

# The Effect of Industrial Agglomeration on Financial Performances of an Enterprise

Based on Electrical Machinery and Equipment Manufacturing

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**Abstract**—An industrial cluster is an economic organization which, owning unique characteristics, is classified as per region and product type and studied by many subjects. The specialized work division and collaboration between individuals in clusters will help cluster-based enterprises break through the limitations in size and strength that single enterprise faces in funds flow and operations, enabling enterprises to lower costs and optimize the funds flow and further perfecting financial performance of the enterprises. Based on industrial clusters of electrical machinery and equipment manufacturing, the article selects indicators to measure the industrial agglomeration and that for proper financial performance, with correlation and regression analysis applied to analyze the effect of industrial agglomeration of electrical machinery and equipment manufacturing on the industry-related financial performances in enterprises in order to make sure of the positive correlation between spatial Gini coefficient of centralized resources allocation and financial performance of an enterprise in clusters. In most cases, the financial performance of an enterprise in the clusters is subject to by the whole progress of the industrial cluster.

**Keywords**—*industrial cluster of electrical machinery and equipment manufacturing; industrial agglomeration; financial performance*

## I. INTRODUCTION

In the 1970s, an industrial cluster came out as a concept, after 50 years of development, it, being a special economic organization, gathered in geographical location, related to industries, cooperating and competing inside it, has been rapidly developing around the globe, driving the economic growth throughout the world. Michael E. Porter (1980), based on competitiveness, thought that an industrial cluster refers to a great number of enterprises which are geographically centralized and industrially related. In addition to gathering products manufacturers, it also includes relevant components, services and even authorities which govern the industries, etc. All of the enterprises and institutions come together providing more information and labor to each other, which may help to improve the competitiveness of enterprises and highly emphasizing the significance of clusters to production and innovation [2]. Currently electronic products, Jinjiang-based shoes, Foshan-based furniture, Wenzhou-based home appliances and Shenzhen-based pharmaceuticals all are manufactured in

industrial clusters with a certain scale throughout the country.

Due to various varieties and types, the electrical machinery and equipment manufacturing are providing products under different grades, and requirements from customers, resulting into a mix of large, medium and small-sized enterprises, which are hard to deal with all demands singly, so the enterprises in the clusters, compared to others outside it, are in a strong awareness of cooperation and integrality, relying more on the integration of industrial clusters to increase the resources utilization of their own with operating pressure and risks reduced. At present, there are a great number of industrial clusters of electrical machinery and equipment manufacturing standing in Yangtze River Delta, Pearl River Delta and some of inland regions throughout China.

Based on the agglomeration of industrial clusters, the article analyzes the impact of industrial clusters on financial performance of enterprises before current environment and resources conditions, making new attempts to study the financial performances of enterprises in clusters.

## II. THEORETICAL ANALYSIS AND ASSUMPTIONS FOR THE STUDY

As far as the formation mechanism of industrial clusters in regional economics, the most basic formation for industrial clusters is that the production division is done as per product process flow by enterprises, that is, relying on industrial chains to develop laterally or longitudinally and form an integration equal or vertical, and each enterprise just takes charge of only one or several processes of related products. Except the flows having higher requirements on funds and technology, which may be in monopoly to some degree, most processes are extremely similar shown to enterprises, all gradually forming a specialized division system. It is defined as a flexible division-based system by scholars in regional economics, which can effectively increase the labor productivity and promote the rapid progress of local economy and enterprises in clusters. Compared to others outside it, the enterprises are taken as a whole and an image of regional brand. For a single enterprise, it is in an advantage for competition with a scale economy obtained, which surely will intensify the competition among

enterprises in the cluster, promoting all of them for innovation, and the exchanges between enterprises may enable advanced technologies and experience to be transmitted quickly among the enterprises in the cluster, forming a unique innovation system locally and improving the innovation ability of the whole cluster.

In the evolution mechanism of industrial clusters in the regional economics, with the huge benefits brought by the rise of related enterprises in an area, related enterprises, including raw materials supply, spare parts, environmental protection, product packaging, equipment & technical service, sales, service agencies, job agencies, transport, R&D, training, living service, and by-product manufacturing, etc. will arise to run around the economic center to serve leading products manufacturers. Within the deduction of internalizing transaction costs, due to the asymmetry in the number of suppliers and service providers, which in nature are helping but not competing with the leading products manufacturers and under a long term cooperation. However, the supporting enterprises are competing with each other, and the enterprises in the cluster can create an optimal environment via seeking for long term cooperation, negotiations and bargaining. It will bring more channels to the leading products companies to get resources, doing good to help the enterprises lower service fees and transaction costs.

