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A Comprehensive Evaluation of and Policy Recommendation to Foreign Direct Investment Environments in Western China

by

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I. Introduction

Ever since its reform and opening-up, the pace of China's integration into the economic and financial globalization has been faster and faster. Now China has become the largest recipient country of foreign direct investment (FDI) among all developing nations. During 1979—2002, foreign investment in China totaled US$623.4 billion out of which $446.3billion was FDI. Yet there lies a serious imbalance as to the actual spread of FDI amongst the country's different regions. In 2002, FDI into China was $52.743bil., out of which 86.1% went to the eastern region, 9.5% to the central and the remaining 5.71% to the western region. That means that per capita FDI in the western region was only $8.30 compared with the eastern region's $95.60. Then what are the determinants or factors that affected the regional distribution of foreign investment in China? What places do the various provinces in the western region hold in terms of their FDI environments? What are the disparities and causes? Through its FDI environment assessment system, this paper conducts a comprehensive evaluation and cluster analysis (CA) of the different investment environments among China's different regions by using statistical data and quantitative models.

Literature Review

Academic research in the past 20 or 30 years on the choice of locations of foreign investment has been focused on: 1. increased analysis of location factors in international FDI theory to explain the influence of geographical locations on the choice of FDI recipient countries; 2. site investigation on investors to find out the decision-making process of their FDI locations; and 3. quantitative methods to determine the differences of FDI destination locations or the factors deciding on the choice thereof.

With the ever-increasing foreign investment into China, research findings on FDI to China has proliferated in both Chinese and English. Both foreign scholars and Chinese scholars working or studying overseas have contributed in English to the field of research. Due to the growing geographical imbalance, choice of FDI destination locations in China has become a hot topic of academic research, a major area of which has been to examine the determinants leading to the choice of FDI locations in the country by relying

on the basic principles of modern geographical location theory and by using all kinds of econometric tools, such as the analysis done by Minghong Lu(1997) on the GDP, labor cost and other data from 29 provinces during 1988—1995 in their influence on the FDI locations in the country. Houkai Wei and Feican He(2002) researched on the same by further analyzing the relationships between the choice of locations and different industry groups, the methodology of entry, differences in economic development stages in China and the different country origins of FDI.

Kevin Honglin Zhang(2002) is representative of recent research in English in the field. He used data from 29 provinces during the 1987—1990, '91—'94 and '95—'98 periods and analyzed the influence of such factors as market scale, labor cost, labor quality, business concentration, transportation cost, stimulation policy and cultural link on the choice of FDI destinations. Then he compares the results from his regression analyses of the three above-mentioned periods with those of the panel estimate from the 12-year period between 1987—1998. Changhui Zhou, Andrew Delios and Jingyu Yang(2002) used data from 28 provinces during 1980—1998 for the analysis of Japanese businesses in their decision of investment locations. One feature standing out in their research is the use of the number of businesses and the number of employees as a variable. In their study the accumulative number of businesses was used to explain the degree of economic concentration in the variable whereas the same was explained by the development stage of industry in other studies.

Though different variables and data years were used in the above researches, the quantitative methodology remained the same. The main purpose of their research was to try to find out what factors, and to how large a degree, influenced the inflow of FDI into China or from which country, i.e., the relationship between FDI and certain determining variables(determinants). Based on the assessment of the FDI environments in western China, this paper intends to: 1. set up an assessment system of indicators by using the above-mentioned FDI and its relevant factor analysis methodology to determine the certain factors most relevant to FDI in China; 2. to ascertain the combined index of FDI in 30 provinces in China in order to discover where western provinces lie in the index; and 3. to carry out a cluster analysis in the hope of finding out the commonality of the FDI environments in the 12 western provinces and their disparities with that of their eastern counterparts by objectively analyzing the internal types of the FDI environments in China's 30 provinces and regions.

Ⅱ. An Empirical Assessment of FDI Determinants

2.1 Model specification and variables

Based on calculations, the following model is constructed:

$$FDI_i = \alpha 0 + \alpha X_i + \varepsilon_i$$

where i =1,…,30; FDIi is the amount of FDI inflow into the provinces in a given period of time; Xi denotes a set of independent variables that vary across provinces and over time; and ε denotes stochastic disturbance. The variables used in this analysis are defined below(See Table 1).

FDI: A dependent variable referring to the share of FDI inflow into various regions, its unit being 100 million yuan(RMB) at the average annual exchange rate with US dollars listed by the Ministry of Commerce of China.

Following are independent variables:

GDP: Gross Domestic Product, the total amount of production and services of a certain region in a given year, and a substitutive variable of the market volume in this study, its unit being billions of RMB. Theoretically, its expected impact should be positive.

LOCA: A dummy variable with the eastern region=3, the central=2, and the western=1. Geographically, Guangxi Province belongs to the eastern coastal region and Inner Mongolia the central, but for the Great Development of Western China, both Guangxi and Inner Mongolia are considered western province and region. It should have a positive impact on FDI inflows,

STA: The state-owned industrial output, or ratio of the state-owned and state-held majority industrial enterprises' output to the gross industrial output. Reflecting the degree of maturity of China's market economy, it should be negatively related to FDI inflows. Its unit is the percentage (%).

TER: Ratio of the value-added of the tertiary in GDP, mainly indicating the stage of development of finance, transportation, information services, etc. It's expected impact should be positive. Its unit is in percentage.

CITY: Urbanization level, representing the ratio of cities with an urban population of 500,000 out of the total number of cities in a given region. Theoretically, this variable should be positive on FDI, its unit being in percentage.

POLI: A dummy variable. With reference to Sylvie Démurger's(2002) approach, this paper measures and tests favorable policy index based on the types of the special economic zones established by each province(the weight varies from three to one and that of non-open regions is null) and the open-door policy(Western

Development region=0.5). Representing preferential policies, and it should be positively related to FDI inflows.

WAGE: A dummy variable. It is 1 if the labor cost of the region is higher than that of the national average, or it will be null. In theory, it is inverse to FDI.

LI: This variable refers to the proportion of light industry above a certain size relative to the gross industrial output value. With the priority change from heavy industry to the compensatory development of light industry since China's reform and opening-up, FDI has been affected by the regional distribution of light industry locations in China. Its unit is in percentage.

FTD: Foreign trade dependency degree is equal to the ratio of total imports and exports in GDP. Reflecting the openness of the economic development of the region concerned, it's impact should be positive theoretically. Its unit is in percentage.

