

# Current Situation of Manufacturing Cluster Development in CD-CQ Twin Cities Economic Circle and Policy Recommendations

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## Abstract

At present, the phenomenon of global value chain reconstruction is obvious: on the one hand, the old manufacturing powerhouses have promoted re-industrialization to get rid of the current economic difficulties; on the other hand, China's cost advantage has gradually weakened, and the labor-intensive manufacturing industry has begun to shift to other developing countries with cost advantages. The manufacturing industry has become the focus of international economic competition. The Chengdu-Chongqing Economic Circle (CD-CQ EC) has become a breakthrough in driving the economic development of the western region by virtue of its geographical location advantages and natural endowments. This paper takes the development status quo of the manufacturing cluster in CD-CQ EC as an entry point, introduces the industry location entropy analysis method, and explores the opportunities and challenges of the manufacturing industry of the CD-CQ EC in the current era by comparing the important indexes of the manufacturing industry of the CD-CQ EC in a multi-faceted way from 2013-2018, and provides policy suggestions for the development of the manufacturing cluster in the CD-CQ Twin Cities. The study will provide policy recommendations for the development of manufacturing cluster in CD-CQ.

## Keywords

Chengdu-Chongqing Economic Circle; Manufacturing Clusters; Location Entropy Analysis.

## 1. Introduction

As the intersection of the "Yangtze River Economic Belt" and the "Belt and Road" construction, the CD-CQ, together with the city clusters in the middle reaches of the Yangtze River and the Yangtze River Delta city clusters, supports the rise of the Yangtze River Economic Belt, and the promotion of the development of CD-CQ EC has an important role to play in improving the overall competitiveness of the region. It is important to promote the development of CD-CQ EC to improve the overall competitiveness of the region. As a new carrier of industrial agglomeration in China, the CD-CQ EC plays an important role in the process of China's regional economic development. The CD-CQ EC has superior location advantages, economic development level, increasingly sound urban system and close economic and social humanistic ties, which plays an important role in the task of improving the overall competitiveness of the region, and the strategic position of the CD-CQ EC has been rising in the regional development of the country. Therefore, the study and analysis of the current situation of manufacturing cluster development in the CD-CQ EC has both theoretical significance and practical significance.

## 2. Related Work

### 2.1. Literature Review

Generally speaking, the causes of industrial clusters are mainly relying on the upstream and downstream industrial chain structure relationship and the natural formation of geographic relations. Adam Smith firstly put forward the theory of division of labor and collaboration,

pointing out that the requirement of efficiency in the development of capitalism promotes the formation of division of labor among enterprises, and at the same time, due to the agglomeration of enterprises in the spatial location, the efficiency of division of labor is further enhanced[1]. Alfred Marshall pointed out that the agglomeration of SMEs also gives rise to economies of scale[2]. Peru (1987) used the attraction of the poles of a magnet to represent the phenomenon of geographical agglomeration of enterprises with certain creativity, and illustrated that clustering of enterprises brings certain advantages[3]. Rosenthal and Strange (2004) elucidated the reasons for the formation of spatial agglomeration of industries from the micro point of view [4]. Qi, Zhao and Wang (2012) introduce the division of labor and analyze the occurrence mechanism of agglomeration from the technological externality and division of labor of knowledge[5]. Fujita and Thisse (2013) start from the perspective of economic development and classify the areas with close inter-industry relationship, high economic growth rate and industrial agglomeration as urban agglomeration areas, and conclude that the productivity of capital per capita is proportional to the degree of urban agglomeration. Dupont (2013) concludes that the degree of urban agglomeration is proportional to the productivity of capital per capita and the degree of urban agglomeration. The conclusion of [6]. Dupont (2007), Chica and Marmolejo C (2016) all pointed out that under the conditions of the full realization of the spillover effect and the free flow of factors, geographic industrial agglomeration can promote the realization of the knowledge spillover effect, eliminate the phenomenon of interregional unequal development, and promote the growth of regional economy[7] [8]. Zhang Jinbing (2014) pointed out that enterprises improve their competitiveness by means of clustering, thus driving regional economic growth[9]. Liu Zhenkun (2020) believes that when the spatial layout of manufacturing industries is unreasonable, it is necessary to improve the operational efficiency of manufacturing clusters as well as the development of innovation capacity by means of technological updating[10]. However, Lou Tongtong (2020) got the opposite conclusion, which believes that the role of technological innovation effect is not obvious, and the scale brand effect is the reason to promote economic growth[11]. Pan Wenqing and Liu Qing (2012) found that regional manufacturing industry agglomeration in China has a significant positive effect on economic growth[12].

In conclusion, industrial agglomeration is often accompanied by urban agglomeration, and it affects regional economic growth through knowledge spillover effect and brand effect of scale, thus positively stimulating economic growth.