Seen from theories of financial performances, as far as operations, benefiting from the local economy, enterprises in the cluster can increase earnings or lower costs on the basis of mutual relationships. Benefiting from the urban economy, it may be more easy and selective for the enterprise to obtain convenient facilities in a bigger space, and qualified labor force in order to obtain higher capital operation efficiency. As far as financing, for enterprises in the cluster are all similar in performance, individual enterprises become more conservative when trading, and much inclined to be honest and trustworthy. Investment institutions as banks become easier to get information when investigating enterprises in the cluster which are centralized geographically and similar in performance, helping to reduce the information asymmetry between investors and the investees. The long-term and close cooperation between enterprises have also made it easier for those in the cluster to keep creditable mutually, which may reduce investment risks and make them creditable to loan, doing good for them to finance. Various modes can be selected for enterprise members for capital re-organization inside and business plans adjustment, as well as capital flow optimization. The cooperation between upstream and downstream will also lower risks a single enterprise faces.

Due to the agglomeration and rooting of industrial clusters in geography, and relevance in industry as well as specialization in production, a regional network comes into being that makes enterprise members in the cluster for collaboration to obtain competitive advantages against others outside it. Such advantage will help them set up potential advantage in commercial competitions and set up brand images, so that they can provide markets with products and services more efficiently, gaining higher reputations and

excessive returns and achieving a lot in financial performance [7] [8], therefore, assumptions are hereby given as follows:

H1: Positive correlation between competitiveness and performance in a cluster.

With the agglomeration of industrial clusters raised, the increase of external layers will lead to the agglomeration of material spaces that centralize the resources in the cluster. The centralized resources will make enterprises get more resources to use, and more supplies to choose, greatly reduce costs of materials for production and operation. While the costs for normal production and operation can be reduced as low as possible, getting materials with the lowest risks and achieving higher financial performances in saving costs [9]. Assumptions are hereby given as follows:

H2: Positive correlation between competitiveness and performance in a cluster.

### III. STUDY DESIGN

#### A. Sampling and Data Source

Sampling electrical machinery and equipment manufacturing enterprises listed in Shanghai and Shenzhen during 2013-2017, the article screens 30 samples having 5 years of data. All data come from websites of the Shenzhen Stock Exchange and the Shanghai Stock Exchange as well as Guotai'an database; and the data sources of the aggregation indicators come from the national statistical yearbooks and province and city-based statistical yearbooks.

#### B. Definition of Variables and Indicators Selected

1) *Indicators selected for financial performance assessment:* The return on equity (ROE) in the article is used to measure financial performance of an enterprise, and both the ROE and ROA (return on total assets) are indicators commonly used for assessing financial performance of an enterprise. In comparison, the ROE will be better to reflect roles of finance as leverage; however, the industrial clusters play a high role in optimizing the leverage, which is especially highlighted in improving an enterprise's operating capacity, reducing costs, raising productivity, as well as optimizing tax burdens in the cluster. So based on the roles, compared to the ROA, the ROE works better to measure the financial performance in the clusters.

2) *Selection of indicators for industrial agglomeration:* In order to measure the industrial agglomeration, different statistical indicators are adopted by researchers at home and abroad, CRn (industrial concentration index), HHI index, spatial Gini coefficient, and location quotient (LQ) are commonly used to measure the industrial agglomeration [10].

For both CRn and HHI reflect the concentration of an industry but not some industry in a region, so they are not used here.

Location quotient (LQ), also called specialization rate, is a quantitative analysis tool for industrial efficiency and benefits, which is generally used to measure the distribution strength or specialization of some sector or industry in a regional economy, and it is calculated through the formula given below:

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

q<sub>ij</sub>: Income of i industrial yield at j area

q<sub>j</sub>: Income of total industrial yield at j area

q<sub>i</sub>: Income of total yield of i industry nationwide

q: Income of total industrial yield nationwide

If LQ<sub>ij</sub><1, there will be no agglomeration effect in the area; if LQ<sub>ij</sub>>1, there may be an agglomeration effect; if LQ<sub>ij</sub>>1.4, there will be a higher agglomeration effect [11].

