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Research on the Competitiveness of Hubei Manufacturing

Post Financial Crisis Era——Panel Data of 2008~2011

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Abstract: With Location Quotient and Shift-Share-Method, this paper evaluated the competitiveness of manufacturing industries in Hubei province post Financial Crisis Era based on the panel data from 2008 to 2011 of Output Value of Industrial Products Sales and Delivery Value for Export of Large and Medium Scale Industrial Enterprises. On basis of these, this paper also put forward some countermeasures to improve the competitiveness of manufacturing industry of Hubei province.

Keywords: Location Quotient; Shift-Share-Method; Output Value of Industrial Products Sales; Delivery Value for Export;

1. INTRODUCTION

Since the second half of 2008, with the influence of the international financial crisis' spreading, major economies of the world experienced another shock after the Second World War. Under the action of the countries' governments introduced a series of economic stimulus policies, since the second quarter of 2009, the global economic confidence became returning, the PMI (purchasing managers' index), one of economic leading indicators bounced back, the actual output of industry began to return, the spreads index of financial market returned to normal, the confidence of consumer rebounded, the expectation of economic growth raised, while the unemployment rate remained high, the global economy came into the "post financial crisis era" through the panic of financial crisis.

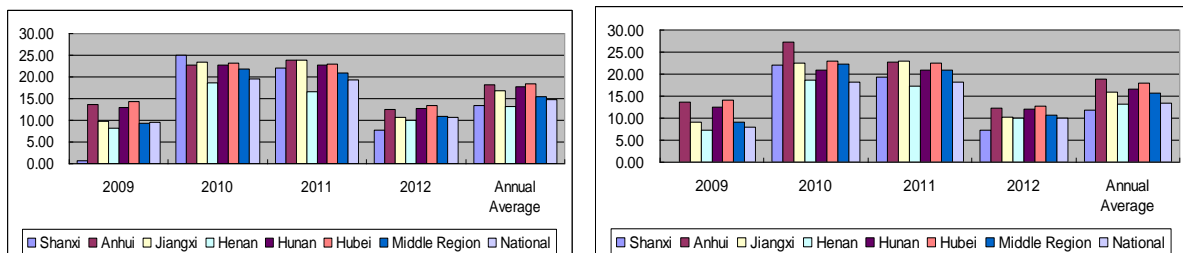


Figure 1. The Growth Rate of GDP & Per Capita GDP of Middle Region during 2009 ~ 2012

During 2009 ~ 2012, the growth rates of the whole Middle Region of GDP and Per Capita GDP had realized faster than the average of national (respectively 15.57% and 15.61%, more than 14.68% and 13.51% of national) (as shown in figure 1). The annual average growth rate of GDP in Hubei was 18.38%, the first place of the whole Middle Region; and the annual average growth rate of Per Capita GDP was 18.05%, slightly lower than 18.81%, the average annual growth rate of Anhui.

At the same time, the growth rate of the whole Middle Region of Industrial Productivity (9.60%) during 2009 ~ 2012 (as shown in figure 2), also had realized faster than the growth rate of the national average (5.80%). The growth rates of Industrial Productivity in Hubei were more than 10% except in 2011, and the average annual growth

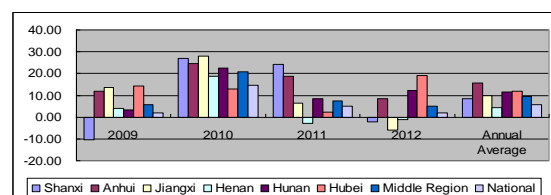


Figure 2. The Growth Rate of Labor Productivity of Middle Region during 2009 ~ 2012

rate was 11.90%, less than 15.80% of Anhui.

Under the background of globalization and knowledge-based of world economic, manufacturing industry has become the cornerstone of economic development of national and regional, has become the carrier of technology and science and the media of technology achievements transformation, and has been the foundation of the competitiveness of national and regional. The development of manufacturing industry and the promotion of its competitiveness in Hubei is the important strength to push the rapid development of Hubei, so it is very important to analyses the competitiveness of manufacturing industry of Hubei, to promote the competitiveness of manufacturing industry of Hubei, and to realize the first rise in the Middle Region.

