

# The Evaluation of the Old Industrial Base Transformation

## —With the Development of Modern Service Industrial Cluster in Liaoning Province as an Example

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Received 27 November 2015; accepted 16 December 2015; published 21 December 2015

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### Abstract

With the development of economy and the cluster development of modern service industry, the revitalization plan of northeast area and the upgrading of industrial structure in Liaoning depend on the improvement of its modern service industry. But the cluster development is the mainstream not only in developed countries but also domestic developed areas. Therefore, to speed up the process of modern service industry cluster in Liaoning has certain significances in promoting the development of clustering situation which should be guided reasonably.

### Keywords

The Cluster, Modern Service Industry, Concentration Factor, Analytic Hierarchy

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## 1. The Overview of Modern Service Industry

### 1.1. The Connotation of the Modern Service Industry

Compared with the traditional service industry, modern service industry is modern and informationalized. With the development of science and technology, it is essential to modernize the traditional industry and promote the application of modern information and technology. The development of modern service industry will provide higher-value and high-tech industry. The modern service industry mainly contains the following sectors: modern logistics; information transmission, software and information technology services; financial industry; real estate, etc. [1]. Its classification is shown in **Table 1**.

**Table 1.** The classification of china's modern service industry.

Code	Category	Item
G	Modern logistics	TPL, etc.
I	Information transmission, software and information technology services	Telecommunications, broadcasting and TV transmission and satellite services, the internet and related services, software and information technology services.
J	Financial industry	Monetary and financial services, capital market services, insurance and other financial business.
K	Real estate	Real estate management, property management, real estate intermediary services and other real estate business.
L	Leasing and commercial services	Financing lease, car rental, engineering machinery leasing, enterprise management service and other business services.
M	Scientific research and technical services	Professional and technical services, technology promotion and application.
P	Education industry	Preschool education, primary school, secondary education and higher education, special education, skill training, etc.
Q	Health and social work	Health care services, social security and other social services activities.
R	Culture, sports and entertainment	Television and recording studios, culture, art, sports and entertainment industry.

From GB\_T4754-2011.

## 1.2. The Connotation and Classification of Modern Service Industrial Cluster

When talking about the connotation of modern service industrial cluster, there isn't a unified definition in the world. However, depending on the researches at home and abroad and the connotation of industrial cluster applied extensively, it is concluded that modern service industry cluster is a new organization structure. This new structure can not only bring economies of scope and economies of scale, but also point out the close relationship in a certain space [2]. The industrial cluster as a spatial agglomeration phenomenon keeps in a close economic relations with special locations, and it is characterized by the path of special location. It is based on the industrial cluster theory and has a long-term goal.

The classification of modern service industrial cluster is summarized roughly as the following:

### 1) original cluster

The regional natural resources or some congenital advantages promote the development of original cluster. During the long endogenous process, the industrial cluster is the main performance in industrial agglomeration or the collection of enterprises, so most scholars defined it as Marshall industrial cluster. This kind mainly focuses on some private small and medium-sized enterprises, which also exists the mutual competition, just like the wholesale and retail.

### 2) embedded cluster

Embedded cluster is between native cluster and exogenous cluster which is also known as advantage cluster. When they have built their own certain foundation, the government preferential policies or guide will play a role in reinforcing the application of the capital and technology which can promote it to be the leading enterprise in the areas. So this kind of enterprises is almost technology intensive modern service industry and capital intensive modern service industry, which greatly rely on the government guidance, such as financial industry, scientific research and technical services.

### 3) exogenous cluster

Exogenous cluster enterprises entirely depend on the government's arrangement, which just own limited factor endowments. And the limited factor endowments refer to the natural resources of local or regional conditions. The typical representative of exogenous cluster is the free trade zone.

### 4) collaborative cluster

Collaborative cluster is the emerging form of cluster, which is the special competitive cooperation. This kind of cluster will promote the collaborative technology research and the enterprises' internal competitiveness. It is better to realize common development by forming multiple center enterprises and reinforce the mutual trust.

### 5) driven cluster

The driven cluster mainly highlights the effect of a giant modern service industrial enterprise, and will lead other enterprises to form industrial clusters.

## 2. Construct Evaluation Index System

### 2.1. The Evaluation Method of the Development of Modern Service Industrial Cluster

Based on the scholar's point of views and the problems preliminarily discussed, it is concluded that they carry out the different index system for the different research angle. But establishing a perfect system of comprehensive evaluation is an important premise. This paper establishes the multi-target appraisal, depending on the current scholars' researches and the limited useful data.

