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Analysis of School Students Distribution on China Province Level

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***Abstract* – This paper is to describe the school student amounts of Preschool, Primary School, Junior School, Senior School, and Higher Education in all the China province areas, and the data are obtained from China National Bureau of Statistics. Through the descriptive study, it is shown that low-developed provinces often have higher students rate in preschool, primary school, and middle school, while rich areas have more student rate in higher education. Hierarchical Clustering method is then used to segment province regions by their various school student amounts, and 5 clusters are found.**

***Keywords* – China Education Type, Areal Student Amount and Hierarchical Clustering.**

I. Introduction

Education is people's life preparation, and it is the basis for the future. Education decides the future of a country and a nation, and is the most important project of a country and a nation. Since entering the new century, China's education has developed very rapidly. By the end of 2016, according to the statistics of the Ministry of Education, the number of schools at all levels in China has reached 152,000, which is a very large number. In 1999, China government implemen--ted the popular development strategy and began to expand the enrollment scale sharply. By 2002, the gross enrollment rate of higher education reached 15%. According to the internationally accepted indicators, China has entered the stage of mass development. Over the years, the gross enrollment rate of higher education reached 42.7% in 2016. According to the outline of the plan, this rate will reach 50% by 2020. This indicates that China has entered the stage of popularization of higher education and is striving towards the direction of intensive development. Generally speaking, the development level of education in China has stepped into the ranks of the world, but at the same time, China still have some contradictions and problems in national education developments.

The main contradictions in China education are consistent with the China social development. The main contradiction in the past was the difficulty in going to school and the shortage of educational resources. At present, the difficult problem of going to school in China has been fundamentally alleviated, but the government still have a lot of pressures. On the one hand, people are in urgent need of high-quality education, hoping their children can go to good schools; on the other hand, the supply of high-quality education resources in China is short and unbalanced, and there are too few good schools to meet the needs of the people and the needs of social development. These contradictions are especially heavy in some low-developed provinces, and the unbalance of education development attracts government's attention. This paper focuses on the analysis of school students' distribution in China provinces, and the results can be taken as a reference to describe the unbalanced developments in China education, which helps government make corresponding polices.

In this paper, the authors analyses the number of China area school students in Preschool, Primary School, Junior School, Senior School, and Higher Education in year 2016. The data are downloaded from the China National Bureau of Statistics, and the student amounts are at every one hundred thousand population level.

II. Hierarchical Clustering

Hierarchical clustering essentially consists of progressi--vely organizing all of the candidate objects into clusters comprising mutually similar objects as determined by some measure of inter - object and inter - cluster similarity, proceeding in succession from the formation of small clusters containing just two objects to large clusters containing many objects. It is characteristic of this procedure that the clusters formed in each step can be graphically displayed in tree diagrams referred to as dendrograms. Hierarchical clustering is widely used as it visuality, but it is less efficient for large observations. In this paper, the dataset only has 31 observations and 5 columns, and it is suitable for hierarchical clustering method. Each observation indicates each province region, and each column stand for the school student number of each school type. The segmentation is based on these 5 columns and data are transformed by z-score standardized before clustering.

By clustering, the 31 areas are grouped into several clusters, and the analysis about these cluster is then performed. The result is useful to show the difference and similarity of these 31 provinces.

III. Descriptive Study

China's preschool education generally starts at the age of 3, and the preschool education is mainly in kindergartens. The preschool education stage is divided into: small classes (3-4 years old), middle classes (4-5 years old), large classes (5-6 years old). Kindergarten life includes three meals a day, mainly games; pre-school classes like school classes, but the time is short; many outdoor activities. Figure 1 displays the spatial distribution of China mainland preschool students in all provinces. The color of each region

is proportional to its preschool students. It can be found that the low developed provinces Xinjiang, Henan, Guizhou and Guangxi have higher preschool students rate, while rich areas like Beijing, Tianjin and Shanghai have lower preschool students rate. It might be because that a lot of outlanders work in the rich areas, for example, about half of population in Beijing are from other areas, and they put their children study in their hometown.