FI: The proportion of the amount of foreign enterprises' imports out of the total local imports and exports, which reveals the degree to which local governments control the imports by foreign enterprises. It should be positively related to FDI inflows, its unit being the percentage.

HC: Illiteracy rate of the population at or over the age of 15 in the region concerned, which represents the accumulation of the local human resource. It should be theoretically negative related on FDI inflows, its unit being the percentage.

We conduct a multi-regression analysis with the comprehensive data of 30 provinces (excluding Tibet) from the various years between 1998--2002 and the cross-sectional data of the year of 2002 respectively.

Time frame for the selection of the data is based on two considerations: one is that Chongqing, which has attracted quite an enormous amount of FDI in recent years, began to have its own statistics in 1998, and the other is that the on-going Great Western Development started in 1999, so statistics from 1998—2002 can better reflect the changes that took place after the Development began.

Model based on the comprehensive data from 1998—2002 is as follows:

Model I: $\ln(FDI)=a+a_1\ln(GDP)+a_2STA+a_3TER+a_4LOCA+a_5WAGE+\varepsilon$

Model II: $\ln(FDI)=a+a_1\ln(GDP)+a_2LI+a_3FTD+a_4FI+a_5HC+\varepsilon$

And the model based on the cross-sectional data from 2002 is:

Model III: $\ln(FDI)=a+a_1 \ln(GDP)+a_2 LOCA+a_3 POLI+a_4 CITY+\varepsilon$

2.2 The estimation results

Factors affecting FDI inflows are estimated by the ordinary least-squares(OLS) techniques of the SAS statistic analytic software package. Through repeated measurements and calculations, 11 factors remarkably affecting FDI are established. They are lnGDP, TER, CITY, FTD, LI, POLI, LOCA, FI, STA, WAGE and HC. The results are illustrated in Table 2.

The overall performance of three estimates is satisfactory. Values of adjusted R^2 in the three cases were from 71 percent to 85 percent, indicating a strong explanatory power of the models, and the significance level of F test is $p<0.0001$, indicating that the significance of the model regression as a whole is high.

The determinant model of FDI in 2002 is purposefully designed as Model III in order to test the impacts of various factors in pure cross-sectional data, the results of which denote that factors In (GDP), LOCA, CITY and POLI affect FDI significantly but both factors of POLI and LOCA are significant at 5 percent.

Specifically, some coefficient estimates in the models appear to be low. But in effect, when the statistic position of independent variable to dependent variable is horizontal-logarithmic value, the interpretation of coefficient *a* should be: $\%\Delta y=(100a)\Delta x$, i.e. the coefficient should be multiplied by 100. For a better understanding, factors in question are discussed as follows.

1) GDP

GDP refers to the economy and market size of a region. In Model I, the impacts of GDP on FDI is significant and the elastic coefficient is 1.147, denoting that when GDP between provinces increases at 1%, FDI will correspondingly increase by 1.147%. In addition, we also tested the relationship between FDI and per capita GDP, but it failed to pass the *t* test. As other researchers concluded, FDI is mainly to capture the markets of all provinces, municipalities and autonomous regions where the average individual consumption level remains low but its total amount is enormous. However, the elasticity estimated by cross-sectional data is far lower than that by comprehensive data. Provinces with less GDP values in the western region do see their FDI inflows affected, but it is relatively more favorable to those regions with larger GDP's such as Sichuan, Shaanxi (Xi'an), Chongqing, etc.

2) LOCA

Three belts of the eastern, central and western regions can fully illustrate the natural and economic environment variability of China. Regional factors mainly affecting foreign investment policy-making are transportation costs. Particularly,

eastern coastal regions are endowed with naturally convenient conditions for export. Other economic advantages are the closeness between these regions and the nearby investor countries, the consanguinity with their overseas Chinese investors, and the geographical factors that offer them superior agriculture, resources, human capital and so on and so forth. The disturbance coefficient of LOCA on FDI is 0.733, i.e., the regional variation of the eastern, central and western regions affects FDI inflow to a certain extent and the regional disadvantage of western China is unfavorable to attracting FDI inflow.

3) POLI

Establishing regional variations by offering preferential economic policies is crucial in order to attract foreign investment into China. It is well known that the reform and opening-up of China began with the preferential policies granted to Guangdong and Fujian provinces for their economic and foreign trade activities. In 1980, four special economic zones(SEZ), typical of which was the Shenzhen SEZ, were set up as a pilot scheme; in 1984, 14 more eastern coastal cities were opened up to the outside world. In 1985, the pace of the coastal regions' opening-up hastened. Then in 1988 the whole island of Hainan was established as a SEZ. In 1990, Pudong in Shanghai was opened up for development, followed by the opening-up of the inland cities along the Yangtze River, land frontier cities and inland provincial capital cities after 1992. When it comes to the western region, its opening-up was by far later than any other region. It has enjoyed no special preferential policies, either. That is the single serious and institutional reason as to why there exists this tremendous disparity of the total FDI between the eastern and western regions. This study shows a significant impact of the preferential policy factor upon FDI inflow.

4) CITY

Urban structure is an indicator of the urbanization scale and density of a given province or region. In general, cities in the western region are small in number and sparsely scattered in scale. Their urban functions are far from perfect and are inadequate in co-operating with each other. Besides, they are in shortage of light industry bases and manpower reserves. In contrast with rural areas, their dyadic economy is deeply rooted. All of these factors are unfavorable to attracting foreign investment. The coefficient of the impact of the urban structural index on FDI is 0.019, indicating that when the proportion of the number of large- and medium-scale cities with a population of more than 500,000 increases by one percentage point, FDI will correspondingly go up by 1.9%. The higher the proportion, the more capable it is to attract foreign investment. In addition, we have investigated on the impact of the urbanization of 2002 on FDI but failed to get significant

results, which could mean that it is the urban structure but not the urbanization level that affects the FDI more.

5) STA

The ratio of state-owned economy reflects the degree of the market-oriented reform and the maturity of market economy environment. It represents the structure of ownership and the structure of competition in the market. In western China, the state-owned economy still remains a high proportion, while in its eastern region the non-public ownership in the economy has been growing swiftly and actively. It is concluded from Model I that when the proportion of state-owned industrial economy increases one percent, FDI will decrease by 3.5%, which indicates that foreign investment prefers those regions whose growth rate of the market economy is higher. Shuyun Chen et al.(1995) calculated that higher market economy regions mainly lie in the eastern coastal areas whereas those lower regions are in the west. The stagnation in the development of the market economy in the western region is a key factor in restricting the FDI inflow.