This paper takes in the basic law of modern service industrial cluster and the precious scholars' experiences and achievements. It is necessary to point out the research about the service industrial development in Gansu written by Jinmei. Using for reference from the above research and the level of modern service industrial cluster in Liaoning, it establishes the index system and also divided into 18 comprehensive indexes [3]. It is not only beneficial to compare modern service industrial cluster of regions, but also to ensure the finding's accuracy. The specific level of evaluation index about modern service industrial cluster is shown in the following **Table 2**:

### 2.2. The Collection and Instructions of Data

Because of the second economic census in 2008 in China and the limitations of statistical data in Liaoning province, this article adopts the statistical data of Liaoning province in 2013. At the same time, the lack of statistical caliber decides this paper to give up external evaluation but to choice the internal evaluation. Besides, the

**Table 2.** Modern service industry evaluation index in Liaoning.

The evaluation object	First grade indexes	Second grade indexes
The comprehensive strength of modern service industry	Development level	GDP
		GDP per capitals
		Industrial GDP
		Industrial GDP/GDP
		Non-agricultural population
		Non-agricultural population proportion
		The proportion of foreign investment
		The investment of residents and other services
		The students in high school or above
	Economic efficiency	The proportion of students in high school or above
		Modern service industry in GDP
		Modern service industry GDP per capitals
		The third industry GDP
		Modern service industry employment
		The proportion of modern service industry employment
	Concentration coefficient	Modern service industry GDP/GDP
		The third industry GDP/GDP
		Modern service industry in GDP/ the third industry in GDP
		The concentration factor of modern service industry

Jin, M. (2013) The Research of Industry Development in Gansu Province Based on Cluster]. Lanzhou University, Lanzhou, (9), 56-87.

development of modern service industrial cluster in Liaoning is used in the early stage, which requires to take in the industrial cluster data instead of industrial data.

### 3. The Evaluation of the Development of Modern Service Industrial Cluster in Liaoning

#### 3.1. The Evaluation of Development Conditions

From the factor analysis of development conditions, this paper mainly takes in the following factors: GDP (f1), GDP per capita (f2), industrial GDP (f3), 18 - 60 population (f4), students in high school or above (f5) (Table 3).

##### 1) factor analysis

Factor analysis calculation is made by SPSS. After the reflection as correlation coefficient matrix and the KMO inspection and Bartlett ball inspection, it shows that the characteristic roots of the first and the second common factor is 4.155 and 0.625. All the three public factors explain 99.718 percent of the original variables. So it abandons the other two public factors which means just little information lost with an ideal analysis effect.

##### 2) the score table of development conditions

From the above-mentioned analysis result (Table 4), we choice the variance contribution rate as the proportion, and get the scores formulas of various areas:

$$f = (43.621 * f1 + 33.63 * f2 + 23.467 * f3) / 99.718$$

Depending on the Table 5, when talking about the development condition, the top three regions are Dalian, Shenyang and Anshan whose scores respectively are 1.38, 1.36, 0.184; by contrast, the last three areas are Fuxin, Huludao and Tieling with the lowest score. We also conclude that the development conditions of almost regions are lower than the average level except the Dalian, Shenyang and Anshan. It is easy to get that the development condition is influenced by the GDP, industrial development situation, the population, the educational level, etc. Besides, the above data shows that the 14 regions in Liaoning develop in a different level, and the gap in basic condition is great.

**Table 3.** The cluster development condition index in Liaoning modern service industry.

Region	GDP (billion)	GDP Percapita (Yuan)	Industrial GDP (Billion)	18 - 60 Population (Thousand)	Students in high school or above (Person)
Shenyang	715.857	86850	334.9	4936.0	493.77
Dalian	765.079	110600	343.9	3973.0	397.44
Anshan	262.325	72606	124.6	2338.0	233.88
Fushun	134.045	63922	67.5	1508.0	150.85
Benxi	119.366	69118	64.1	1063.0	106.34
Dandong	110.730	45596	45.8	1609.0	160.96
Jinzhou	134.493	43497	58.6	2011.0	201.17
Yingkou	151.311	61937	71.2	1597.0	159.76
Fuxin	61.512	34259	23.7	1309.0	130.95
Liaoyang	107.999	58236	63.9	1200.0	120.04
Panjin	135.106	94052	84.0	882.0	88.23
Tieling	103.127	34143	47.2	2039.0	203.97
Chaoyang	100.286	33591	40.7	2262.0	226.28
Huludao	77.511	29915	30.4	1829.0	182.96

From the statistical yearbook of Liaoning province 2014.