However, if there are only some large enterprises for some industry in an area, the LQ<sub>ij</sub> may be higher, yet there is no agglomeration, so it shall be corrected to some degree (on LQ<sub>ij</sub>):

$$LQ_{ij} = \frac{q_{ij}/q_j}{q_i/q} \times M_{ij} \quad (2)$$

M<sub>ij</sub>: Income after integration of all enterprises of i industry at j area

Spatial Gini Coefficient: It is used to show the equilibrium distribution of Lorenz curve of income distribution and Gini coefficient-based industrial spatial distribution, and it is calculated through the formula given as below:

$$G = \frac{\sum (S_i - X_i)^2}{2} \quad (3)$$

S<sub>i</sub>: Proportion of employed people in the industry at i area in that around the country of the same

X<sub>i</sub>: Proportion of employed people at i area in that of the country

When measuring the agglomeration and resources distribution, the higher the index value, the greater the agglomeration. Generally if G is very small, the resources distribution in an area remains even, and there will be no clusters existing; if it is bigger, there will be a cluster existing.

The corrected LQ and spatial Gini coefficient both can show the agglomeration of some industry in a region through competitiveness and resources concentration respectively, which are herein selected by the article as indicators to measure the industrial agglomeration from competitiveness and resources concentration.

3) *Selection of control variables*: Control variables refer to variables that should be taken into account in research,

which are not related to the research themes, but will affect key factors in the research theme to a large degree. Based on studies upon influencing factors of financial performance, in the article, enterprise size, growth, age, and subject to pilot scope for innovative industry clusters are used as control variables which may affect the financial performance of an enterprise.

**Enterprise size**: Sizes of listed enterprises vary with performances of their own, and the enterprises in a large scale have more advantages in integrating resources inside and outside, so when studying the correlation between industrial agglomeration and financial performance, it needs to be taken as control variable for models so as to avoid the results from deviating.

**Enterprise growth**: it is certain that enterprises in different stages of growth will differ in resources integrating and use, which will affect the financial performance, so it shall be taken into consideration.

**Enterprise Age (AGE)**. The age of an enterprise is calculated from the incorporation to the year ending the research.

**Subject to pilot scope of innovative industrial clusters (SD)**: The cluster's development and operation cannot be separated from various supports, of which, what have great impact on enterprises in the cluster include governmental policies, behavior preferences and restrictions, so all of such shall be considered as well. In the article, the SD is to be 1 or 0 according to lists of innovative industrial clusters among the 1st, 2nd and 3rd batch issued by the Ministry of Science and Technology.

### C. Modeling

Sampling listed enterprises in electrical machinery and equipment manufacturing from Shanghai Securities Exchange and Shenzhen Securities Exchange, the article takes the ROE reflecting the financial performance as explained variable, and the corrected LQ as explaining variable, and enterprise size, growth and age as control variables, and analyzes the impact of industrial agglomeration on the financial performance from the competitiveness of industrial clusters, establishing a model 1:

$$ROE = \beta_0 + \beta_1 LQ + \beta_2 SIZE + \beta_3 FM + \beta_4 AGE + \beta_5 SD$$

Take ROE as explained variable, the spatial Gini coefficient as explaining variable, and company size, growth, age as control variables, and analyze the impact of industrial agglomeration on the financial performance from the resources concentration of industrial clusters, establishing a model 2

$$ROE = \beta_0 + \beta_1 G + \beta_2 SIZE + \beta_3 FM + \beta_4 AGE + \beta_5 SD$$

Refer to "Table I" for details:

TABLE I. VARIABLES TABLE

Type	Name	Code	Description
Explained Variable	Return on Equity	ROE	To measure enterprise's efficiency to employ capital
Explaining Variable	Corrected LQ	LQ <sub>ij</sub>	Relative indicator or specialization of distribution strength for a sector, industry in a regional economy
	Spatial Gini coefficient	G	Difference in resources distribution for a sector and industry in a regional economy
Control Variable	Enterprise Size	SIZE	Logarithm of ending total assets
	Enterprise Growth	FM	Business income growth rate=( current business income- previous business income)/previous business income
	Enterprise Age	AGE	Year of data source - Year of incorporation
	Innovative Clusters	SD	In the pilot scope, SD=1, or SD= 0