## 2.2. Related Concepts

### (1) Twin Cities Economic Circle

A twin-city economic sphere is a metropolitan area with two cities at its core. In addition to emphasizing the radiation effect of the metropolitan area on the surrounding region, it is also necessary to take into account the coordinated development relationship between the two cores. Its intrinsic nature is to better integrate the elements within the radiated area of the metropolitan area, so as to promote the economic development of the region and form a higher quality regional economic growth.

### (2) Manufacturing, Industrial Clusters

This paper categorizes China's manufacturing industry into 31 sub-industries based on the latest National Economic Industry Classification (NEC) released by the China Bureau of Statistics (CBS).

An industrial cluster is a group of geographically concentrated and interrelated groups in a specific region with competitive and cooperative relationships. There are individualities and commonalities among different clusters. In the process of vertical integration, enterprises can internalize external transactions to reduce transaction time and capital costs in order to improve efficiency, while in the process of horizontal integration, enterprises can reduce the

cost of intermediate products in order to obtain greater economic efficiency. As a result, industrial clusters enable enterprises to achieve greater economies of scale and scope.

### 3. Literature References

#### 3.1. Scale of Manufacturing

As shown in Table 1, the scale of manufacturing in CD-CQ is still small up 2018. Compared with the Yangtze River Delta, the Pearl River Delta, and the Beijing-Tianjin Wing Economic Circle, its contribution is low.

**Table 1.** Data Related to Manufacturing in CD-CQ, 2018

	CD-CQ	Nationwide	Proportion
No. of enterprises	20977	375,000	5.59%
Total assets	63248.4	1153251	5.48%
Total profit	3936.6	71609	5.50%
No. of employed	396.13	7942.3	4.99%

In addition, from Table 2, it can be seen that the increase in fixed asset investment in manufacturing industry in CD-CQ EC between 2008 and 2018 is higher than the national average. At the same time, the proportion of fixed asset investment amount from manufacturing industry showed an upward trend in six years.

**Table 2.** CD-CQ and National Manufacturing Industry Fixed Asset Investment

	CD-CQ			Nationwide		
	Manufacturing investment in fixed assets	Total investment in fixed assets	proportion	Manufacturing investment in fixed assets	Total investment in fixed assets	proportion
2008	3056.2	11647.7	26.2%	56702.4	17828.4	32.8%
2009	4414.0	16586.2	26.6%	70612.9	224598.8	31.4%
2010	5167.0	19487.4	26.5%	88619.2	278121.9	31.9%
2011	6003.4	21055.0	28.5%	102712.9	311485.1	33.0%
2012	6596.2	25140.0	26.2%	124550.0	374694.7	33.2%
2013	7612.1	32254.2	23.6%	147705.0	446294.1	33.1%
2014	8206.1	36801.2	22.3%	167025.3	512020.7	32.6%
2015	9144.2	39173.7	23.3%	180370.4	561999.8	32.1%
2016	10631.4	44860.1	23.7%	187962.1	606465.7	31.0%
2017	12173.7	48676.5	25.0%	193710.0	641238.4	30.2%
2018	13191.8	46726.7	28.2%	212112.4	645675.0	32.9%

**Table 3.** Regional Distribution of Top 500 Manufacturing Industry in china, 2018

Shore	CD-CQ		Yangtze River Delta				BJ-TJ-HE		
Province	CD	CQ	SHH	JS	ZJ	AH	BJ	TJ	HE
Quantities	14	4	34	73	83	10	39	7	6
Total	18		200				52		
Percentage	3.6%		40%				10.4%		

From Table 3, the CD-CQ EC has a large difference in total volume with the advanced regions in total volume, but in terms of the proportion of subdivided regions, the CD-CQ EC has less internal variability and relatively balanced development.

### 3.2. Industrial Structure

This paper refers to Xu Jianrong's (2008) classification of factor intensity. The 31 manufacturing sub-industries are classified as labor-intensive, capital-intensive and technology-intensive according to the degree of factor intensity, and the specific classification is shown in Table 4.

**Table 4.** Classification of manufacturing subsectors

	Sub-industry
labor-intensive	(1), (2), (3), (5), (6), (7), (8), (9), (10), (11), (12), (21), (29))
capital-intensive	(4), (13), (16), (17), (18), (19), (20)
technology-intensive	(14) , (15), (22), (23), (24), (25), (26), (27) , (28), (30), (31)

Selecting the years in which the share of manufacturing investment in CD-CQ EC rises in Table 2, i.e., 2013-2018, Then based on the above classification method, the main economic indicators of labor-intensive manufacturing, capital-intensive manufacturing and technology-intensive manufacturing are shown in Table 5.