**Table 4.** Total variance explained.

Component	Initial eigen values			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.155	83.106	83.106	2.181	43.621	43.621
2	0.625	12.500	95.606	1.631	32.630	76.251
3	0.206	4.112	99.718	1.173	23.467	99.718
4	0.013	0.255	99.974			
5	0.001	0.026	100.000			

From SPSS.

**Table 5.** Score table of the development level in Liaoning regions.

Region	f1	f2	f3	f	Rank
Shenyang	2.148	0.333	1.323	1.363	2
Dalian	1.287	1.702	1.023	1.378	1
Anshan	0.575	0.598	-1.146	0.184	3
Fushun	-0.750	0.226	0.328	-0.175	6
Benxi	-0.908	0.678	-0.301	-0.240	8
Dandong	-0.295	-0.515	-0.011	-0.305	12
Jinzhou	-0.532	-0.929	1.447	-0.206	7
Yingkou	-0.056	0.323	-1.031	-0.158	5
Fuxin	-1.120	-1.134	1.686	-0.475	14
Liaoyang	-0.653	0.196	-0.263	-0.281	9
Panjin	-1.387	1.753	-0.352	-0.098	4
Tieling	0.618	-0.978	-1.032	-0.302	12
Chaoyang	0.735	-1.107	-0.975	-0.281	10
Huludao	0.338	-1.146	-0.696	-0.402	13

From the statistical yearbook of Liaoning province 2014.

### 3.2. The Evaluation of Economic Efficiency

Considering the representative and the useful of the data, the factor analysis of economic efficiency of modern service industrial cluster chooses the following factors: modern service industry in GDP (f1), modern service industry GDP per capitals (f2), the third industry GDP (f3), modern service industry employment (f4), the proportion of modern service industry employment (f5), modern service industry GDP/GDP (f6), the third industry GDP/GDP (f7).

This part of factor analysis is same with the previous section, so it omits the steps and gives the results directly.

The composite scores ranking in the **Table 6** shows that, in 2013, the economic efficiency in Liaoning 14 regions are still a great gap. The top three cities are Dalian, Shenyang and Yingkou, whose composite scores respectively are 1.46, 1.27 and 0.06, the other regions' scores are negative. Briefly, the situation is severe. Through the analysis, it is easily to find that the economic efficiency of the Shenyang economic zone and the coastal economic belt is better than the northwestern Liaoning province. According to 2013 statistics, the proportion of the first industry in GDP in northwestern Liaoning province is still as high as 20%. This economic

**Table 6.** The score table of economic efficiency in Liaoning regions.

Region	f1	f2	f3	f	Rank
Shenyang	1.910	0.780	0.902	1.270	2
Dalian	1.271	1.862	1.053	1.460	1
Anshan	0.717	0.625	-2.605	0.030	4
Fushun	-0.533	0.087	0.228	-0.140	6
Benxi	-0.460	0.369	-0.145	-0.070	5
Dandong	0.297	-0.508	-0.961	-0.270	9
Jinzhou	0.200	-0.754	0.085	-0.200	8
Yingkou	0.230	-0.299	0.410	0.060	3
Fuxin	-0.315	-1.047	0.740	-0.400	13
Liaoyang	-0.785	0.237	-0.630	-0.350	12
Panjin	-2.182	1.681	0.276	-0.180	7
Tieling	-0.459	-0.552	-0.563	-0.520	14
Chaoyang	-0.598	-1.002	1.329	-0.380	11
Huludao	0.708	-1.478	-0.121	-0.320	10

From the statistical yearbook of Liaoning province 2014.

phenomenon implies that economic efficiency of modern service industrial in the northwestern Liaoning province is weak. At the same time, the development of the Anshan, Benxi and Fushun owns the advantages of industrial foundation which can provide the support of capital [4]. Even though can improve the economic efficiency in the early stage, it will put off the development of modern service industrial cluster in the long term. The experience of the top composite scores regions indicates that their own advantages, just like the location and the provincial advantage, play an essential role in promoting modern service industrial cluster.