In most parts of China, primary schools are divided into six years. It is generally believed that the first grade to the third grade is the "lower grade" that is the basic stage of primary school, while the fourth to sixth grade is the "higher grade" that is, the expansion stage of primary school. In these six years, students usually have to study moral and life, moral and social, language, mathematics, English, sports and health, science, music, art, information technology. But in fact, because there is no unified examination at the time of primary school graduation, it is difficult to guarantee the quality of other courses except Chinese, mathematics and English. Figure 2 shows the spatial distribution of China mainland primary school students in all provinces. The trend of spatial distribution on primary school students is similar to the trends of preschool students, and they share the same reasons.

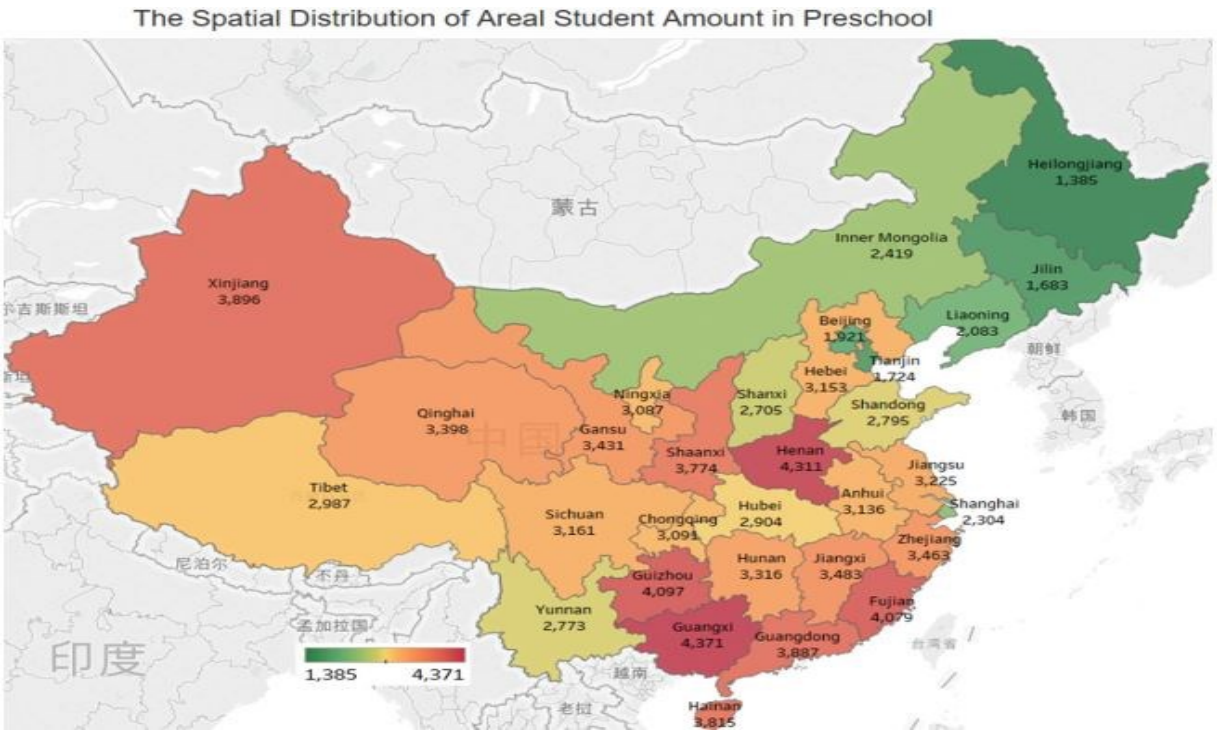

Fig. 1. The spatial distribution of China mainland preschool students in all provinces, and the student amounts are at every one hundred thousand population level. The color of each region is proportional to its preschool students.