2. STATISTICAL INDICATORS AND ANALYSIS TOOLS OF RESEARCH ON MANUFACTURING COMPETITIVENESS OF HUBEI

2.1 Statistical Indicators of Research on Manufacturing Competitiveness of Hubei

According to the yearbook of Hubei, the panel data from 2008 to 2011 of Output Value of Industrial Products Sales and Delivery Value for Export of Large and Medium Scale Industrial Enterprises were selected to analysis the competitiveness of manufacturing of Hubei.

2.2 Location Quotient (LQ)

Location Quotient, also called Regional Specialization Rate, is a basic analysis method to evaluate the advantage industry of regional, was first put forward by P. Haggett and applied in the location analysis. In order to measure of space distribution of the elements in a field, to reflect the advantages and disadvantages of a particular industry sector, to reflect the position and function of an area in the high level region, through the calculation of Location Quotient, the industries with a certain advantage in the area can be found out and be measured the rate of specialization through Location Quotient.

The calculation formula of LQ of the industry i of region j is:

$$LQ_{ij} = \frac{L_{ij} / L_j}{L_i / L} \times 100\% \quad (1)$$

LQ_{ij} is the Location Quotient of the industry i of region j ;

L_{ij} is the index of the industry i of region j ;

L_i is the index of the industry i of the country, namely $L_i = \sum_j L_{ij}$;

L_j is the index of all industries of region j , namely $L_j = \sum_i L_{ij}$.

If $LQ_{ij} < 100\%$, means the index of the industry i of region j at a relatively disadvantage compared with the national level;

If $LQ_{ij} = 100\%$, means the index of the industry i of region j at a balance with the national level;

If $LQ_{ij} > 100\%$, means the index of the industry i of region j at a relatively advantage compared with the national level.

2.3 Shift-Share-Method (SSM)

Shift-Share-Method was put forward by the American scholar Daniel (1942) and Creamer (1943), and was summarized to the normally form by Dunn in the early 1980's. Shift-Share-Method explains the gap between the growth rate of regional economic from two aspects of industrial structure and competitive factor. If the growth rate of industry of a regional were same with the growth rate of same industry of the national, the difference of the growth rate between the regional and national was not the difference of the competitiveness of the industry, but was the difference of industrial structure; if the industrial structure of an area was same with the national, the difference of the growth rate between the regional and national had to be explained by the competitiveness of a regional. So not only did SSM measure the determinants of the regional economic growth, the role of industrial structure and competitive factor, but also compared the difference between regional economic growth

determined by structure.

Compared with other methods, SSM, with comprehensive and dynamic, can reveal the reason of change of the industry structure of regional, and determine the dominant development direction of future. With SSM, the change of regional economy was seen as a dynamic process, referring with the whole country's economic development, and was divided into three components, the National Growth Effect, the Industrial Mix Effect and the Shift Share Effect, to explained the cause of the development and the recession of regional, to evaluated the quality of industry structure and the competitive, to find out the relative advantage of industrial sector of regional, and to determine the reasonable direction in the future and the principle of adjustment for the industrial of regional.

$$\text{Assume } F_i(T) \text{ was the output of industry } i \text{ of national in period } T, \quad F_i(T) = \sum_{j=1}^n F_{ij}(T) \quad (2)$$

$F_{ij}(T)$ was the output of the industry i of region j in period T .

$F(T)$ was the total output of all industries of national in period T , then $F(T) = \sum_{i=1}^m F_i(T)$, $T=t_0$ was the base period, $T=t$ was the reported period, (2) could divided into the Industrial Mix Effect and the Shift Share Effect:

$$\begin{aligned} \Delta F_{ij} &= F_{ij}(t) - F_{ij}(t_0) = N_{ij} + P_{ij} + D_{ij} \\ &= F_{ij}(t_0) \left[\frac{F(t)}{F(t_0)} - 1 \right] + F_{ij}(t_0) \left[\frac{F_i(t)}{F_i(t_0)} - \frac{F(t)}{F(t_0)} \right] + F_{ij}(t_0) \left[\frac{F_{ij}(t)}{F_{ij}(t_0)} - \frac{F_i(t)}{F_i(t_0)} \right] \end{aligned} \quad (3)$$

ΔF_{ij} was the increase value of the output of the industry i of region j ;

$F_{ij}(t_0)$ was the base value of the output of the industry i of region j ;

$F_{ij}(t)$ was the value in period T of the output of the industry i of region j .