### 3.3. The Evaluation of Cluster

There are kinds of methods used in the research of industrial cluster depending on the precious scholars' experience. This article mainly brings into the concentration coefficient. In some extent, concentration coefficient is a relative index, according to per capitals output or yield. This method uses a relative index to explain the development of modern service industrial cluster more scientific and more persuasive. In addition, concentration coefficient method is operated simply and the result is intuitive. Its formula is shown as followed:

$$CC_{ij} = \frac{e_{ij}/p_j}{\sum_{j=1}^n e_{ij} / \sum_{j=1}^n p_j}$$

Note:

$CC_{ij}$ : the concentration coefficient of industry  $i$  in region  $j$ ;  $e_{ij}$ : the output value of industry  $i$  in region  $j$ ;  $p_j$ : the employment of industry  $i$  in region  $j$ ;  $n$ : the number of region. It is easy to get the conclusion that the greater of the numerical value of  $CC_{ij}$ , the more concentrated of this industry. The following **Table 7** is the concentration coefficient of the 14 regions in Liaoning in 2013.

This table analyzes the 9 sectors of 14 regions in Liaoning province. The result indicates that the concentration coefficient is general low which means the concentration ratio in these regions is weak, which also means its development condition and economic efficiency is unapparent. By comparison, Shenyang and Dalian possess the prominent environmental advantage and economic conditions, which lead to the two regions' concentration coefficient higher than 1. Besides, their low cluster level in Tieling, Huludao and Chaoyang has a close relationship with the relative poor foundation. Many theory and practice prove that the development of modern ser-

**Table 7.** The concentration coefficient in Liaoning regions 2013.

Region	Modern logistics	Information transmission, software and information technology services	Financial industry	Real estate	Leasing and commercial services	Scientific research and technical services	Education industry	Health and social work	Culture, sports and entertainment	Modern services industry
Shenyang	1.16	1.79	1.59	1.33	1.57	1.04	1.50	0.97	1.53	1.27
Dalian	1.21	0.81	2.00	1.03	2.28	2.75	1.72	1.70	0.76	1.68
Anshan	0.52	0.99	0.96	1.07	1.31	0.75	0.56	0.55	0.99	0.82
Fushun	1.22	1.34	0.76	1.13	0.26	1.59	0.91	1.77	0.86	0.95
Benxi	1.00	1.00	0.64	0.60	0.81	1.29	0.88	0.44	2.97	0.71
Dandong	0.71	1.55	0.82	0.32	1.34	0.32	0.29	0.32	1.24	0.54
Jinzhou	0.95	1.02	0.58	1.15	0.42	0.53	0.59	0.60	0.38	0.74
Yingkou	1.28	1.11	0.92	1.44	1.05	1.04	0.78	0.72	0.95	1.25
Fuxin	0.96	0.56	0.48	0.78	0.36	1.04	0.75	0.52	0.81	0.57
Liaoyang	1.76	1.48	0.83	1.03	0.57	1.30	0.67	0.59	0.77	0.92
Panjin	1.08	0.68	0.79	1.30	0.36	1.46	0.86	0.84	0.78	0.92
Tieling	1.25	0.62	0.75	1.09	0.18	0.45	0.48	0.59	0.45	0.63
Chaoyang	0.89	0.87	0.51	0.95	0.48	0.96	0.56	0.72	0.56	0.57
Huludao	1.37	0.94	0.50	1.60	0.33	0.55	0.60	0.77	0.83	0.74

From the statistical yearbook of Liaoning province 2014.

vice industrial cluster not only is affected by some hardware factors like the geographical conditions, the resources endowment, but also influenced by the software factors such as the policy, market economy. Overall, the whole level in the 14 regions is general low, especially those regions whose concentration coefficient is lower than 1. These regions must exist some obstacles to limit the development of the whole region.

### 3.4. The Comprehensive Evaluation

According to the above analysis of development condition and the economic efficiency, and the statistical calculation of concentration coefficient, this paper adopts AHP. AHP is also called expert rating or literature reading method, put forward in 1970s by professor Satty from University of Pittsburgh. As a hierarchy weighted decision-making analysis method, it is widely used in systematic analysis which combines the quantity factors with quality factors in a more clear way.

Through the calculation of the judgment matrix and the RI table, we concluded the weighing factor of development condition, the economic efficiency and concentration coefficient [5] (Table 8, Table 9).