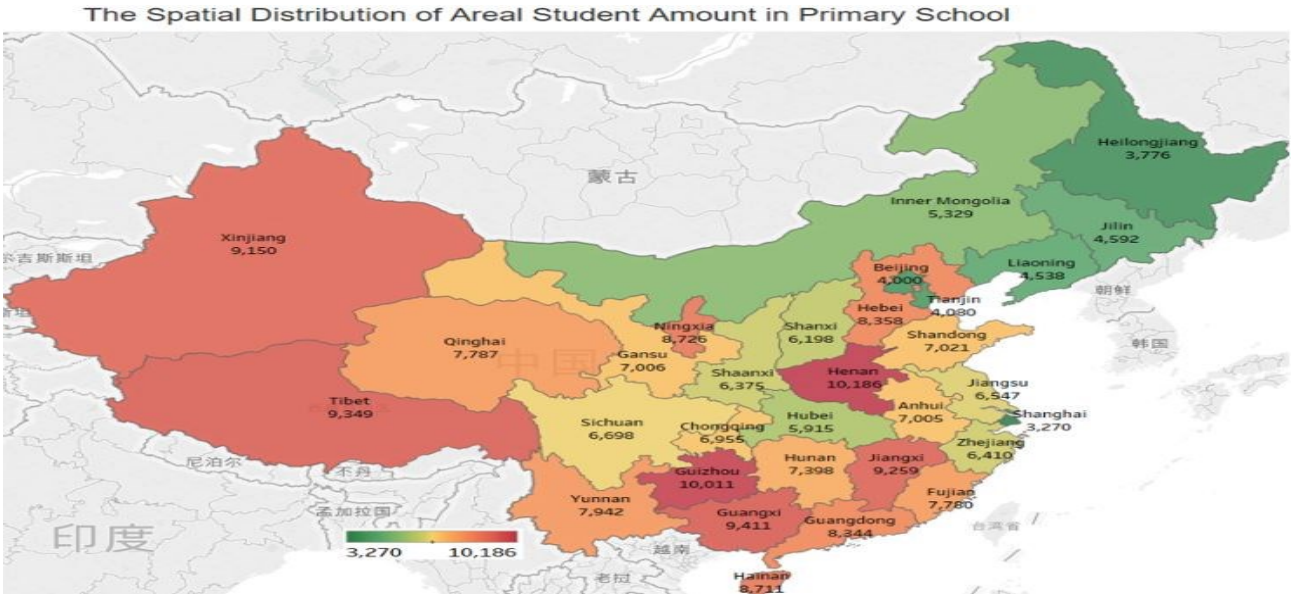

Fig. 2. The spatial distribution of China mainland primary school students in all provinces, and the student amounts are at every one hundred thousand population level. The color of each region is proportional to its primary school students.

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Students in China second level education are often between 12 and 17 years of age. Junior middle school, senior high school, vocational high school and technical secondary school are all secondary schools. Ordinary secondary schools are divided into junior high school and senior high school. The school system is three years each, and part of the junior high school graduates into senior high school, also part into vocational high school and technical secondary school. Secondary schools are usually set up by local governments. Figure 3 and Figure 4 show the spatial distribution of junior middle school students and senior middle school students respectively. General speaking, the trend of spatial distribution on junior middle school students and senior middle school students are similar to the trends of preschool and primary school students, and they share the same reasons. However, the senior student amounts in Tibet decease about one third, and it might be because that families there have no intention or not enough fund to support children's education. For other areas, the senior student amounts change a little, and it means more and more Chinese families realize the importance of education, and let their children finish their education under third level education.