According to SSM, the increase value of the output of the industry i of region j including the following 3 parts:

- The National Growth Effect, $N_{ij} = F_{ij}(t_0) \left[\frac{F(t)}{F(t_0)} - 1 \right]$, was the due growth rate of the industry i of region j

according to the growth of national, and $\left[\frac{F(t)}{F(t_0)} - 1 \right]$ was the growth rate of the output of national.

- The Industrial Mix Effect, $P_{ij} = F_{ij}(t_0) \left[\frac{F_i(t)}{F_i(t_0)} - \frac{F(t)}{F(t_0)} \right]$, was the growth of the industry i of region j

deviated from the average growth of the industry i of national, which was due to the difference of growth of the industry i of region j relative to the national, and reflected superiority of region j on the basis of industrial structure of national. $F_{ij}(t_0) \left[\frac{F_i(t)}{F_i(t_0)} - \frac{F(t)}{F(t_0)} \right]$, was the difference between the growth rate of the industry i and the

whole industries of national, which was same with every region and depended on the structure of $F_{ij}(t)$. The positive P_{ij} showed the better quality of the industrial structure of the regional, which would promote the growth of regional economy; in contrast, the negative P_{ij} showed the poorer quality of the industrial structure of the regional, which would affect the growth of regional economy.

- The Shift Share Effect, $D_{ij} = F_{ij}(t_0) \left[\frac{F_{ij}(t)}{F_{ij}(t_0)} - \frac{F_i(t)}{F_i(t_0)} \right]$, was the remaining ingredient of the growth of the

industry i of region j , which was thought as the competitiveness of regional industry, namely the growth deducting the growth of national economic and the change of structure. The positive and negative and the value of the Shift Share Effect reflected the relative level of the growth of the industry comparing with the same industry of national and the affection of the conditions or regional competitiveness to the growth of regional

economic. Not only did the Shift Share Effect judge the competitive position of the industry i of national, but also understand where the relative expanding and contracting of each industrial sector.

$$F_{ij}(t_0) \left[\frac{F_{ij}(t)}{F_{ij}(t_0)} - \frac{F_i(t)}{F_i(t_0)} \right],$$

was the difference of the growth rate of industry i of region j and the growth rate of industry i of national. The positive D_{ij} showed the industrial was favorable, the higher of $F_{ij}(t_0)$, the stronger of the competition; in contrast, the negative D_{ij} showed the industrial was disadvantage, the higher of $F_{ij}(t_0)$, the poorer of the competition.

And $P_{ij}+D_{ij}$ was the Total Shift of industry i of the region and the national, which reflected the total growth advantage of industry i of region j . The positive $P_{ij}+D_{ij}$ showed the industrial with the growth advantage and the development potential; in contrast, the negative $P_{ij}+D_{ij}$ showed the other side.

3. ANALYSIS OF THE OUTPUT VALUE OF INDUSTRIAL PRODUCTS SALES OF MANUFACTURING INDUSTRY OF HUBEI

According to the principle of “28”, the first 11 manufacturing industries, the total of the Output Value of Industrial Products Sales of Large and Medium Scale Industrial Enterprises in 2011 was accounted for 81.95% of Hubei, were selected as the analysis objects (seen in Table 1 and Table 2).

Table 1. LQ of 2008 to 2011 and Accounted for Output Value of Industrial Products Sales in 2011 of Hubei

Rank	Industry	Accounted for 2011 %	2008	2009	2010	2011	Average
1	Transportation Equipment Manufacturing	21.84	274	212	211	196	223
2	Smelting and Processing of ferrous Metals	18.03	145	148	154	159	152
3	Raw Chemical Material and Chemical Products	8.53	31	9	13	25	20
4	Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing	5.21	33	40	28	43	36
5	Primary Products, Food, Process Industry	4.87	78	109	115	117	105
6	Textile Industry	4.61	81	95	102	120	100
7	Petroleum Processing, Coking Products and Nuclear Fuel Processing	4.10	74	74	64	58	68
8	Nonmetal Material Products	3.96	115	121	105	110	113
9	Electric Machinery and Equipment	3.82	54	55	55	53	54
10	Beverage Production	3.79	183	186	212	231	203
11	Smelting and Processing of Nonferrous Metals	3.19	79	61	64	68	68

Data sources: Sorting, Accounting and According to the Statistical Yearbooks of Hubei and China from 2009 to 2012.

