

Print ISSN: 1738-3110 / Online ISSN 2093-7717  
<http://dx.doi.org/10.15722/jds.13.4.201503.29>

# The Interactive Relationship between Small and Medium-sized Enterprises' Clusters and Regional Economic Growth

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Received: March 09, 2015. Revised: April 12, 2015. Accepted: April 14, 2015.

## Abstract

**Purpose** - This paper aims to explain the interactive relationship between small and medium-sized enterprises' clusters and regional economic growth, with Jiangsu Province as an illustrative example. It focuses on studying the promotional effects, if any, of small and medium-sized enterprises' cluster-development on regional economic growth, and vice-versa.

**Research design, data, and methodology** - Data were collected from the Jiangsu Statistical Yearbook and the China Industrial Economic Statistical Yearbook, by selecting 26 industries as the research subjects. The sample interval selection is 1981–2012. The data were analyzed with the dynamic panel system using stata 12.0.

**Results** - 1) The small and medium-sized enterprises' cluster degree and Jiangsu's economic growth have a long-term stable equilibrium relationship. 2) In the short term, they have a dynamic adjustment 3) The enterprises' cluster degree leads to regional economic growth in Jiangsu, but not vice-versa.

**Conclusions** - Small and medium-sized enterprises' clusters have an important promotional effect on Jiangsu's economic growth, especially industries with high degree of agglomeration. Therefore, the formation of these clusters can significantly improve economic growth.

**Keywords:** Jiangsu, Small and Medium-sized Enterprises Cluster, Economic Growth.

**JEL Classifications:** D80, D90, E00.

## 1. Introduction

A common feature of the relatively developed regions is the

cluster development of small and medium-sized enterprises. With the rapid development of economy, small and medium-sized enterprises is making more and more obvious contribution in promoting national economic development. The characteristics of regional economic development are further reflected in the rise of small and medium-sized enterprises cluster, especially in developed countries. The dynamic interaction of the two attracts much attention by the governments, research institutions and intermediary organizations. Previous studies used to ignore the regional differentiation and did not reflect their own characteristics. It is of great practical significance to use the concept of small and medium-sized enterprises cluster development to guide the regional economic growth. This paper is based on the above principle and makes the interaction between small and medium-sized enterprises clusters and regional economic growth as the research object, while mainly discussing the causal relationship between them, trying to find another important impetus for regional economic development. It helps to guide regional economic development and solve the bottlenecks problem of small and medium-sized enterprise development to some extent.

## 2. Literature review

### 2.1. The concept of small and medium-sized enterprise cluster

Marshall pioneered the study of small and medium-sized enterprises cluster in the external economic theory. He creatively presents the idea of 'Industrial district', in other words, the agglomeration of many small and medium-sized enterprises from the same industry. From the point of his view, this kind of agglomeration can produce regional external economy. Marshall describes external economies of scale (external economies of scale in general sense) in detail in his book "Principles of economics". Through the study Britain's traditional industry cluster, Marshall finds that enterprise agglomeration can lead to economies of scale. Therefore, he thinks the external economies of scale have a higher efficiency of industrial organization, which is why manufacturers are willing to gather in the same area. In

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addition, he also analyzes the deep reason of economies of scale, mainly including raw material, technology economy and mechanical economy.

## 2.2. Research on small and medium-sized enterprise clusters and regional economic growth

Henderson et al. (2000) point out that Geographical location plays an important role in the unbalanced regional economic development. They discuss the reason of industry agglomeration formation, the consequences of getting out of it and other issues mainly from the perspective of economic development and geography based on the empirical research on economic and geographical characteristics of Britain, South Korea and other countries. Norman and Venables (2001) explore the relationship between SMES (small and medium-sized enterprise) cluster policy and the balance of world economic development, as well as the relationship between SMES clusters and global social welfare based on the number and size of global SMES cluster from the perspective of increasing returns of scale. He explains that if the national subsidy rate for small and medium-sized enterprises cluster is too high, there would be more SMSE cluster, but with smaller size.