**Table 5.** CD-CQ EC share of Manufacturing Industry Key Economic Indicators

Intensive type	year	No. of enterprises		Total assets		Revenue		Total profit	
		CD-CQ	National	CD-CQ	National	CD-CQ	National	CD-CQ	National
LABOR	2013	30.63	4.24	15.69	4.99	23.26	4.75	30.66	5.59
	2014	30.84	4.21	14.86	4.81	22.58	4.78	26.03	5.33
	2015	31.19	4.32	14.63	4.86	22.9	4.86	26.32	5.3
	2016	31.73	4.51	14.97	5.08	22.96	5.02	25.73	5.45
	2017	32.63	4.78	15.02	5.31	23.16	5.37	24.29	6.21
	2018	31.38	4.51	15.44	5.64	23.43	6.37	29.19	7.95
CAPITAL	2013	21.61	5.72	18.13	4.46	19.97	3.9	11.86	3.03
	2014	20.27	5.32	17.97	4.67	19.45	4.08	10.92	3.41
	2015	20.07	5.43	16.2	4.41	18.3	4.27	9.2	3.28
	2016	19.86	5.63	15.66	4.37	17.95	4.47	8.25	2.45
	2017	19.48	5.63	14.89	4.14	20.36	4.79	16.42	4.66
	2018	19.18	5.77	15.39	4.28	20.03	4.57	21.63	5.33
TECHNOLOGY	2013	21.61	5.72	18.13	4.46	21.61	5.72	18.13	4.46
	2014	20.27	5.32	17.97	4.67	20.27	5.32	17.97	4.67
	2015	20.07	5.43	16.2	4.41	20.07	5.43	16.2	4.41
	2016	19.86	5.63	15.66	4.37	19.86	5.63	15.66	4.37
	2017	19.48	5.63	14.89	4.14	19.48	5.63	14.89	4.14
	2018	19.18	5.77	15.39	4.28	19.18	5.77	15.39	4.28

From the horizontal comparison, in Table 5, the technology-intensive manufacturing industry occupies an absolute advantage, meanwhile, labor-intensive compared to capital-intensive, has a comparative advantage in the number of enterprises, main business income and total profit, but considering that capital-intensive has an inherent advantage in the stock of assets compared to labor-intensive, the strength of manufacturing industry in CD-CQ EC can be manufacturing industries in the following order, namely: technology-intensive, labor-intensive, and capital-intensive.

Vertical comparison shows that the total assets of the three types of manufacturing industries are floating during the six-year period. And the total profit of each type of manufacturing industry has increased significantly in comparison, indicating that the investment strength of the manufacturing industry in CD-CQ EC has improved more slowly but profitability has improved significantly. However, it is worth noting that technology-intensive as the advantageous manufacturing industry in CD-CQ EC showed a downward trend in total profit in 2018.

#### 4. Math

Industry location entropy, also known as industry specialization rate, is used to measure the concentration status of an industry in a region as well as its spatial distribution, which is calculated by the formula:

$$LQ_{ij} = \frac{q_{ij}/q_j}{q_i/q} \quad (1)$$

In the Eq,  $LQ$  denotes the locational entropy,  $LQ_{ij} > 1$  indicates the industry has a high level of industry clustering on a national scale.

According to the 31 manufacturing subsectors and the location entropy calculation method of equation (1), the results of location entropy calculation of the output in CD-CQ EC can be obtained as shown in Table 6.

From Table 8 it can be obtained that during the period from 2013 to 2018, the location entropy value of 10 industries in the manufacturing industry of CD-CQ Twin Cities Economic Circle is always greater than 1, which represents that these 10 industries in the CD-CQ Twin Cities Economic Circle have a certain degree of industrial clustering phenomenon. Combined with Table 4, it can be seen that half of these ten manufacturing industries are labor-intensive, only one is capital-intensive, and four are technology-intensive. Among them, the cultural, educational and recreational supplies manufacturing industry and the non-metallic mineral products industry have always shown an increasing trend of locational entropy between 2013 and 2018, releasing more economic vitality through industrial clusters in the process of the synergistic development of the CD-CQ Twin Cities' economy; on the contrary, some of the industries that originally had a high degree of industrial agglomeration in the country, such as: the automobile manufacturing industry, the computer, communication and other electronic equipment manufacturing industry, which are On the contrary, some industries that originally had a higher degree of industrial agglomeration in the country, such as: automobile manufacturing, computer, communication and other electronic equipment manufacturing, which are two types of technology-intensive manufacturing industries, have failed to ride on the wind of the development of CD-CQ Twin Cities' economic clusters and continue to show stronger national competitiveness.

