.
- Yang X, Wang W. (2013). A Comparative Study on Teacher' s Development in Different Provinces. *Educational Research*, 10, 84-94.
- Zhai B. (2013). Study on the National Standard of Balanced Development of Compulsory Education. *Educational Research*, 5, 5-10.
- Zhai B. (2007). Demonstrative Analysis on the Equilibrium Development of Chinese Basic Education. *Educational Research*, 7, 22-30.
- Zhu J, Ruan C, Liu B. (2010). Research on Monitoring Indicators System of Balanced Development on Regional Compulsory Education - Based on Policy Practice of Compulsory Education in Anhui Province. *Educational Research*, 11, 12-17.

Appendixes

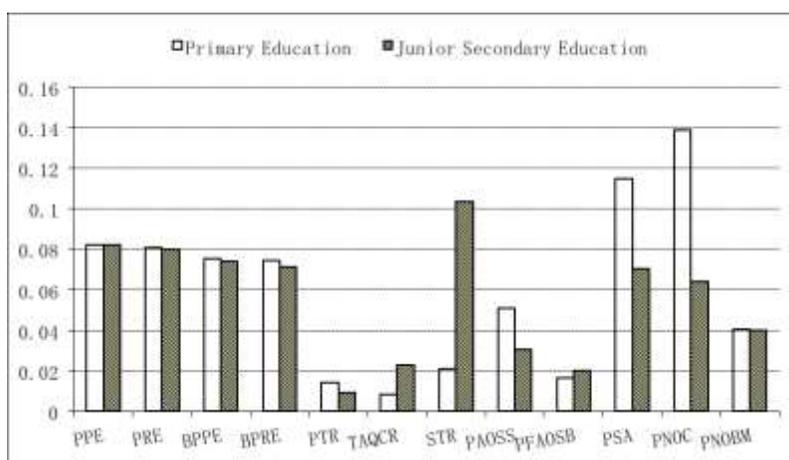
1) Table1: The Theil indexes of twelve indicators for primary education (2003-2012)

| Year | Educational Expenditure |        |        |        | Teacher Resource |           |        | Material Resource |            |        |        |           |
|------|-------------------------|--------|--------|--------|------------------|-----------|--------|-------------------|------------|--------|--------|-----------|
|      | PPE                     | PRE    | BPPE   | BPRE   | PTR              | TAQC<br>R | STR    | PAOS<br>S         | PFAO<br>SB | PSA    | PNOC   | PNOB<br>M |
| 2003 | 0.0966                  | 0.0934 | 0.0829 | 0.0809 | 0.0160           | 0.0289    | 0.0301 | 0.0672            | 0.0164     | 0.1500 | 0.1203 | 0.0479    |
| 2004 | 0.0947                  | 0.0922 | 0.0803 | 0.0797 | 0.0176           | 0.0187    | 0.0273 | 0.0634            | 0.0169     | 0.1417 | 0.1183 | 0.0496    |
| 2005 | 0.0862                  | 0.0843 | 0.0791 | 0.0796 | 0.0172           | 0.0121    | 0.0241 | 0.0587            | 0.0164     | 0.1371 | 0.1250 | 0.0455    |
| 2006 | 0.0817                  | 0.0802 | 0.0723 | 0.0721 | 0.0175           | 0.0081    | 0.0226 | 0.0573            | 0.0168     | 0.1350 | 0.1379 | 0.0466    |
| 2007 | 0.0755                  | 0.0733 | 0.0679 | 0.0658 | 0.0149           | 0.0056    | 0.0213 | 0.0545            | 0.0153     | 0.1224 | 0.1392 | 0.0436    |
| 2008 | 0.0739                  | 0.0731 | 0.0700 | 0.0693 | 0.0133           | 0.0041    | 0.0197 | 0.0501            | 0.0149     | 0.1171 | 0.1507 | 0.0390    |
| 2009 | 0.0764                  | 0.0757 | 0.0735 | 0.0728 | 0.0125           | 0.0029    | 0.0178 | 0.0452            | 0.0147     | 0.1065 | 0.1667 | 0.0385    |
| 2010 | 0.0804                  | 0.0793 | 0.0802 | 0.0789 | 0.0111           | 0.0021    | 0.0166 | 0.0424            | 0.0128     | 0.0939 | 0.1523 | 0.0330    |
| 2011 | 0.0750                  | 0.0744 | 0.0708 | 0.0702 | 0.0105           | 0.0014    | 0.0156 | 0.0362            | 0.0290     | 0.0803 | 0.1481 | 0.0341    |
| 2012 | —                       | —      | —      | —      | 0.0097           | 0.0011    | 0.0151 | 0.0331            | 0.0128     | 0.0637 | 0.1281 | 0.0290    |