6) TER

The improvement of the proportion of tertiary industry is a necessity for the national economic growth to a certain level. The higher the proportion, the higher the requirements for the division of labor the economic development needs for its services and infrastructures. During the period of 1978--2002, the ratio of the tertiary industrial structure in the eastern 11 provinces has shifted from 21.5:59.3:19.2 to 10.2:48.9:40.9 while that in the western 12 provinces has changed from 37.2:43.1:19.7 to 20.1:41.3:38.6. In appearance, the difference between the eastern and the western regions mainly lies in the development of the first and second industries. However, the tertiary industry in the western areas consists of services mostly from the ideological Party and administrative departments of the government, which controls more and offers less, especially in such areas as modern service and information industries, thus limiting the amount of FDI inflows. Given that when the TER proportion is increased by one percent, FDI will increase by 8.3%, TER is the biggest coefficient factor.

7) Wage & HC

Seeking for cheap labor is also an important factor contributing to the FDI inflows. As the models postulate, when the labor cost in an area is higher than the national average, FDI decreases by 1.19%; when illiteracy goes up by one percent, FDI goes down by 7.6%, suggesting that it is necessary for FDI to make a choice between the decrease of labor cost and increase of human capital. Since the Chinese government offered a preferential wage treatment for the workers and staff members in the border ethnic minority regions and impoverished districts

that are at the rudimentary stage of reform, the variation of regional labor cost in the whole nation is perfectly indistinctive. Thus it is natural for foreign enterprises to invest in the eastern regions where a large sum of human resources has been accumulated. With the development of non-public ownership in the economy and change in pay policy, additional income beyond wages in the eastern regions is increasing by a large extent and the regional labor cost variation has begun to show up. But in contrast to developed countries, the impact of regional labor cost in China on FDI is comparatively small. With more and more farm workers as well as talents from the western region moving to the eastern and southern regions in seek of better pay, the impact of WAGE and HC on FDI is getting weaker and weaker.

8) LI

The reason to design and test the relationship between FI and FDI is because we think that when it comes to the investment structure, FDI tends to favor real estate and light industrial production and pays more attention to those regions with light industrial bases when selecting investment locations. In China, eastern regions have always been regarded as the major target areas for light industries to locate while western regions are characteristic of heavy industry sites. To a large extent, FDI further lowers the position of western regions when it comes to the locating of light industries. During the period of the centrally planned economy, China placed its priority on the development of heavy industries. Since its reform and opening-up, the country has experienced a rapid period of great development in the production of the means for livelihood. FDI-invested enterprises and villages and township businesses, especially those in the eastern and coastal areas, seized the rare opportunity to quickly develop themselves, which in turn greatly stimulated FDI. Our models indicate that when the proportion of light industry increases by one percent, FDI goes up by 3.8%.

9) FTD & FI

Model IV postulates that FDI correspondingly increases by one percent when trade dependency degree increases by one percent, and 2.1% when the import ratio of FDI increases by one percent. It is noted that the import of FDI into China was initiated from coastal port cities. Thus such provinces and metropolises as Guangdong, Beijing, Shanghai and Tianjin well-known for their leading positions in imports and exports have been the earliest and biggest beneficiaries of FDI. The implementation of the open-door policy and the SEZ policy also originated from coastal port cities with rich international experiences and then slowly extended to the central and western regions under such circumstances as had been gradually permitted by administrative decisions. The FTD level is an

important resource and precious experience in the attraction of FDI. The development of FDI needs the importation of technology and equipment and labelling business. Just as the direct correlation of FI to FDI indicates, it is easier to attract more FDI for regions in which FDI-invested enterprises enjoy a higher position in the total number of imports.

This research has also measured and tested the factors related to the per capita GDP and the total sum of investment in the nation's infrastructure. But these factors were eventually eliminated due to the failure of result confirmations. The establishment of the assessment system on FDI environments should emphasize the comprehensiveness and stability of the indicators. Our analysis indicators are highly general and representative since they take into consideration all factors ranging from macro, to location, to policy and to micro factors.

III. A Comprehensive Evaluation of Foreign Investment Environments by Principal Componential Analysis

3.1 Calculation of the comprehensive estimation index for foreign investment environments by Principal Componential Analysis

Following section intends to make a componential analysis of the k number of affecting factors ascertained through the regressional analysis by using the SAS statistic analytic software package, to calculate the characteristic value and vector of the correlation matrix R, contribution ratio and the like, to reduce the k number of variables to a lesser m number of new variables by a further selection of factors and reduction of dimensions, and to interpret the economic significance of the selected principal components.

The analysis is done through the 11 selected interpretative variables of lnGDP, TER, LI, CITY, FTD, POLI, LOCA, FI, N-STA, N-WAGE and N-HC. In accordance with the comprehensive analysis, three indicators of STA, WAGE and HC are alternated whereby N-STA refers to the proportion of non-state-owned industrial production value, N-WAGE=-WAGE and N-HC stands for the ratio of the population with an education beyond the elementary school.

Suppose the previous m as the number of principal components are, respectively:

$$Y_1=f_1[\ln(GDP), LOCA, CITY \ldots]$$
$$Y_2=f_2[\ln(GDP), LOCA, CITY \ldots]$$
$$\ldots$$

$$Y_m=f_m[\ln(GDP), LOCA, CITY \ldots]$$

then, when the various interpretative variables of the standardized process of the ith region are placed in the above model, the values of Y_1, Y_2, …,Y_m will be achieved. When the characteristic values corresponding to the m principal components are weight-imposed, the comprehensive index Y of foreign investment environments can be obtained as follows.

$$Y=b_1Y_1+ b_2Y_2+\ldots+b_mY_m$$

where b is the characteristic value corresponding to the previous m principal components. In the operation, the weight is thoroughly determined by the model and thus the subjective deviation caused by artificially controlled weighting is avoided.