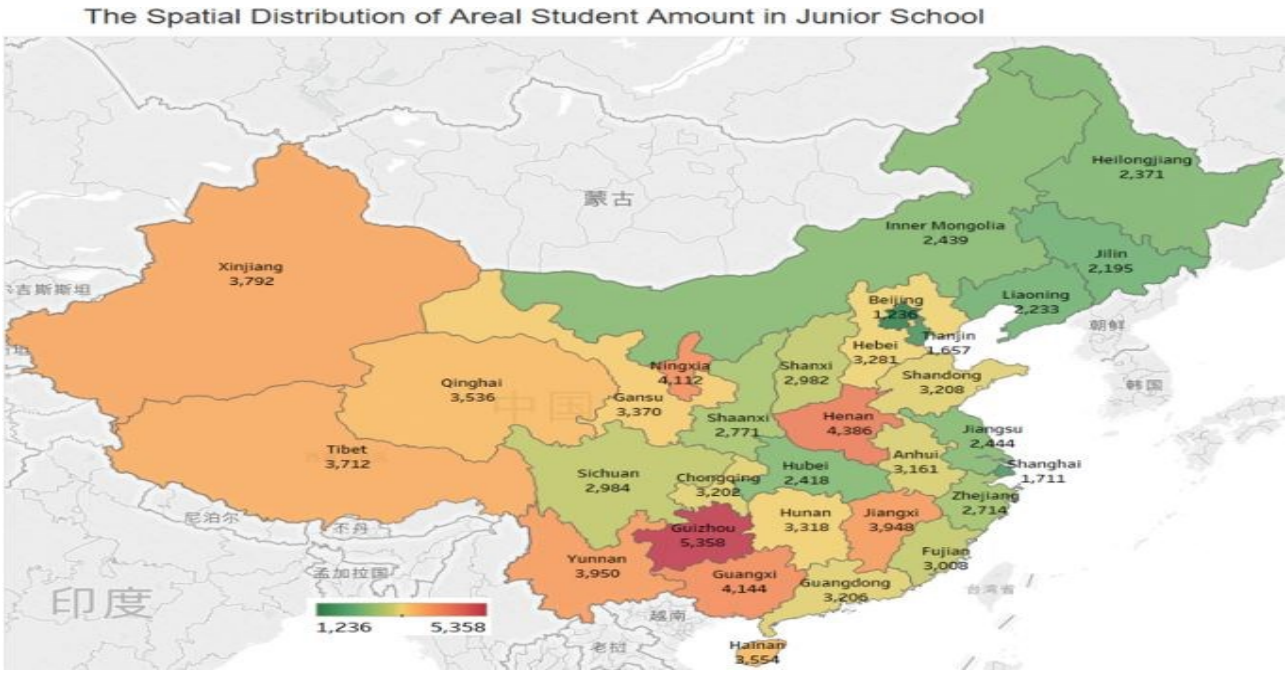

Fig. 3. The spatial distribution of China mainland junior middle school students in all provinces, and the student amounts are at every one hundred thousand population level. The color of each region is proportional to its junior middle school students.