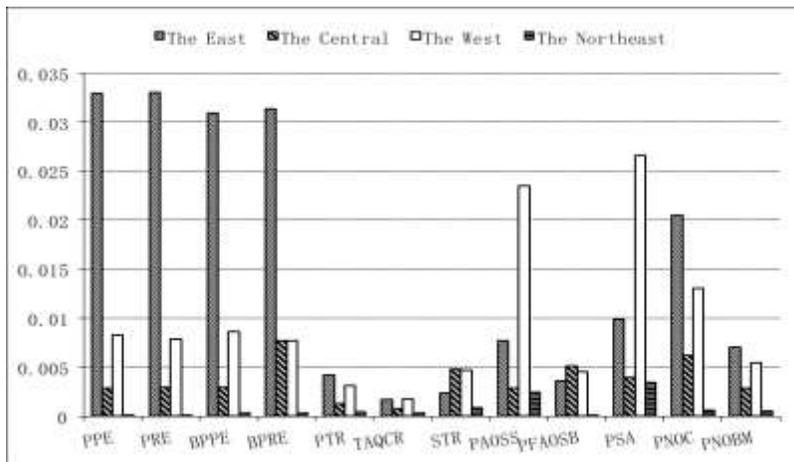
2) Table2: The Theil indexes of twelve indicators for junior secondary education (2003-2012)

| Year | Educational Expenditure |        |        |        | Teacher Resource |           |        | Material Resource |            |        |        |           |
|------|-------------------------|--------|--------|--------|------------------|-----------|--------|-------------------|------------|--------|--------|-----------|
|      | PPE                     | PRE    | BPPE   | BPRE   | PTR              | TAQC<br>R | STR    | PAOSS             | PFAO<br>SB | PSA    | PNOC   | PNOB<br>M |
| 2003 | 0.0989                  | 0.0989 | 0.0866 | 0.0789 | 0.0051           | 0.0527    | 0.1309 | 0.0264            | 0.0161     | 0.0597 | 0.0571 | 0.0393    |
| 2004 | 0.1057                  | 0.1009 | 0.0930 | 0.0891 | 0.0064           | 0.0440    | 0.1324 | 0.0288            | 0.0177     | 0.0625 | 0.0617 | 0.0404    |
| 2005 | 0.1002                  | 0.0955 | 0.0908 | 0.0873 | 0.0081           | 0.0363    | 0.1234 | 0.0296            | 0.0198     | 0.0669 | 0.0607 | 0.0434    |
| 2006 | 0.0930                  | 0.0901 | 0.0806 | 0.0779 | 0.0098           | 0.0277    | 0.1134 | 0.0321            | 0.0214     | 0.0727 | 0.0546 | 0.0452    |
| 2007 | 0.0801                  | 0.0772 | 0.0696 | 0.0661 | 0.0099           | 0.0211    | 0.1077 | 0.0339            | 0.0210     | 0.0735 | 0.0523 | 0.0443    |
| 2008 | 0.0628                  | 0.0629 | 0.0567 | 0.0568 | 0.0100           | 0.0164    | 0.1011 | 0.0350            | 0.0222     | 0.0781 | 0.0574 | 0.0438    |
| 2009 | 0.0622                  | 0.0629 | 0.0582 | 0.0584 | 0.0102           | 0.0121    | 0.0894 | 0.0320            | 0.0216     | 0.0792 | 0.0678 | 0.0430    |
| 2010 | 0.0708                  | 0.0686 | 0.0687 | 0.0659 | 0.0103           | 0.0097    | 0.0828 | 0.0310            | 0.0208     | 0.0794 | 0.0744 | 0.0388    |
| 2011 | 0.0653                  | 0.0635 | 0.0614 | 0.0592 | 0.0109           | 0.0081    | 0.0790 | 0.0299            | 0.0190     | 0.0719 | 0.0720 | 0.0328    |
| 2012 | —                       | —      | —      | —      | 0.0103           | 0.0011    | 0.0753 | 0.0285            | 0.0194     | 0.0596 | 0.0813 | 0.0301    |