IV. EMPIRICAL ANALYSIS

selected above, and the testing results are hereby given as follows: (See "Table II")

A. Correlation Analysis

The author shall conduct tests on correlations between variables through Pearson correlation index for variables

TABLE II. CORRELATION ANALYSIS TABLE

	ROE	LQ	G	SIZE	FM	AGE	SD
ROE	1						
LQ	0.3064*	1					
G	0.2681*	0.8054*	1				
SIZE	0.0422	-0.019	0.1054	1			
FM	-0.0644	-0.0254	0.0268	0.1210	1		
AGE	0.1373	-0.1049	-0.0330	-0.0637	-0.0508	1	
SD	0.0228	0.3770*	0.5442*	-0.0552	0.0236	0.1521	1

<sup>a</sup> Notes: \*\*\*, \*\*, \* refer to significance at levels as 1%, 5% and 10% respectively

Seen from the correlation analysis table shown above, the corrected LQ (Location Quotient) is 5% positively related to subject to the pilot scope of the innovative industry cluster, indicating that the pilot scope of innovative startup clusters is just the industrial cluster with advantages in competition due to agglomeration. The spatial Gini coefficient is 5% positively related to subject to the pilot scope of the innovative industrial cluster, indicating that the pilot scope of innovative startup clusters is just the industrial cluster with high resources concentration due to resources agglomeration. The ROE (return on equity) is 5% positively correlated with the correct LQ, indicating that it is true that the advantages in competition produced by the industrial agglomeration have brought benefits to enterprises in the cluster, raising the enterprise's financial performance. The ROE is 5% positively correlated with the spatial Gini coefficient, indicating that the advantages in resources produced by industrial resources agglomeration have brought benefits the enterprises in the cluster in finance to some degree, raising the enterprise's financial performance.

B. Multiple Regression Analysis

Based on models that have been created, the author shall conduct a regression analysis through the multiple linear regression analysis method. The model I shall take the corrected LQ as explaining variable, and company size, growth, age and subject to pilot scope in the innovative cluster as control variables so as to explain the correlations between the competitiveness of the industrial cluster and financial performance in the cluster. Model II takes spatial Gini coefficient as explaining variable, and company size,

growth, age, and subject to pilot scope in the innovative cluster as control variables so as to explain the correlations between the resource allocation centralization in an industrial cluster and financial performance in the cluster. Details of the regression results are as follows: (See "Table III")

TABLE III. REGRESSION ANALYSIS TABLE

	ROE	ROE
LQ	6.46***	
	(4.53)	
G		2.14***
		(4.14)
SIZE	0.57	0.07
	(0.77)	(0.10)
FM	-0.01	-0.01
	(-0.62)	(-0.78)
AGE	0.42**	0.38**
	(2.54)	(2.27)
SD	-3.09*	-4.52**
	(-1.74)	(-2.27)
Constant term	-14.99	-3.54
	(-0.90)	(-0.21)
Sample	150	150
R-squared	0.1473	0.1294
F value	4.98	4.28

<sup>a</sup>. Notes: (1) \*\*\*, \*\*, \* refer to significance at levels as 1%, 5% and 10% respectively; (2) What given in brackets are t value

Model I: Seen from the value of correlation coefficient, the correlation coefficient between the corrected LQ and the ROE is 6.46, passing the significance tests, yet the company size and growth fail. Maybe, the enterprises in electrical machinery and equipment manufacturing are still small-sized

and similar in size and development stages. The enterprise age passes the significance tests and it is positively related. Main reasons include: first, the financial performance is really related to its age; second, it is true that when measuring the competitiveness in an industrial clusters, the clusters which are older in longer development and higher in perfection, will be much more competitive.

Model II: Seen from the value of the correlation coefficient, the spatial Gini coefficient and the ROE coefficient are 2.14, passing the significance tests, yet the company size and growth fail. The company's age and ROE coefficient is 0.38, passing the correlation tests. Main reasons are similar to what given in Model I, the industrial clusters with a longer history of development will be sure to own higher resources concentration.

Subject to the scope of industrial clusters and ROE are negatively correlated, passing the significance tests, maybe, the companies in the pilot scope of the innovative clusters are special with lower profits, or the oversized scale has made it difficult for them to meet excessive enterprises through limited resources in the cluster[13].