3.2 The estimation result of the foreign investment environments

We select the 11 factors of ln(GDP), TER, LI, CITY, POLI, LOCA, FI, N-STA, N-WAGE and N-HC for the componential analysis. As illustrated in Table 3, with the exception of the correlation of TER to FI and N-STA and LI to N-HC being weak, the correlation between all the key factors, especially that between those and GDP, are of medium correlation. There is no factor that can be rejected due to its extremely low level of correlation(<10%) or extremely high correlation(>95%). As shown in Table 4, the representative can be as high as 94% if m=6 factors is selected. According to Tables 4 and 5, the six principal components are, respectively, as follows:

Y_1=0.2771*In(FDI)+0.2065*TER+0.2200*LI+0.2830*CITY+0.3341*FTD+0.3513*POLI+0.3696*LOCA+0.3241*FI+0.3604*N-STA+0.3049*N-WAGE+0.2291*N-HC

Y_2=0.3139*In(FDI)+0.5720*TER+0.4028*LI+0.3443*CITY+0.3254*FTD+0.1562*POLI+0.0717*LOCA+0.1921*FI+0.2540*N-STA+0.2251*N-WAGE+0.0780*N-HC

Y_3=0.3219*In(FDI)+0.0646*TER+0.2811*LI+0.1817*CITY+0.1103*FTD+0.2336*POLI+0.1697*LOCA+0.0888*FI+0.1543*N-STA+0.4478*N-WAGE+0.6726*N-HC

Y_4=0.2591*In(FDI)+0.1456*TER+0.2629*LI+0.4904*CITY+0.2217*FTD+0.4238*POLI+0.1567*LOCA+0.3191*FI+0.2503*N-STA+0.1776*N-WAGE+0.3908*N-HC

Y_5=0.4787*In(FDI)+0.0080*TER+0.4136*LI+0.2457*CITY+0.2555*FTD+0.1721*POLI+0.2646*LOCA+0.6099*FI+0.0076*N-STA+0.0419*N-WAGE+0.0236*N-HC

Y_6=0.3257*In(FDI)+0.3102*TER+0.5950*LI+0.3749*CITY+0.2599*FTD+0.1322*POLI+0.0907*LOCA+0.2145*FI+0.1308*N-STA+0.3734*N-WAGE+0.0852*N-HC

$Y=5.4603\ Y_1+2.0224\ Y_2+\ 1.2153Y_3+\ 0.6348Y_4+\ 0.5614Y_5+\ 0.4477Y_6$

If we introduce into the above model the interpretative variables after standardized treatment from each and every province and autonomous region, we can obtain the index of the assessment system on the FDI. The result is shown in Table 6.

(1) The places most favored by FDI are eastern coastal provinces and cities such as Guangdong, Fujian, Shanghai, Tianjin, Jiangsu, Zhejiang, Beijing, Shandong, Hainan and Liaoning. In reference to the comments by Minghong Lu on FDI between 1988--1995, today's FDI environments have changed. Such provinces as Jiangsu, Zhejiang, Tianjin and Shandong have advanced quickly. Guangdong has replaced Fujiang as the most favorable place for FDI. In fact, the position of Guangdong has also declined a bit, but it's still ranked number one in terms of the total FDI investment.

(2) The most backward places for FDI are Gansu, Qinghai, Ningxia, Xinjiang, Guizhou, Shaanxi and Inner Mongolia, all located in western China. According to Minghong Lu, Qinghai, Gansu, Ningxia, Xinjiang and Shaanxi rank No.11, 12, 15, 19 and 21 respectively in the middle echelon on the national scale. In 1988, these destination provinces and regions accounted for 4.05% of the nation's total FDI, which was their highest ever. That share has been dwindling down ever since. It stood at 0.86% of the national total in 2002, which agrees with our assessment.

(3) Study shows that at present southwestern provinces have better investment environments than their northwestern counterparts. Guangxi, Chongqing, Sichuan and Yunnan have progressed to the national average in ranking, which is in line with the actual FDI in the southwestern region. Throughout 1980's, the southwestern region lagged behind the northwestern region in attracting FDI, but it has surpassed the northwestern region since 1992. In 1994, it even reached 3.42% of the national total. According to Lu(1997), the worst FDI environments went to the southwestern region and such central region provinces as Anhui, Henan, Hunan, Inner Mongolia and Heilongjiang, etc., but in our analysis, Anhui, Henan and Hunan's positions have risen to a much higher level than before.

IV. A Cluster Analysis of the Regional Model of the Investment Environments and Internal Structures

4.1 Methodology

The cluster analysis is the mathematical method used to classify the subjects being researched on, the fundamental purpose of which is, firstly, to agglomerate the intended n number of individual candidates into various categories, and, secondly, to agglomerate the categories that are closest to each other into a new category of n-1 by stipulating the distance between the individual candidates or categories, and finally to agglomerate into yet an even newer category of n-2 by locating the categories that are closest to each other, until all the individual candidates are integrated into one single category.

With the aid of, again, the SAS statistical analytic software package, we carry out a systematic cluster analysis of the data after standardized treatment from all the provinces, municipalities and autonomous regions except Tibet. First, a mean is obtained of the various indicators from the period of 1998—2002. Then the indicators undergo a rudimentary standardization through the use of the national mean. After that, the indicators that are adjacent to each other in meaning are combined. Finally, the SAS software package is used for standardization to make the MEAN=0 and STD=1 so as to carry out the cluster analysis.

The purpose of such a classification is two-fold, i.e., to establish the regional model of investment environments and to analyze the internal structures of the investment environment indexes. Specifically, on the one hand, researchers normally classify various regions into different types based on the data structure and empiricism, which is apt to lead to confusion with large populations of data. But our research can avoid the deviation caused by the subjective judgment in terms of the cluster analysis. Through the division of the regional model, it can examine the types and differences between and amongst all parts of the nation and is convenient for the direction under categories and the regulation of regional policies. On the other hand, based on h regional models classified, the research respectively summarizes the raw data and figures out the various means of each provincial unit. With the comparative study, the internal differences of various regional models can be seen clearly.

The interpretative variable indexes are divided into seven factors ranging from market, industry, trade, service, manpower, location and policy. In what follows, detailed descriptions of these factors are provided.

Market factor: X1=InGDP*0.7+N-STA*0.3, where GDP is the market size and STA the market structure.

Industrial factor: X2=LI, indicating the regional differences of their industrial structures.

Trade factor: X3=FI*0.7+FTD*0.3, where FI is the impact of FDI on trade and FTD the degree of foreign trade dependency.

Service factor: X4=TER*0.7+CITY*0.3, where TER represents the development degree of the tertiary industry and CITY the urban structure.