3.1 The Analysis of Location Quotient of the Output Value of Industrial Products Sales of Manufacturing Industry of Hubei

Shown in Table 1, during 2008 ~ 2011, of the first 11 industries of Hubei, there were 5 industries whose annual average Location Quotient more than 100 and with advantages, the highest was Transportation Equipment Manufacturing (223); the annual average Location Quotient of Textile Industry was 100, with a balance in national; and there were 5 industries whose annual average Location Quotient less than 100 and with disadvantages, the lowest was Raw Chemical Material and Chemical Products (20).

3.2 The Analysis of SSM of the Output Value of Industrial Products Sales of Manufacturing Industry of Hubei

Shown in Table 2, of the first 11 industries,

——the National Growth Effect of 11 industries were positive and more than the growth rate of national,

the highest was Transportation Equipment Manufacturing (197.16), and the lowest was Beverage Production (2.86);

— the Industrial Mix Effect of 11 industries were positive and with advantage of structure, the highest was Transportation Equipment Manufacturing (1823.35), and the lowest was Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing (151.34);

— the Shift Share Effect, there were 7 industries whose the Shift Share Effect were more than 100 and with competitiveness, the highest was Smelting and Processing of ferrous Metals (734.37), and there were 2 industries whose the Shift Share Effect were negative and with a trend of weakening competitiveness, the lowest was Transportation Equipment Manufacturing (-540.93);

— the Total Shift were more than 200, the highest was Smelting and Processing of ferrous Metals (1287.60), and the lowest was Petroleum Processing, Coking Products and Nuclear Fuel Processing (211.23).

Table 2. SSM of Accounted for Output Value of Industrial Products Sales in 2011 of Hubei (2008 ~ 2011)

Rank	Industry	Accounted for 2011 %	Nij	Pij	Dij	Gij	Pij+Dij
1	Transportation Equipment Manufacturing	21.84	197.16	1823.35	-540.93	1479.58	1282.42
2	Smelting and Processing of ferrous Metals	18.03	89.18	553.23	734.37	1376.79	1287.60
3	Raw Chemical Material and Chemical Products	8.53	33.88	482.21	286.90	802.99	769.11
4	Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing	5.21	25.23	151.34	299.65	476.22	450.99
5	Primary Products, Food, Process Industry	4.87	7.80	214.75	356.17	578.72	570.92
6	Textile Industry	4.61	6.86	177.55	330.20	514.61	507.75
7	Petroleum Processing, Coking Products and Nuclear Fuel Processing	4.10	20.74	254.20	-42.97	231.97	211.23
8	Nonmetal Material Products	3.96	8.59	283.25	88.15	379.99	371.40
9	Electric Machinery and Equipment	3.82	15.59	207.65	107.68	330.92	315.33
10	Beverage Production	3.79	2.86	192.86	212.42	408.14	405.28
11	Smelting and Processing of Nonferrous Metals	3.19	9.93	208.98	23.62	242.54	232.60

Data sources: Sorting, Accounting and According to the Statistical Yearbooks of Hubei and China from 2009 to 2012.

For convenience of comparison analysis on the manufacturing industry in Hubei, the data should standardize

with Z-score method: $ZX_{i,t} = \frac{X_{i,t} - X_i}{S_i}$, $i, t = 1, 2, \dots, n$ (4)

While, $\bar{X} = \frac{1}{n} \sum_{i=1}^n X_{i,t}$, $S_i = \sqrt{\frac{\sum_{i=1}^n (X_{i,t} - \bar{X}_i)^2}{n-1}}$.

$ZX_{i,t}$ was the standardization data of t observed value of i index, $X_{i,t}$ was the data of t observed value of i index. \bar{X} was the sample mean for X_i , and $S_i = \sqrt{\frac{\sum_{i=1}^n (X_{i,t} - \bar{X}_i)^2}{n-1}}$ was the Sample standard deviation. The analysis diagram of industry advantage and deviatory component of manufacturing industry in Hubei were drawn according to the data of Table 2 and the standardization (Figure 3).

