

# Analysis of the Domestic Node cities' Openness along the “Belt and Road”

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**Keywords:** “Belt and Road,” economic openness, index analysis.

**Abstract.** In this paper, 10 domestic node cities along the “Belt and Road” are selected as the analysis objects, including Shanghai, Tianjin, Ningbo, Wuhan, Chengdu, Chongqing, Zhengzhou, Xining, Yinchuan and Lanzhou. Trade, investment, and tourism openness are the first-level indexes; the total volume of import and export trade, foreign direct investment, and international tourism income, these three absolute indexes are secondary indexes to measure and compare their economic openness, meanwhile, it will analyze the reasons for difference in economic openness and put forward targeted development proposals.

## 1. Introduction

Many domestic scholars have studied the measurement of the economic openness of regions along the “Belt and Road”. Sun Chengdong (2011) analyzed and examined the current situation of Chongqing's opening up and development through Chongqing's international and inter-provincial openness, he found that attracting foreign investment, promoting tourism development and commodity trade these measures are conducive to improve the level of urban economic openness. Xie Tingting (2015) concluded that China's economic openness presents ladder-shaped distribution from east to west by constructing a spatial econometric model. She also pointed out that enhancing innovation ability, improving regional conditions, and accumulating human capital are important engines for improving economic openness. Wu Fenglan (2016) used Principal Component Analysis to calculate the openness of the provinces along the “Belt and Road”. The results show that the openness of regions along ‘road’ is lower than that of the ‘belt’. She indicated that the difference is largely caused by geographical location factors, then she proposed that the country should give policy support to the region with lower openness to coordinate the pattern of opening up. Zhang Xiuying (2016) evaluated the economic openness of 11 provinces through ten indexes, including foreign economic cooperation, trade dependence, industrial ratio and so on. Studies have shown that the western provinces have made some progress in economic openness due to the influence of Western Development and ‘Belt and Road’ policy.

## 2. Analysis on the Current Situation of the Openness of the Node Cities along the “Belt and Road”

The overall opening level of the 10 node cities along “New Silk Road” economic belt has been continuously improved in recent years, foreign exchanges have become more frequent, and economic interdependence has been continuously improved. The specific performances are the improvement in the total volume of imports and exports, foreign direct investment, international tourism income and other indexes.

### 2.1 Current Situation of Trade Openness

Since the “Belt and Road” was proposed in 2013, these ten node cities have made continuous progress in foreign trade. Compared with the past, the increase in foreign trade is obvious. For example, the import and export volume of Shanghai reached 5.1883 trillion yuan in 2016, it has almost doubled compared with 2015. The import and export volume of Chongqing in 2015 reached 463.8 billion yuan, it has increased 30 times compared with the 15.1 billion yuan in 2001, it has

increased nearly 38% compared with 335.8 billion yuan in 2013; Yinchuan, Xining and Wuhan have also improved accordingly.

## **2.2 Current Situation of Investment Openness**

Among the 10 node cities, Shanghai is the most attractive to foreign investment as a coastal open city. In addition, as nodes of the economic belt, Zhengzhou, Wuhan, Chengdu and others play an increasingly important role in transformation and undertaking, their openness and amount foreign direct investment have gradually increased. Compared with 2001, 8 cities have increased by more than 10 times, among which Wuhan has increased by nearly 40 times, Shanghai and Chengdu have increased by 20 times, and Zhengzhou has increased by 10 times, only Yinchuan and Lanzhou have a relatively small increase because of the regional conditions, economic environment and other factors.

## **2.3 Current Situation of Tourism Openness**

From the perspective of international tourism income, the tourism revenue of these 10 nodes has increased in recent years. The coastal city Shanghai, Chengdu and Chongqing, which are rich in tourism resources, and Tianjin also has a geographical advantage, still have great advantages in attracting international tourists, they have a higher international tourism income. Therefore, it can serve as a central city to undertake industrial transfer, and gradually increase its level of opening up. On the whole, the growth rate has been relatively stable between 2001 and 2014, and the increase has been obvious since 2015. For example, Xining City has an average annual growth rate of about 6% in the first 14 years. In 2016, its international tourism revenue reached 143 million yuan.

## **3. Building Index System**

(1) Total import and export. It reflects the influence and dependence of a region or country's foreign trade activities on its economic development, it also reflects the extroversion degree of a region.

(2) Foreign direct investment. This index can be used to measure the frequency of a city's foreign economic cooperation and exchanges. After the above nine node cities along "Belt and Road" proposed to rebuild the overland Silk Road economic belt, the amount of foreign direct investment has changed significantly, it makes these ten cities become more relevant to foreign economic activities.

(3) International tourism income. This index can be used to reflect the impact and dependence of interpersonal activities in a region on the economic development of the region.