Human Capital factor: X5=N-HC

Location factor: X6=LOCA

Policy factor: X7=POLI

4. 2 Results after cluster

We adopt the seven factors to undertake a cluster analysis, where X1 is the market factor, X2 industry factor, X3 trade factor, X4 service factor, X5 manpower factor, X6 location factor and X7 policy factor. Analysis results are shown in Table 7. According to the Table, deviation reaches 63.59% when the whole country is treated as one category, 17.83% when the whole country as two categories, 5.12% when treated as four categories. So we suggest that it be divided into at least two categories. Table 8 indicates that RMSSTD is as high as 1.2148 when the whole country is treated as one single category. It goes down significantly to 0.9568 when the country is divided into two categories. It goes down even further to 0.8745 when the country is divided into four categories. It keeps declining steadily when and after the whole country is divided into six categories. PST2 declines greatly from one category to two categories and from four categories to five categories. PSF reaches a climax at two categories. According to these indications, we think the country can be divided into two or five categories (with Guangxi as a single category). For the purpose of research, a division of four categories (with Guangxi belonging to the 2nd category) seems most adequate.

As shown in Figure 1, when the whole country is divided into two categories, there are only the eastern coastal region and the inland central/western region. Following will be the situation when we divide the country into four categories. We calculated and analysed the internal structures of the four different categories of regions(see Table 9).

Type One: Guangdong and Fujian, the most favored places by FDI, were also the earliest places to adopt open-door policies. They enjoy China's most preferential

policy treatment. From the internal structure, all of the four factors exceed those of the country's average. Their location advantages are obvious and market conditions good. Their policy and trade advantages are especially outstanding. The drawback is that their service environment is not as good as that of Type Two. Between 1997—2002, Guangdong's ratio of the total national FDI declined from 26.0% to 21.5%, whereas that of Fujian's decreased from 9.3% to 7.3%. In 2002, the amount of FDI came to $11.334bil. and $3.838bil. for Guangdong and Fujian respectively. Since 1996, their level of FDI has been stagnant mostly due to the Asian financial crisis and a saturation in domestic economy. A restructuring is also needed for their industries.

Type Two: Consisting of 10 eastern coastal provinces and cities including Beijing, Tianjin, Hebei, Liaoning, Shandong, Shanghai, Jiangsu, Zhejiang, Hainan and Guangxi, it is the most vitalizing region to draw FDI. It has the best service and human resource environments among all the four categories of regions. Its policy environment is equivalent to that of Type One at best, but it has superior location advantages of the eastern coasts and its macro environment is equally sound. It's worthwhile to note the rapid growth of FDI in Jiangsu, Shanghai, Zhejiang and Shandong. Jiangsu's FDI surpassed that of Fujian in 1993, thus ranking second nationally. In 2002, its FDI totalled $10.191bil., not far behind that of Guangdong's. It could even take over the number one place of Guangdong's in a certain number of years. At present, FDI in Shandong and Shanghai has surpassed that of Fujian's.

Type Three: Made up of 13 provinces and regions including Hunan, Hubei, Anhui, Jiangxi, Henan, Chongqing, Sichuan, Shaanxi, Inner Mongolia, Shanxi, Xinjiang, Jilin and Heilongjiang, it covers the country's central region and the good areas from the western region. Its manpower environment coefficient is slightly higher than the national average, but all its other environment indicators are inferior to the national averages. Central region has a location dvantage over the western region. Western frontier areas and bigger provinces and regions are better equipped than other locations from the same western region. From the tendency of the FDI increasing in the central region, there exists the possibility of the FDI moving away from concentrating on the eastern region to the central region. Since the provinces in this category are mainly huge agricultural provinces, their huge population and market size will lure more FDI. The differences between the infrastructure and human resources among the major cities in this region and the eastern region are not significant, but the labor and land costs in Type Three

areas are cheaper. That would make these areas attractive to the FDI. Development of Hubei and others as of late is a good example worthy of attention.

Type Four: Comprising of the five inland northwestern and southwestern border provinces and regions of Gansu, Qinghai, Ningxia, Guizhou and Yunnan, it is the major poverty-stricken region of the country (Tibet, which is not included in our analysis, can be grouped into this category or treated as a separate category of its own). Its geographical location and transportation conditions are poor and its market size small. It has too big an emphasis on natural resource exploitation as its heavy industries. Thus it is lacking in its attraction of FDI. Its macro, location, micro and policy factors are the worst in the nation. Compared with the six western areas from Type Three, it is noted that all of the factors in Type Four are inferior to those of Type Three, indicating that the internal structure of the western region in Type Four is disadvantageous in the attraction of FDI.

V. Conclusion and Policy Recommendation Based on the FDI Environment Research in Western China

Conclusion of the analysis

This paper combined the use of regression analysis, principal componential analysis and cluster analysis, all of which supported and complemented with each other. It not only analyzed the influence of the 11 factors on the FDI inflow in a quantitative way, but also listed out the order of foreign investment environments in China. It went on further to group the country's 30 provinces, municipalities and regions(excluding Tibet) into four different types(categories) of investment environments and analyzed the differences between affecting factors from among the four types of investment environments, especially those between the eastern and western regions.

Specifically, the conclusion of the research is:

1. The discovery that besides such factors as policy, location and labor cost, etc., the level of urbanization scale and density, ratio of the light industry output relative to the total industrial output, ratio of the value-added of the tertiary out of the GDP and the degree of foreign trade dependency all have a significant impact on the FDI inflows.

2. Through the comprehensive evaluation of the assessment index on the FDI environments in the 30 provinces, municipalities and regions, it was discovered

that: 1). The 11 top-ranking provinces and cities during our assessment period all happened to be coastal provinces and cities; 2). The ranking of the northwestern region dropped from the middle echelon during Minghong Lu's observation period(based on the data from 1988—1995) to the bottom; and 3). The ranking of the southwestern region improved from the worst level to a higher position and has become much better than that of the northwestern region.

3. Discovery from the cluster analysis: 1). The 30 different provinces, municipalities and regions can be grouped into four types of investment environments with the western provinces and regions fitting into three different types, indicating a high level of difference in internal investment environments. Among the 11 western provinces and regions, the best region, Guangxi, went to Type Two and sat shoulder to shoulder with the eastern coastal provinces except Guangdong and Fujian, which belonged to Type One; the southwestern region with the exception of Guizhou and Yunnan provinces was all classified into Type Three; Guizhou and Yunnan together with Gansu, Qinghai and Ningxia were put into Type Four of the investment environments. 2). Between Type One and Type Two, the biggest differences lie in the trade, policy and location factors; next come industrial structure and market scale. Human resource difference was the minimum between the two types.