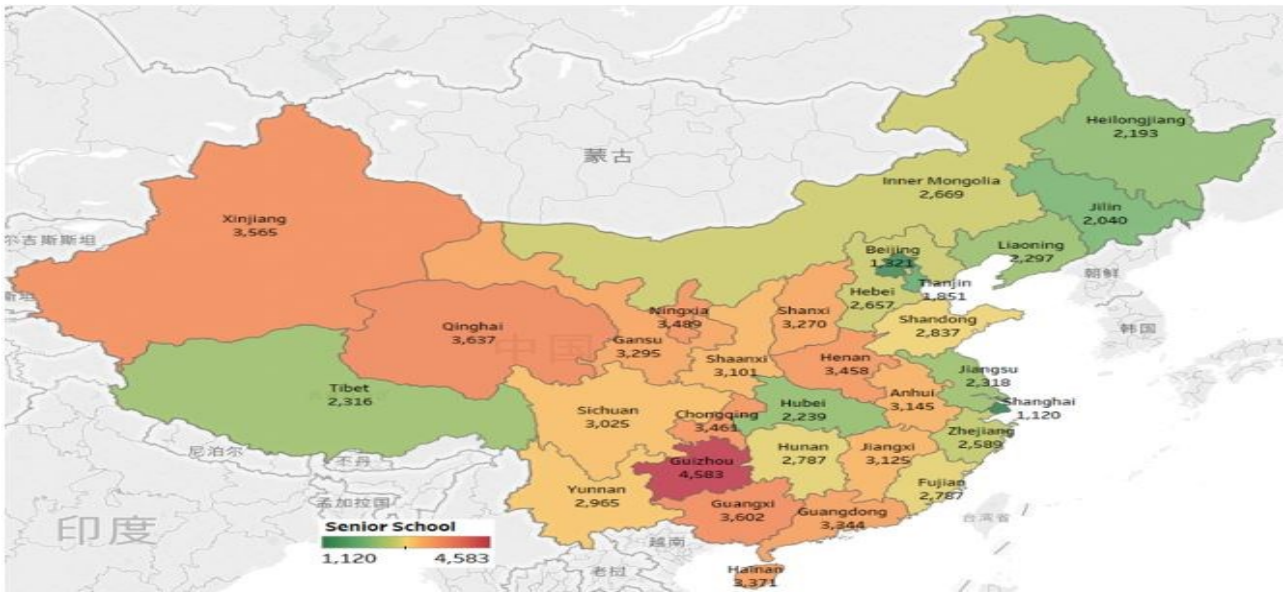

Fig. 4. The spatial distribution of China mainland senior middle school students in all provinces, and the student amounts are at every one hundred thousand population level. The color of each region is proportional to its senior middle school students.

Undergraduate and postgraduate education are after secondary education. Institutions of higher education in China are universities, colleges and colleges. Colleges and universities have three functions: teaching, scientific research and social service. There are 1396 institutions of higher learning and 72 private institutions of higher learning. There are 718 adult colleges and 4 private adult institutions of higher learning. In order to promote the development and reform of higher education, during the Ninth Five-Year Plan period, the "211 Project" was put forward that about 100 colleges and universities and a number of key disciplines should be built. Figure 5 displays the spatial distribution of China mainland students in higher education, and the spatial distribution is quite different from the trends in the other education stages. It is because the majorities of universities and colleges of higher education are set up by central government, and thus important cities often have many colleges. For example, Beijing, Tianjin, Shanghai, Nanjing, Xi'an, Wuhan, and Chongqing all have many colleges, which makes their located provinces have relative higher college students.