## **4. Economic openness measurement and analysis**

### **4.1 Standardization of data**

The data of total volume of import and export trade, foreign direct investment and the international tourism income of ten node cities from 2001 to 2018 was collected and calculated on average. In order to avoid the inconsistent dimension of selected data and the existence of outliers affecting the measurement of each index, this paper standardized the data and index. According to the effect of each index on economic openness, the above three secondary indexes are positive indexes, in the decision matrix, the data was winsorized in order to make it smooth. Positive index:

$$y_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (1)$$

### **4.2 Analysis of the indexes' correlation**

The average value of the obtained data was used to analyze the correlation of indexes, and the correlation coefficient of indexes was extracted from the correlation coefficient matrix of each index. As shown in Table 1:

**Table 1.** The correlation coefficient among indexes of openness

Secondary Indexes	Total volume of import and export trade	Foreign direct investment	International tourism income
Total volume of import and export trade	1.000	0.796	0.861
	0.796	1.000	0.758
	0.861	0.758	1.000

It can be seen from the correlation coefficient among the secondary indexes on the average level of 2001-2018 in the above table that the three indexes to be studied and analyzed are highly correlated with each other, it meets the requirements of factor analysis.

#### 4.3 KMO and Barlett tests

By using the SPSS, the KMO and Barlett tests were first performed on the data of 10 cities in 2001, 2009, 2018, and averages from 2001 to 2018. The results are shown in Table 2.

**Table 2.** Tests by KMO and Bartlett

Year	2001	2009	2018	2001-2018
Kaiser-Meyer-Olki Metrics	0.784	0.638	0.700	0.742
Bartlett's test of sphericity	32.696	13.491	9.507	17.376
	df	3	3	3
	Sig.	0.000	0.004	0.023
				0.001

From the test results in the above table, the KMO statistics of these data are 0.784, 0.638, 0.700, and 0.742, respectively, the Barlett's sphericity test is significant, and indicates that the variables are suitable for factor analysis.

#### 4.4 Component matrix

The principal component analysis method is used to extract the effective common factors (the effectiveness is judged by the eigenvalue of the common factors and the cumulative variance contribution rate), and this is used as a comprehensive variable to analyze the values of 2001-2018, the following component matrix was obtained:

**Table 3.** Component matrix

Year	2001		2009		2018		2001-2018	
component	1	2	1	2	1	2	1	2
Import and export	0.980	-0.148	0.934	-0.271	0.903	-0.341	0.951	-0.133
Foreign direct investment	0.964	0.200	0.743	0.665	0.812	0.557	0.877	0.409
International tourism income	0.981	-0.050	0.935	-0.265	0.908	-0.176	0.937	-0.263

It can be seen from the composition matrix in the above table: in each year and the overall situation of 2001-2018, the first common factor mainly reflects the effect of import and export income and international tourism income on the urban economy's openness to the outside world, and the level of import&export trade and attracting foreign tourists, therefore, the first factor can be

defined as the level of urban foreign trade and tourism openness. The second common factor mainly reflects the effectiveness of foreign direct investment on economic openness and reflects the ability of a city to attract foreign investment. therefore, the second common factor is described as the level of attracting foreign investment by the city.

#### **4.5 Result and reason analysis**

In order to measure the economic openness of these 10 cities, the factor score function is calculated by regression method based on empirical data, and the component score coefficient matrix is extracted by principal component analysis. And on this basis, the formula was applied:

$$F = \frac{\lambda_1}{\lambda_1 + \lambda_2} F_1 + \frac{\lambda_2}{\lambda_1 + \lambda_2} F_2 \quad (2)$$

Calculate the level of openness of each city, which is, the proportion of variance contribution rate of each common factor in the total variance contribution rate was selected as weight for analysis. By analyzing the data results, the ten cities can be divided into three echelons according to the level of openness: Shanghai is in the first echelon; Tianjin, Ningbo, Wuhan, Chengdu, Chongqing and Zhengzhou are in the second echelon; Xining, Yinchuan and Lanzhou are in the third echelon. The reasons for these differences can be judged: First, the geographical location, coastal areas have great advantages in external relations. Second, the level of economic development, the degree of economic development is directly proportional to foreign trade and the opportunity to obtain foreign investment. Third, infrastructure construction, under the background of the ‘Belt and Road’, Lanzhou, Yinchuan and Xining still need to be improved compared with other cities, although its infrastructure construction has been greatly improved, which restricts the city's openness to some extent.

#### **5. Conclusion**

This paper adopts three indexes of the ten node cities along the “Silk Road Economic Belt” from 2001 to 2018, and uses data panel regression to analyze the influencing factors of city openness. (1) From the current situation of their opening up, in the context of the “Belt and Road”, the openness of each city has increased to some extent. Therefore, each city should make full use of the “Belt and Road” strategy to bring in and go out. (2) The analysis of indexes shows that the degree of openness of the city has shown a downward trend from the east to the west with the change of space. In the analysis of influencing factors, geographical location, economic development level, and infrastructure improvement are all important reasons for the differences. (3) There are some suggestions for each gradient with different degrees of openness. The first echelon cities should further promote technological innovation and financial reform, accelerate the construction of Shanghai's international financial center; the second echelon cities should promote the construction of transportation and logistics hubs and international commodity logistics distribution centers, fully release the internal potential, such as human resources and industrial base, to create an economic-open city; the third echelon cities should implement talent introduction strategy, while the government should give policy support, actively promote the construction of economic development zones, transform resource advantages, strengthen economic and trade cooperation with countries along the route. (4) In general: it is necessary to improve the degree of economic openness according to own location characteristics and the actual level the economic development, so that the level of urban openness can be further improved.

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