3.3 The Evaluation of Competitiveness of Hubei Based on Output Value of Industrial Products Sales

According to above analysis, the first 11 manufacturing industries, not only had their Output Value of Industrial Products Sales of Large and Medium Scale Industrial Enterprises in 2011 contributed more than 80% of Hubei, but also had the obvious advantage compared with the national and had grown faster than the national level; not only had Smelting and Processing of ferrous Metals, Primary Products, Food, Process Industry, Textile Industry and Beverage Production more competitiveness, but also had the advantage position of Location Quotient; and Transportation Equipment Manufacturing had the strongest advantage of structure, but with the

downward trend competitiveness; and Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing had the advantage of structure and competitiveness, but the advantage of Location Quotient was not obviously.

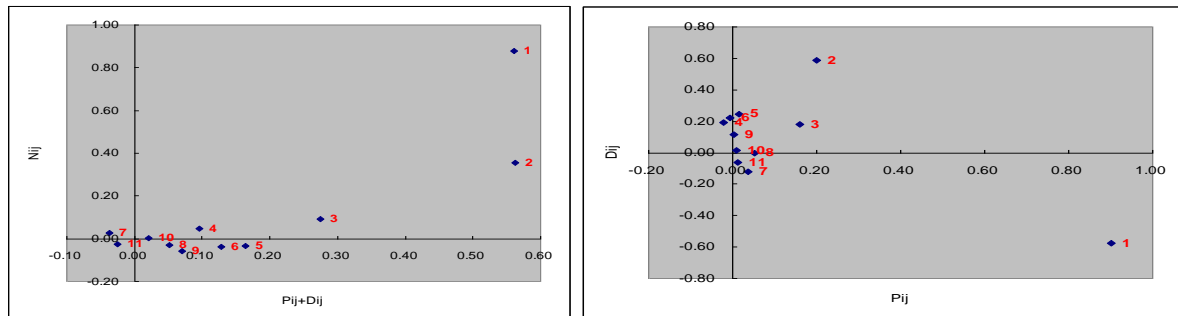


Figure 3. The Analysis Diagram of Industry Advantage and Deviator Component of Manufacturing Industry in Hubei Based on Output Value of Industrial Products Sales

4. ANALYSIS OF THE DELIVERY VALUE FOR EXPORT OF MANUFACTURING INDUSTRY OF HUBEI

According to the principle of “28”, the first 7 manufacturing industries, the total of the Delivery Value for Export of Large and Medium Scale Industrial Enterprises in 2011 was accounted for 80.33% of Hubei, were selected as the analysis objects (seen in Table 3 and Table 4).

4.1 The Analysis of Location Quotient of the Delivery Value for Export of Manufacturing Industry of Hubei

Shown in Table 3, during 2008 ~ 2011, of the first 7 industries of Hubei, there were 6 industries whose annual average Location Quotient more than 100 and with advantages, the highest was Medical and pharmaceutical Products (514); and only the annual average Location Quotient of the Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing (53) was less than 100 and with disadvantages.

Table 3. LQ from 2008 to 2011 and Accounted for Delivery Value for Export in 2011 of Hubei

Rank	Industry	Accounted for 2011 %	2008	2009	2010	2011	Average
1	Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing	28.71	44	68	36	65	53
2	Transportation Equipment Manufacturing	12.27	229	225	191	163	202
3	Smelting and Processing of ferrous Metals	9.97	385	459	435	434	428
4	Raw Chemical Material and Chemical Products	9.65	431	416	380	356	396
5	Textile Industry	8.89	135	97	106	228	141
6	Textile Garments, Shoes and Hats Products	6.73	261	282	260	266	267
7	Medical and pharmaceutical Products	5.15	555	507	438	554	514

Data sources: Sorting, Accounting and According to the Statistical Yearbooks of Hubei and China from 2009 to 2012.

4.2 The Analysis of SSM of the Delivery Value for Export of Manufacturing Industry of Hubei

Table 4. SSM of Accounted for Delivery Value for Export in 2011 of Hubei (2008 ~ 2011)

Rank	Industry	Accounted for 2011 %	Nij	Pij	Dij	Gij	Pij +Dij
1	Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing	28.71	2.36	25.25	6.04	33.65	31.29
2	Transportation Equipment Manufacturing	12.27	0.05	2.36	5.46	7.87	7.82
3	Smelting and Processing of ferrous Metals	9.97	0.05	4.14	8.11	12.31	12.25
4	Raw Chemical Material and Chemical Products	9.65	0.16	6.43	4.44	11.03	10.87
5	Textile Industry	8.89	0.10	2.70	10.08	12.88	12.78
6	Textile Garments, Shoes and Hats Products	6.73	0.08	3.28	5.33	8.69	8.61
7	Medical and pharmaceutical Products	5.15	0.02	2.83	3.86	6.71	6.69

Data sources: Sorting, Accounting and According to the Statistical Yearbooks of Hubei and China from 2009 to 2012.