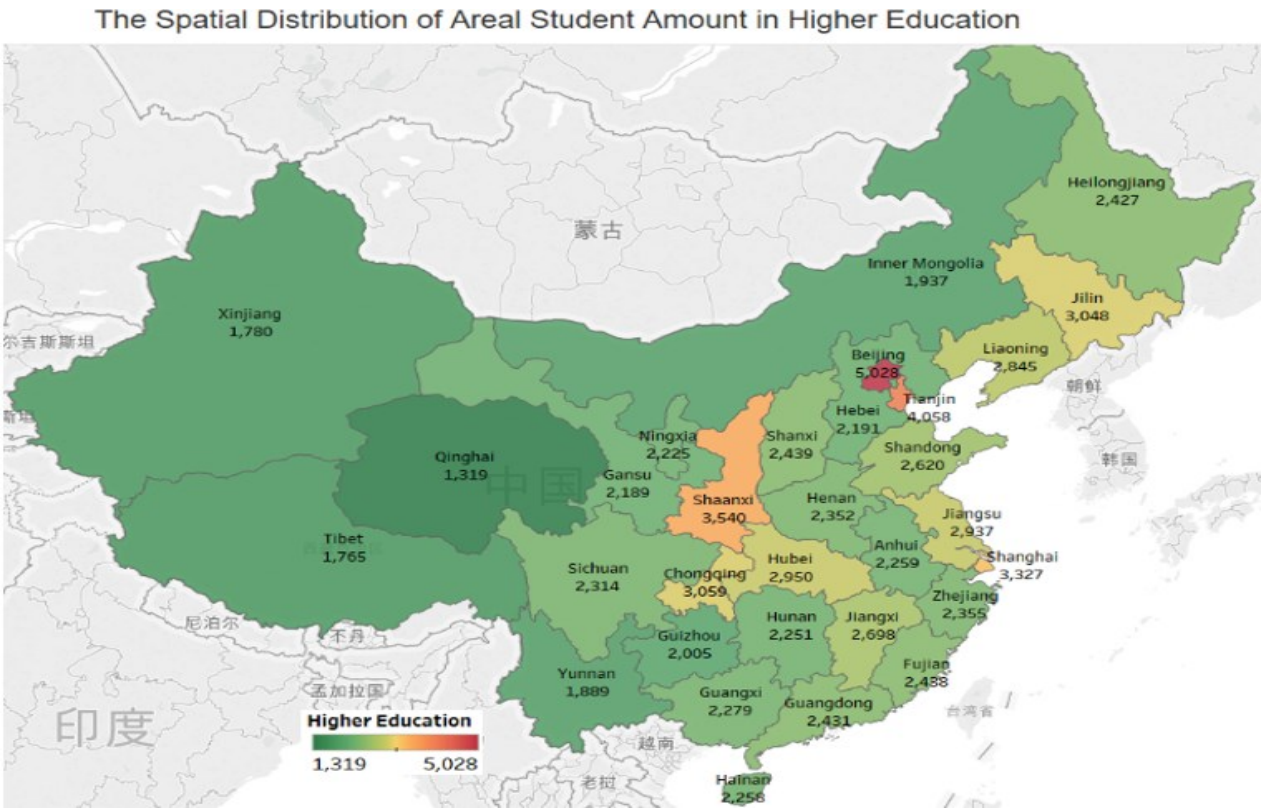

Fig. 5. The spatial distribution of China mainland students in higher education of all provinces, and the student amounts are at every one hundred thousand population level. The color of each region is proportional to its school students in higher education.

IV. CLUSTERING RESULT

After the Hierarchical Clustering, the tree-diagram are shown in Figure 6, and it demonstrate how the provinces are grouped into small groups in detail.

Table 1. The cluster result of 31 province areas with average student amounts in each type of education.

Clus	Areas	Pre-school	Primary School	Junior School	Senior School	Higher Education
1	Inner Mongolia, Liaoning, Jilin, Heilongjiang	1,893	4,559	2,309	2,300	2,564
2	Hebei, Shanxi, Jiangsu, Zhejiang, Anhui, Fujian, Shandong, Hubei, Hunan, Chongqing, Sichuan, Shaanxi, Gansu	3,249	6,897	2,989	2,886	2,580
3	Jiangxi, Henan, Guangdong, Guangxi, Hainan, Yunnan, Tibet, Qinghai, Ningxia, Xinjiang	3,601	8,886	3,834	3,287	2,100
4	Guizhou	4,097	10,011	5,358	4,583	2,005
5	Beijing, Tianjin, Shanghai	1,983	3,783	1,535	1,431	4,138