According to the comprehensive score statistics of modern service industrial cluster (Table 10, Table 11), the top regions are Dalian, Shenyang, Yingkou, Anshan, whose scores are 1.52, 1.26, 0.47, 0.33 among the regions, Dalian in the coastal economic belt get the highest score, and Shenyang as the capital city is far higher than others. The composite scores ranged from 0.1 to 0.3 are forced in Fushun, Panjin, Benxi, Jinzhou, Liaoyang; and then, it is necessary to pay attention on the last regions like: Huludao, Dandong and the northwestern Liaoning province, whose composite scores are negative. By competing, the greatest gap in composite scores is 1.6 overall, the development of modern service industrial cluster has a close relationship with their development condition, economic efficiency. For a long time, the cluster level is deeply influenced by the regional economy development. Meanwhile, the cluster development of modern service provides impetus to the improvement of locale conomy and the upgrade of regional industrial structure. Based on the analysis of three districts in Liaoning (Chaoyang, Fuxin, Tieling), the low score incluster development is directly related to the imperfect industrial structure.

**Table 8.** The second level judgment matrix.

Comprehensive strength	Development level	Economic efficiency	Concentration coefficient
Development level	1	1/4	1/5
Economic efficiency	4	1	2
Concentration coefficient	5	1/2	1

From the document consulting and investigation and expert consultation.

**Table 9.** RI.

n	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49	1.52	1.54	1.56

Hong, Z.G., Li, Y., Fan, Z.G. and Wang, Y. (2002) The Calculations of AHP and RI. *Computer Engineering and Application*, (12), 45-47.

**Table 10.** The weighing factor.

Index	Development condition	Economic efficiency	Concentration coefficient
Weighing factor	0.09	0.54	0.36

From **Table 8** and **Table 9**.

**Table 11.** The scores table of cluster development of modern service industry in Liaoning regions.

Region	Development level	Economic efficiency	Concentration coefficient	Composite scores	Rank
Shenyang	1.36	1.27	1.27	1.26	2
Dalian	1.38	1.46	1.68	1.52	1
Anshan	0.18	0.03	0.82	0.33	4
Fushun	-0.17	-0.14	0.95	0.25	5
Benxi	-0.24	-0.07	0.71	0.20	7
Dandong	-0.31	-0.27	0.54	0.02	11
Jinzhou	-0.21	-0.2	0.74	0.14	8
Yingkou	-0.16	0.06	1.25	0.47	3
Fuxin	-0.48	-0.4	0.57	-0.05	13
Liaoyang	-0.28	-0.35	0.92	0.12	9
Panjin	-0.10	-0.18	0.92	0.22	6
Tieling	-0.30	-0.52	0.63	-0.08	14
Chaoyang	-0.28	-0.38	0.57	-0.03	12
Huludao	-0.40	-0.32	0.74	0.06	10

From **Tables 5-7**.

### 4. Conclusions

Based on the analysis of modern service industrial cluster development in Liaoning, we come to the following conclusion: 1) modern service industrial cluster in Liaoning is underdeveloped; 2) there exists large development gap among 14 districts; 3) modern service has strict requirement for the economy development. Modern service industrial cluster development is a special concept, in which the achieved effect of development cannot always be coincident with the plans and expectations. It needs long-run observation and analysis. However, ac-



ording to the development trend of current economy, the combination of finance and Internet has been increasingly significant in economy and the two industries are the key areas of modern service. It also needs continuous tracking analysis about whether the primary stage of cluster development and the gradual transformation can be smoothly completed and accomplished or not.

During the process of writing the paper, in spite of large quantities of literatures having been collected, the incompleteness of the statistics and inconsistent statistical caliber add obstacles for the data collection and selection. Scholars in the future are expected to analyze the cluster development by using more complete data. Valuable advice to this paper is welcomed. Academic research level can be lifted through more beneficial communications. This paper is not perfect now and needs refinement in the future, but I still feel honored to provide some perspectives for the successors

## References

- [1] The Newsroom (2010) Modern Service Industry. *China's Economic and Trade Tribune*, No. 19, 12-14.
- [2] Zhao, J.P. and Wang, Z.W. (2010) The Research on the Problems and the Countermeasures of Daqing High-Tech Zone of Modern Productive Service Industrial Cluster. No. 1, 15- 17.
- [3] Jin, M. (2013) The Research of Industry Development in Gansu Province Based on Cluster. Lanzhou University, Lanzhou, No. 9, 56-87
- [4] Li, Y. Andwang, H.J. (2011) Liaoning Modern Service Industry and Other Industries Interaction Research. *Journal of Economic Management and the Humanities*, No. 03, 899-901.
- [5] Hong, Z.G., Li, Y., Fan, Z.G. and Wang, Y. (2002) The Calculations of AHP and RI. *Computer Engineering and Application*, No. 12, 45-47.