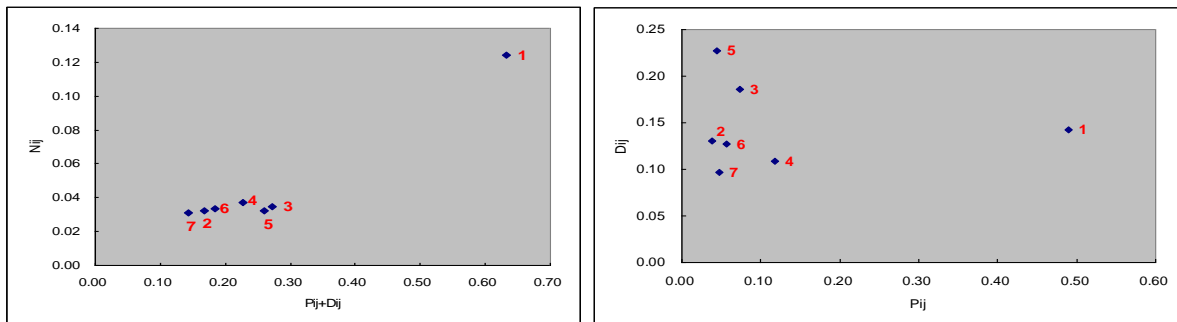


Figure 4. The Analysis Diagram of Industry Advantage and Deviatory Component of Manufacturing Industry in Hubei Based on Delivery Value for Export

Shown in Table 4 and Figure 4, of the first 7 industries,

——the National Growth Effect of 7 industries were positive and more than the growth rate of national, the highest was Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing (2.36), and the lowest was Medical and pharmaceutical Products (0.02);

——the Industrial Mix Effect of 7 industries were positive and with advantage of structure, the highest was Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing (25.25) and the lowest was Transportation Equipment Manufacturing (2.36);

——the Shift Share Effect of 7 industries were positive and with competitiveness, the highest was Textile Industry (10.08), and the lowest was Medical and pharmaceutical Products (3.86);

——the Total Shift, the highest was Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing (31.29), and the lowest was Medical and pharmaceutical Products (6.69).

4.3 The Evaluation of Competitiveness of Hubei Based on Delivery Value for Export

According to above analysis, the first 7 manufacturing industries, not only had their Delivery Value for Export of Large and Medium Scale Industrial Enterprises in 2011 contributed more than 80% of Hubei, but also had the obvious advantage of growth, structure and competitiveness compared with the national, and the advantage of exporting, the highest was Medical and pharmaceutical Products except Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing.

5. CONCLUSIONS

With the above analysis, there were 4 industries, Transportation Equipment Manufacturing, Smelting and Processing of ferrous Metals, Raw Chemical Material and Chemical Products, Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing, whose Output Value of Industrial Products Sales were the first 4, and Delivery Value for Export were also the first 4 of Hubei. The Output Value of Industrial Products Sales of these 4 industries account for 53.61%, and the Delivery Value for Export of these 4 industries account for 60.60% of Hubei, further more, the sum of Funding for R&D Expending of 2008, 2009 and 2010 of these 4 industries account for 70.28% of Hubei (shown in Table 5). So to these 4 industries, it is very important to strengthen science and technology innovation on the basis of optimization of industrial structure to realize the continued ascension of competitiveness.

Table 5. Funding for R&D Expending from 2008 to 2011 of Hubei

Rank	Industry	R&D of Sales %			Account of Total of 3 Years' R&D %
		2008	2009	2010	
1	Transportation Equipment Manufacturing	1.47	1.09	1.05	27.20
2	Smelting and Processing of ferrous Metals	0.84	1.59	1.75	24.19
3	Raw Chemical Material and Chemical Products	0.80	1.35	1.06	7.47
4	Telecommunication Equipment, Computer and Other Electronic Equipment Manufacturing	1.88	3.21	3.08	11.42

Data sources: Sorting, Accounting and According to the Statistical Yearbooks of Hubei 2009 to 2011.

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