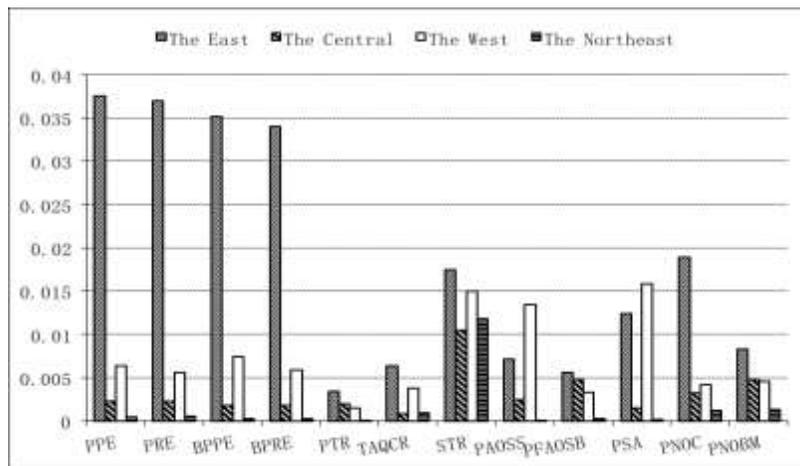
3) Chart 1: Comparison on the mean values of Theil indexes between primary education and junior secondary education (2003-2012)



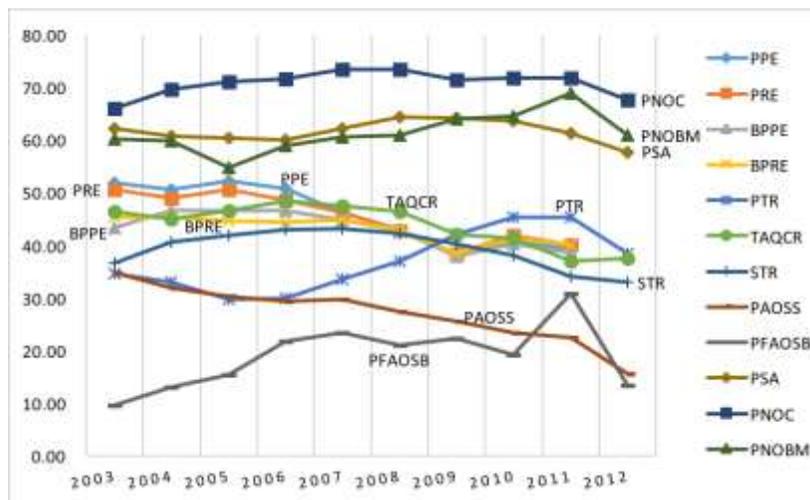
4) Chart 2 : Comparison on the mean values of Theil indexes of twelve indicators among four regions from 2003 to 2012 (primary education)



5) Chart3 : Comparison on the mean values of Theil index of twelve indicators among four regions from 2003 to 2012 (Junior secondary education)



6) Chart 4: The trend of contributing rate of inter-group difference in Primary education (2003-2012)



7) Chart 5: The trend of contributing rate of inter-group difference in Junior secondary education (2003-2012) West, and Northeast in the three