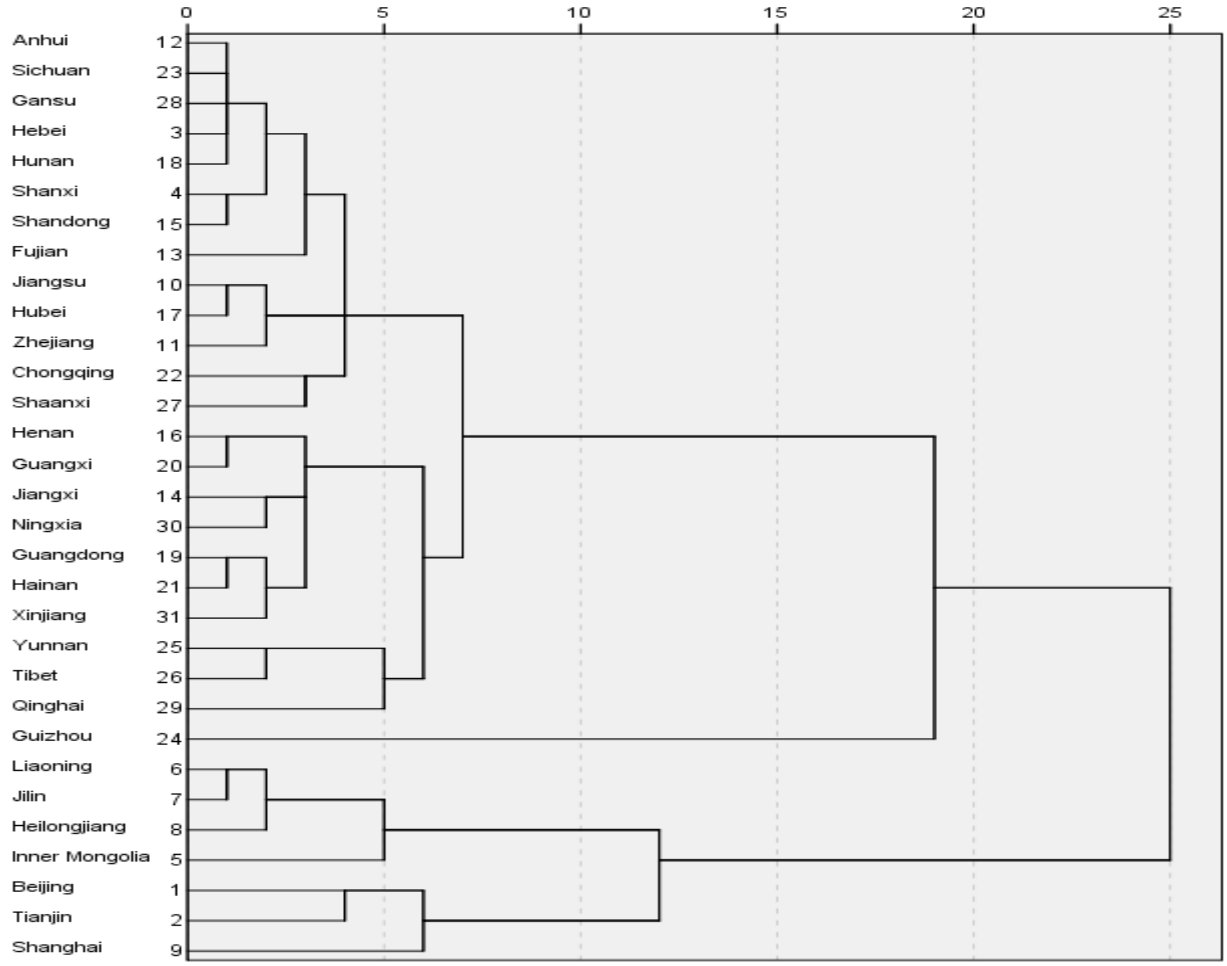

Fig. 6. The tree-diagram of Hierarchical Clustering.

From the figure 6, the 31 areas are grouped into 5 sub-groups, and they are listed in Table 1. It can be found that areas in Cluster 1-4 have higher student amounts in preschool, primary school, junior school, and senior school but lower student amounts in higher education. Cluster 5 have higher student amount in higher education but lower in other education type. The areas in Cluster 5 are all important cities in China, and their student distributions are quite different from the other provinces in Cluster 1-4.

V. Conclusions

This paper does a descriptive study of China area school students amounts in Preschool, Primary School, Junior School, Senior School, and Higher Education in year 2016. This paper firstly demonstrate the spatial distribution of student amounts in each education type, and found that low-developed provinces often have higher students rate in preschool, primary school, and middle school, while rich areas have more students rate in higher education. It might be because that a lot of outlanders work in the rich areas but put their children study in their hometown. By the Hierarchical Clustering analysis, the 31 areas are grouped into 5 sub-groups. It is found that areas in Cluster 1-4 have higher student amounts in preschool, primary school, junior school, and senior school but lower student amounts in higher education. However, Cluster 5 displays a reverse trend. This paper is just a simple descriptive study, and it could give a little help to government and researchers as a reference.

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