**Table 6.** Location entropy of subsectors output in CD-CQ

Industry	2013	2014	2015	2016	2017	2018
1	1.02	1.06	1.04	1.02	1.07	1.11
2	1.00	1.03	1.02	0.98	1.10	1.21
3	3.30	3.16	3.06	3.02	3.29	3.49
4	0.93	0.91	0.76	0.64	0.67	0.59
5	0.54	0.53	0.51	0.51	0.47	0.44
6	0.28	0.29	0.28	0.27	0.31	0.31
7	0.64	0.60	0.58	0.58	0.58	0.56
8	0.52	0.59	0.61	0.59	0.69	0.83
9	1.41	1.47	1.32	1.30	1.40	1.18
10	0.94	1.04	0.95	0.95	0.92	1.01
11	1.29	1.19	1.37	1.28	1.32	1.51
12	0.23	0.24	0.25	0.27	0.27	0.29
13	0.29	0.42	0.46	0.45	0.44	0.30
14	0.75	0.74	0.75	0.74	0.71	0.73
15	1.19	1.25	1.25	1.21	1.25	1.29
16	0.50	0.56	0.62	0.63	0.66	0.63
17	0.81	0.86	0.84	0.85	0.92	0.96
18	1.16	1.19	1.23	1.24	1.27	1.61
19	0.85	0.89	0.89	0.84	0.71	0.70
20	0.54	0.52	0.49	0.52	0.47	0.48
21	0.75	0.77	0.82	0.80	0.94	1.02
22	0.96	1.00	1.07	1.08	1.07	1.05
23	0.87	0.85	0.83	0.89	0.81	0.87
24	1.57	1.77	1.85	1.79	1.64	1.34
25	2.12	2.15	1.93	1.96	1.93	2.37
26	0.57	0.61	0.66	0.64	0.63	0.62
27	1.47	1.56	1.40	1.45	1.48	1.44
28	0.49	0.51	0.50	0.49	0.54	0.65
29	1.39	1.60	1.55	1.24	1.14	1.63
30	0.86	0.90	1.00	0.96	0.95	0.58
31	1.41	1.24	0.90	0.83	0.61	1.03

## 5. Policy Recommendations

### 5.1. CD-CQ Benign Interaction and Synergistic Development

It should focus on the correlation effect, scale effect and structural effect among industries. Through the realization of the Twin Cities Economic Circle in the regions of infrastructure Hutong, industrial integration and urban-rural integration, the actual top-level policy and the construction of coordinated development mechanism as a hand, with the CD-CQ Twin Cities Economic Circle policy integration to promote the formation of CD-CQ integrated development of the industry to achieve the strengthening of CD-CQ Twin Cities Economic Circle manufacturing industry linkage development, synergistic development purposes. At the same time should also strengthen the organization and leadership work, the establishment of a coordination group, the Twin Cities manufacturing industry in the process of coordinated development of major issues arising from the consultation and resolution. Can also establish

the manufacturing industry synergistic development of the demonstration area, clear CD-CQ Twin Cities Economic Circle manufacturing industry cluster development of key tasks, select the appropriate location to establish cooperation park, in the park to implement the cooperative construction of the work of the mechanism.

## 5.2. Exploring Smart Governance, Innovative Development

First of all, CD-CQ should cooperate with colleges and universities to establish a collaborative innovation system, taking colleges and universities as the core, combining with high-end manufacturing enterprises in the Twin Cities to build a scientific and technological innovation platform for CD-CQ, so as to strengthen the conversion of innovative technologies into real productivity. Secondly, the CD-CQ EC can jointly undertake major scientific research projects and strengthen the collaborative attack on key technologies by setting up special funds for joint innovation. Finally, the CD-CQ area can also establish a regional technology sharing alliance to create an integrated technology trading market and strengthen the sharing of scientific and technological achievements within the CD-CQ EC and it should also strengthen the protection of intellectual property rights, patented technologies and commercial secrets, and strengthen the supervision and management of the manufacturing market, so as to make the intelligent and innovative transformation of the manufacturing industry in CD-CQ EC go a step further.

## 5.3. Strengthen the Leading Role and Optimize the Layout

Strengthening the core leading role is to continuously play the central city of CD-CQ' radiation role, promote the development of synergistic development results to the western part of Chongqing and the eastern part of Chengdu, and accelerate the construction of the CD-CQ modernized metropolitan area. Build a four-level construction system of "central city - sub-central city - counties - small towns". The central city will gather high-end elements of manufacturing industry; the sub-central city will strengthen the construction of regional public service facilities and expand the radiation effect of cluster development; counties and small towns should further improve the relevant infrastructure construction and service system to enhance the acceptance of the radiation effect.

## 5.4. Utilizing Clusters Advantages and Foster Competitiveness

The CD-CQ EC should give full play to the advantages of technology-intensive manufacturing clusters. Relying on the advantages of the CD-CQ manufacturing cluster, vigorously develop advanced manufacturing industries such as new energy automobiles, high-end medical equipment, innovative medicines, aerospace engines, and gas turbines. Accelerate the layout of research and development in new materials, robotics, intelligent manufacturing and other advanced manufacturing areas to develop core competitiveness.

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