Policy recommendation based on the findings:

1. Efforts should be made to enlarge the total economic scale and the market size in western China. The FDI inflow aims at occupying the local market, which is influenced by the GDP size. In recent years, the GDP of western provinces and autonomous regions achieved a higher growth than what was in the past, thanks to the Great Development of the Western Region, which has in turn improved such investment environment as infrastructure. But the improvement came from the government investment with the FDI contributing very little to the GDP of the region. With the recovery of the national economy, GDP of the eastern region enjoys a high rate of growth. So it'll take the western region more time and efforts to enlarge its economic aggregation and market capacity owing to the lower development stage, smaller market size and higher freight costs characteristic of its thinly populated but vast expanse of land size. It'll be a long-term task to enlarge the economic total and the market capacity of the west. But the western region must have a rate of growth faster than that of the eastern and central regions in order to improve the FDI environment in the west and to increase the aggregation of its economy.

2. The regional disadvantage should be counterbalanced with the strategic opportunity of the on-going industrial restructuring. The geographical and regional disadvantages of the west were always strengthened by the FDI location imbalance. FDI into China mainly focused on the light industries and the real estate industry, which have a stronger market demand. In addition, investors have a closer geographical relationship with their eastern region counterparts, which impacts on the location selection of FDI. But the western region should make full use of the period where there exists a surplus in consumer products and try hard to attract FDI into developing its tourism industry and catering industry. It should use its advantage of possessing relatively cheaper labor cost to lure foreign businesses to shift their labor-intensive industries to the western region. More importantly, market entry restrictions to heavy industries must be loosened up to attract foreign investments into such areas as energy, exploitation of petroleum and natural gas and machinery manufacturing. Quicker steps must be taken to enhance the economic and trade exchanges between western China and the countries in western Asia, Southeastern Asia, the Middle East and the eastern European countries. Investment in the region should be diversified. Construction of the Eurasian Continental Railroad should be sped up. Regional disadvantages can also be counterbalanced through the increased number of industries open to the different sources of FDI into the region.

3. It is advisable to carry out the strategy of encouraging FDI through the development of regional central cities in the west. The economy in the western region has a dual nature. Urban composition is made up of small townships. Its agriculture can't do without irrigation. Basic infrastructure such as dams and transportation systems is inadequate. The deficiencies of urban functionality also restricts the FDI inflow. Therefore, it is not feasible to see an immediate and massive improvement in the FDI environment in the west. The urbanization policy, however, of the western region should be to loosen up the regulations of small cities and townships, give emphasis to the construction of capitol cities and medium and large regional metropolitan centers, transfer its population to large and medium metropolises and increase the radiation radius of the regional central cities. The trickle-down development strategy should be replaced with that of the leadership of regional central metropolises. Its regional geographical disadvantages of investment environment should be counterbalanced with the improvement in the investment environments of the regional metropolitan centers. Construction of the SEZ applicable to the western region must be

quickened in order to lay a solid foundation for the environment hardware for FDI inflows. The strategy of developing a Greater Yinchuan will also help better its investment environment.

4. More favorable investment policies and economic sovereignty should be given to the western region. In recent years, the major problem with attracting outside investment to the western region has been a lack of preferential policy for the region. What foreign investment truly takes to heart still is preferential treatment in taxation, land and import and export policies. Since the country's opening-up and reform, the western region has never enjoyed any preferential treatment or foreign trade sovereignty afforded with the coastal SEZ's. Currently, fair taxation is being stressed, so again the western region is put at a disadvantage relative to the eastern region. Thanks to the different starting levels, the unified national policy scheme, such as the singular market entry requirement, is restricting the FDI inflow into the west. Tax reduction or waiver policies to the western region should be granted or extended, differential import and export treatment should be implemented and the quota bidding system should be abandoned. The foreign trade and economic sovereignty should be given to the west. The ethnic autonomous regions in particular should have the flexibility of making their own policies in accordance with the local reality. The Central Government should provide special and preferential policies for the specific projects in the west that conform with the industrial development in the region.

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Table 1: Variables of Their Definition

Variables	Definition	Unit	Effect
GDP	The total amount of the economy and the substitutive variable of the market size.	100 M RMB	+
LOCA	A dummy variable, the Eastern regions=3, the Central=2, the Western=1.		+
STA	The ratio of state-owned and stockholder enterprise production value to the gross industrial production.	%	-
TER	The ratio of the increased value of the tertiary to GDP.	%	+
CITY	The proportion of cities with a population of 500,000 in the cities as a whole.	%	+
POLI	A dummy variable.		+
WAGE	A dummy variable.		-
LI	The proportion of light industry over scale in the gross industrial production.	%	?
FTD	The proportion of the total import-exports in GDP.	%	+
FI	The proportion of the amount of foreign enterprise import in the total of the local import and export.	%	+
HC	The illiterate proportion of the population at and over the age of 15.	%	-

Table 2: Estimates of FDI location Determinants

Variables	Model Ⅰ		Model Ⅱ		Model Ⅲ	
Constant	-7.606	***	-5.440	***	-4.397	***
	〔-4.17〕		〔-5.01〕		〔-3.34〕	
ln(GDP)	1.147	***	0.965	***	0.630	***
	〔7.09〕		〔6.90〕		〔3.07〕	
STA	-0.035	***				
	〔-3.56〕					
TER	0.083	***				
	〔3.67〕					
WAGE	-1.194	***				
	〔-3.50〕					
LI			0.038	***		
			〔4.67〕			
FTD			0.010	***		
			〔3.61〕			
FI			0.021	***		
			〔4.40〕			
HC			-0.076	***		
			〔-4.03〕			
LOCA	0.733	***			0.584	**
	〔4.03〕				〔2.37〕	
POLI					0.586	**
					〔2.07〕	
CITY					0.019	***
					〔2.79〕	
R-Square	0.7142		0.7414		0.8505	
F-value	71.97		82.56		35.56	
Date Period	1998-2002		1998-2002		2002	

Notes: 1.The asterisks ***,**, and * indicate the levels of significance at the 1 percent, 5 percent, and 10 percent, respectively.