**C. Robustness Tests**

In order to get a robust conclusion, the explained variable in the article is ROA replacing ROE. And the analysis results indicate: The ROA is positively related with the corrected LQ and spatial Gini coefficient, which is in good robustness as a whole, passing the robustness tests.

TABLE IV. ROBUSTNESS TESTS TABLE

	ROA	ROA
LQ	3.17*** (3.99)	
G		0.95*** (3.29)
SIZE	0.11 (0.26)	-0.12 (-0.27)
FM	-0.01 (-0.45)	-0.01 (-0.59)
AGE	0.20** (2.17)	0.17* (1.88)
SD	0.45 (0.45)	-0.05 (-0.04)
Constant term	-2.37 (-0.26)	3.00 (0.32)
Sample	150	150
R-squared	0.1464	0.1183
F value	4.94	3.87

a. Notes: (1) \*\*\*, \*\*, \* refer to significance at levels as 1%, 5% and 10% respectively; (2) What given in brackets are t value

**V. CONCLUSION AND SUGGESTION**

**A. Conclusion**

Considering the status quo of the electrical machinery and equipment manufacturing developing in China, the author raises a view of positive correlations between industrial agglomeration and financial performance, gives assumptions between competitiveness of industrial clusters

and financial performance on the basis of effect mechanism of industrial clusters on financial performance, as well as the assumption that the resources concentration of industrial clusters and financial performance are positively related, with 30 samples selected from the electrical machinery and equipment manufacturing, the author draws a conclusion as follows:

The stronger the competitiveness of electrical machinery and equipment manufacturing clusters, the easier the enterprises in the cluster will be to get advantages to compete with others through collaboration with member companies in the cluster. It will do good to the enterprises to form an advantageous position in competition and set up brand images, which will help them more effectively provide market with products and services and get higher reputations and more orders, with more profits earned and financial performance. The assumption I proves right.

The higher the resources concentration in the cluster of electrical machinery and equipment manufacturing, the greater the resources can an enterprise get and use. There will be more options to select suppliers, which greatly lower risks and costs needed for materials required for production and operation from outside, achieving higher financial performance in cost saving. The assumption II proves right.

**B. Suggestion**

When analyzing the status quo, an enterprise may take industrial cluster, competitiveness of the same, and concentration of resources allocation as references. First of all, the role of industrial clusters on enterprises cannot be ignored, which shall be considered. Second, it is a new way to analyze the development and financial environment of an enterprise from the industrial clusters in order to analyze the financial performance.

An enterprise is main body of the industrial cluster and foundation for the industrial cluster, and the enterprise in a cluster should make sure of positions of their own and choose a way flexibly to be included in the cluster. The vertical integration of industrial chains will help to improve the specialization of enterprises in the cluster, and the horizontal integration of same will help to promote the integration of those in the cluster. The integration of the scattered can form a scale and strength to some degree in order to enjoy benefits produced by the industrial cluster.

In some cases, the scale of a cluster exceeds what people can expect, for one, in the industrial cluster of electrical machinery and equipment manufacturing in Wenzhou, Zhejiang, there are excessive enterprises in the cluster, the supply of manpower, materials, and financial resources needed and orders attracted by advantages in competitiveness in the cluster are far to meet what needed by a great number of enterprises in the cluster. The crowding effect arises in the industrial clusters, leading to diseconomies in scale and weakening roles of optimizing allocation in the clusters.

Though what mentioned herein have no effect on the conclusion given in the article, yet it has shown a hidden

trouble, showing a bottleneck that an industrial cluster and the enterprises developing inside it may face. Although the impacts of industrial clusters on enterprises are mostly benign, yet there are still many problems during the development. Especially after it has reached a certain size, more and more companies will be attracted to join by its advantages. It is true that the competitiveness and resources concentration in industrial clusters become higher and higher, it cannot be thought that the resources allocation are becoming much more reasonable in the clusters, and the influx of excessive enterprises may dilute existing resources, causing a crowding effect in the industrial clusters and diseconomies in size. So before an enterprise wants to enjoy benefits in the industrial clusters, they have to consider the time and environment to be included, being a member of an industrial cluster with lower agglomeration or giving it up.

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