2.(t-stat)

Table 3: Correlation Matrix of Variables

	lnGDP	TER	LI	CITY	FTD	POLI	LOCA	FI	N-STA	N-WAGE	N-HC
lnGDP	1.000	-0.122	0.456	0.361	0.317	0.457	0.564	0.518	0.668	-0.214	0.480
TER		1.000	-0.091	0.681	0.728	0.250	0.337	0.147	0.091	-0.570	0.318
LI			1.000	0.063	0.196	0.606	0.423	0.385	0.613	-0.220	0.038
CITY				1.000	0.641	0.239	0.489	0.427	0.391	-0.508	0.413
FTD					1.000	0.617	0.562	0.324	0.493	-0.734	0.423
POLI						1.000	0.707	0.628	0.728	-0.593	0.321
LOCA							1.000	0.704	0.693	-0.474	0.580
FI								1.000	0.740	-0.408	0.376
N-STA									1.000	-0.603	0.253
N-WAGE										1.000	-0.055
N-HC											1.000

Table 4: Eigenvalues of the Correlation Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	5.46027977	3.43789404	0.4964	0.4964
2	2.02238573	0.80707978	0.1839	0.6802
3	1.21530595	0.58050697	0.1105	0.7907
4	0.63479898	0.07344405	0.0577	0.8484
5	0.56135494	0.11364284	0.0510	0.8995
6	0.44771209	0.23729410	0.0407	0.9402
7	0.21041800	0.05152300	0.0191	0.9593
8	0.15889500	0.03603281	0.0144	0.9737
9	0.12286219	0.02836004	0.0112	0.9849
10	0.09450215	0.02301694	0.0086	0.9935
11	0.07148521		0.0065	1.0000

Table 5: Eigenvectors of PCA

	Prin1	Prin2	Prin3	Prin4	Prin5	Prin6	Prin7	Prin8	Prin9	Prin10	Prin11
lnGDP	0.2771	0.3139	0.3219	-0.2591	0.4787	-0.3257	0.0082	0.2446	-0.3494	0.3229	0.1801
TER	0.2065	-0.5720	-0.0646	0.1456	-0.0080	0.3102	0.0509	-0.0732	-0.1801	0.4633	0.5035
LI	0.2200	0.4028	-0.2811	0.2629	0.4136	0.5950	0.0336	-0.2110	-0.1250	0.0493	-0.2290
CITY	0.2830	-0.3443	0.1817	-0.4904	0.2457	0.3749	0.0123	0.1955	0.0631	-0.5327	-0.0292
FTD	0.3341	-0.3254	-0.1103	0.2217	0.2555	-0.2599	0.1697	0.2410	0.4639	0.2541	-0.4709
POL	0.3513	0.1562	-0.2336	0.4238	-0.1721	-0.1322	0.2588	0.4388	-0.1247	-0.4231	0.3419
LOCA	0.3696	0.0717	0.1697	0.1567	-0.2646	0.0907	-0.8296	0.1613	0.0557	0.0562	-0.0783
FI	0.3241	0.1921	0.0888	-0.3191	-0.6099	0.2145	0.3928	0.0864	-0.0966	0.2863	-0.2780
N-STA	0.3604	0.2540	-0.1543	-0.2503	-0.0076	-0.1308	0.0072	-0.4309	0.5823	-0.0025	0.4209
N-LAB	-0.3049	0.2251	0.4478	0.1776	0.0419	0.3734	0.1327	0.3873	0.4873	0.1541	0.2328
N-HUMAN	0.2291	-0.0780	0.6726	0.3908	-0.0236	-0.0852	0.2001	-0.4820	-0.0788	-0.2060	-0.0862

Table 6: Evaluation Index of FDI Environment

Region	Index	Rank
Guangdong	33.514	1
Fujian	28.772	2
Shanghai	28.697	3
Tianjin	28.631	4
Jiangsu	26.441	5
Zhejiang	25.689	6
Beijing	23.975	7
Shandong	23.275	8
Hainan	20.681	9
Liaoning	20.442	10
Hebei	19.702	11
Guangxi	19.113	12
Hubei	17.031	13
Anhui	16.300	14
Chongqing	15.116	15
Sichuan	15.115	16
Henan	15.907	17
Hunan	15.093	18
Jilin	15.052	19
Jiangxi	14.135	20
Yunnan	13.839	21
Shanxi	13.272	22
Heilongjiang	13.238	23
Inner Mongolia	12.761	24
Shaanxi	12.478	25
Guizhou	11.128	26
Xinjiang	10.521	27
Ningxia	10.209	28
Qinghai	10.150	29
Gansu	9.901	30

Table 7: Eigenvalues of the Covariance Matrix

	Eigenvalue	Difference	Proportion	Cumulative
1	3.81526399	2.74525014	0.6359	0.6359
2	1.07001385	0.62064785	0.1783	0.8142
3	0.44936600	0.14207969	0.0749	0.8891
4	0.30728630	0.08848419	0.0512	0.9403
5	0.21880211	0.07953436	0.0365	0.9768
6	0.13926775		0.0232	1.0000

The data have been standardized to mean 0 and variance 1
Root-Mean-Square Total-Sample Standard Deviation = 1
Root-Mean-Square Distance Between Observations = 3.464102

Table 8: Cluster History

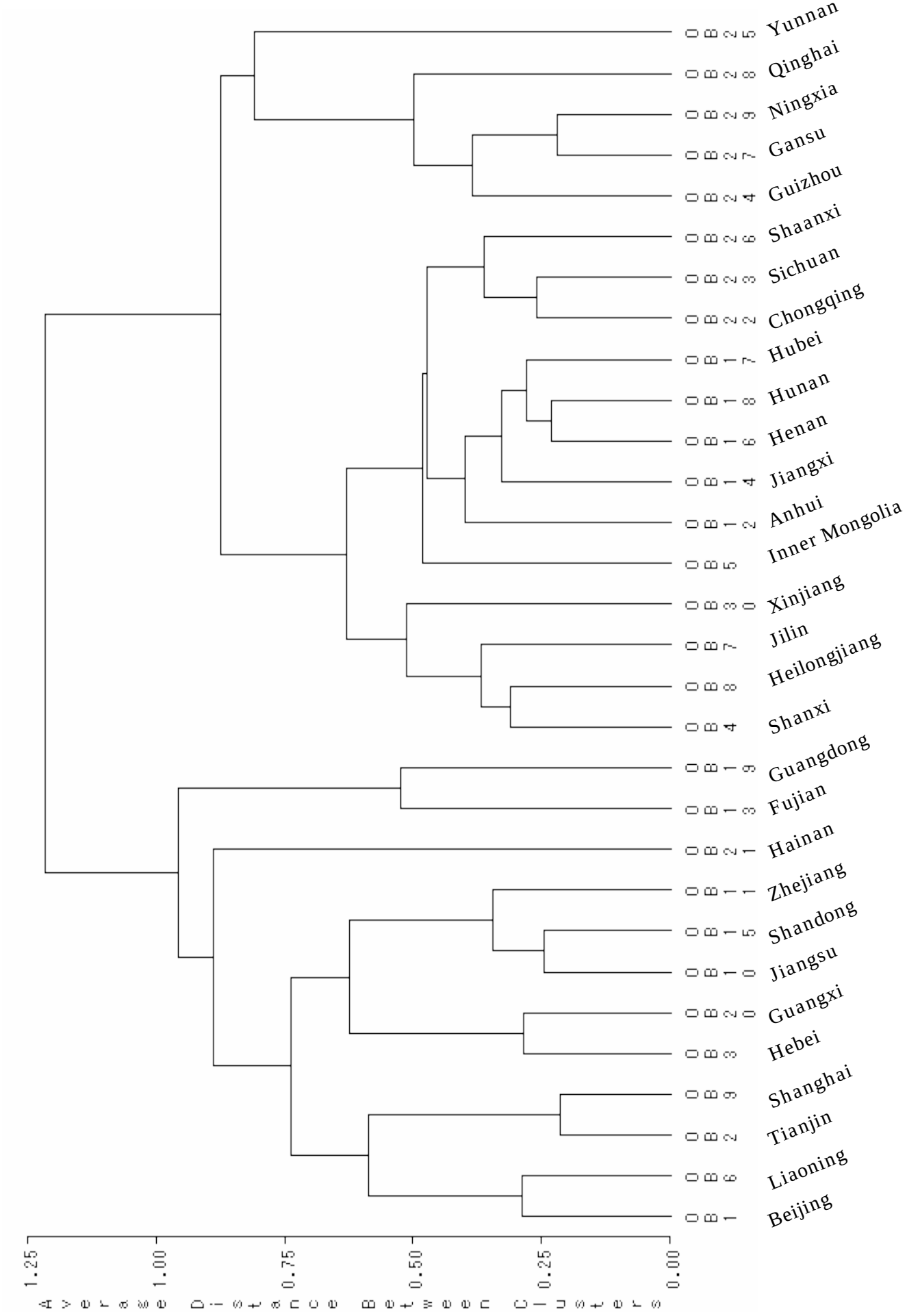
NCL	Clusters	Joined	FREQ	RMS STD	SPRSQ	RSQ	PSF	PST2	Norm RMS Dist
29	OB2	OB9	2	0.2127	0.0016	0.998	22.9	.	0.2127
28	OB27	OB29	2	0.2188	0.0017	0.997	23.0	.	0.2188
27	OB16	OB18	2	0.2311	0.0018	0.995	22.7	.	0.2311
26	OB10	OB15	2	0.2452	0.0021	0.993	22.3	.	0.2452
25	OB22	OB23	2	0.2590	0.0023	0.991	21.9	.	0.2590
24	CL27	OB17	3	0.2634	0.0029	0.988	20.8	1.6	0.2782
23	OB3	OB20	2	0.2856	0.0028	0.985	20.6	.	0.2856
22	OB1	OB6	2	0.2870	0.0028	0.982	20.7	.	0.2870
21	OB4	OB8	2	0.3120	0.0034	0.979	20.6	.	0.3120
20	OB14	CL24	4	0.2970	0.0043	0.974	19.9	1.8	0.3273
19	CL26	OB11	3	0.3147	0.0048	0.970	19.4	2.3	0.3442
18	CL25	OB26	3	0.3307	0.0052	0.964	19.1	2.3	0.3613
17	CL21	OB7	3	0.3492	0.0051	0.959	19.1	1.5	0.3664
16	OB24	CL28	3	0.3395	0.0063	0.953	18.9	3.8	0.3860
15	OB12	CL20	5	0.3417	0.0070	0.946	18.8	2.3	0.3993
14	CL15	CL18	8	0.4158	0.0181	0.928	15.8	4.6	0.4723
13	OB5	CL14	9	0.4314	0.0096	0.918	15.9	1.6	0.4821
12	CL16	OB28	4	0.4270	0.0109	0.907	16.0	2.7	0.4994
11	CL17	OB30	4	0.4380	0.0114	0.896	16.4	2.7	0.5116
10	OB13	OB19	2	0.5247	0.0095	0.886	17.3	.	0.5247
9	CL22	CL29	4	0.5012	0.0216	0.865	16.8	9.8	0.5873
8	CL23	CL19	5	0.5203	0.0277	0.837	16.2	8.6	0.6230
7	CL11	CL13	13	0.5323	0.0461	0.791	14.5	7.1	0.6292
6	CL9	CL8	9	0.6470	0.0522	0.739	13.6	5.8	0.7368
5	CL12	OB25	5	0.6086	0.0322	0.707	15.1	5.1	0.8078
4	CL7	CL5	18	0.7025	0.1210	0.586	12.3	11.5	0.8745
3	CL6	OB21	10	0.7018	0.0373	0.548	16.4	2.6	0.8876
2	CL3	CL10	12	0.7857	0.0718	0.477	25.5	4.4	0.9568
1	CL2	CL4	30	1.0000	0.4765	0.000	.	25.5	1.2148

Table9: Structure of FDI Environment by Region

	X1	X2	X3	X4	X5	X6	X7
National	1.042	1.095	1.182	0.977	0.997	1.035	1.347
Type One	1.358	1.555	2.207	0.958	1.019	1.429	2.804
Type Two	1.138	1.148	1.523	1.213	1.032	1.429	1.417
Type Three	0.935	0.897	0.653	0.909	1.016	0.806	0.598
Type Four	0.739	0.782	0.345	0.828	0.919	0.476	0.569

Note: The data is to be standardized treatment from the four different types of regions.

Figure 1


Yunnan
Qinghai
Ningxia
Gansu
Guizhou
Shaanxi
Sichuan
Chongqing
Hubei
Hunan
Henan
Jiangxi
Anhui
Inner Mongolia
Xinjiang
Jilin
Heilongjiang
Shanxi
Guangdong
Fujian
Hainan
Zhejiang
Shandong
Jiangsu
Guangxi
Hebei
Shanghai
Tianjin
Liaoning
Beijing
1.25
1.00
0.75
0.50
0.25
0.00
Average Distance Between Clusters