Domestic scholars have studied relationship between small and medium-sized enterprises clusters and regional economic growth from different angles and with various methods. Main results are as follows: Wang Jici and Gai Wenqi from Peking University provide research on relationship between SMSE cluster and regional development. Na (2013) describes that SMSE cluster is the Geographic agglomeration of related industry. Cluster is bound to have certain effect on the external enterprise, so the enterprises outside the cluster will shift inside and finally can promote regional economic development, form the core competitiveness of the regional development. Studies of Wang Jici are limited to the realm of economic geography, which cannot show the correlation degree from the perspective of internal mechanism, especially the correlation mechanism between them.

## 2.3. Correlation mechanism research on small and medium-sized enterprise clusters and regional economic growth

Smagulova & Mukasheva (2012) use E - G index to measure degree of agglomeration and industrial economic growth, finding out there is obvious positive correlation between them. Seo & Yoon (2014) uses Sichuan province as an example to measure the small and medium-sized enterprises agglomeration degree of various industries and areas by the method of location entropy. Then she study relationship between the small and medium-sized enterprises cluster and the economic growth based on panel data model. The results showed that most areas of Sichuan province is unbalanced and small and medium-sized enterprises clusters promote the growth of the province to some extent. Besides, the regional contribution rate of the areas with high industry concentration degree is significantly higher than other areas. Bo (2013) studied the small and medium-sized en-

terprises cluster degree around the country, finding that there is an obvious linear relationship between small and medium-sized enterprise clusters and economic growth.

From the existing research situation, most studies are focused on small and medium-sized enterprises cluster, technical innovation and characteristics without much attention to the interaction of both. Some studies are about interaction between large companies. So in this paper, it is of great practical significance to make the relationship between small and medium-sized enterprises clusters and regional economic growth as the research object and try to explore the dynamic interaction between the two.

## 3. Empirical Analysis

### 3.1. Measure of small and medium-sized enterprises agglomeration degree

There are many ways to measure cluster's agglomeration degree and early studies tend to use qualitative description. Along with the further research, quantitative measurement of small and medium-sized enterprises clusters has become the focus of many scholars studies and new measures are constantly emerging and developing. Current measurements include industry concentration (CRn), Hector seaman - h fender index, location entropy, Hannah-Kay Index, space gini coefficient and Ellision - Glaeser agglomeration index (EG index).

In this paper, we use EG index to measure small and medium-sized enterprises cluster's agglomeration degree. Because EG index takes the enterprise scale difference and regional difference brought by influence into consideration so as to distinguish the random concentration caused by enterprises, natural advantages and external factors. It can compare the different features of cross-industry, cross-regional and across time, overcoming the defects of other indicators in a better way.

If an economy (nation or region distribute N enterprise in Area M (M contains enterprise economic geographical area). (the economy contains M geographical areas). Calculation of EG index agglomeration degree is as follows:

$$EG = \frac{Gini - (1 - \sum_i L_i^2) H}{(1 - \sum_i L_i^2)(1 - H)}$$

$$= \frac{\sum_{i=1}^N (K_i - L_i)^2 - (1 - \sum_{i=1}^N L_i^2) \sum_{j=1}^M S_j^2}{(1 - \sum_i L_i^2)(1 - \sum_{j=1}^M S_j^2)}$$

In the above formula, M is on behalf of the number of enterprises in the industry; N says the number of geographic regions; Li represents a certain industry's employment proportion of the total employment; while Ki represents area is employment proportion of the total employment; Sj is on behalf of the No. j enterprise's market share.

### 3.2. Model and analysis method

Based on the purpose to study the dynamic correlation between small and medium-sized enterprise clusters and regional economic growth. This paper constructs a VAR model consist of two variables, containing small and medium-sized enterprises agglomeration degree and regional economic growth. VAR is set up by the data's statistical characteristics. In the economy, the variable will be affected by its own lag value and other variables' lag value. it is necessary to transfer the single variable into multivariate in autoregressive mode, namely the VAR model.

Expression of VAR model can be represented as:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + B X_t + \varepsilon_t$$

( $t=1, 2, \dots, L, T$ )

Where  $Y_t$  is a endogenous variables (k-dimensional vector). T is the number of samples. P is the order number of the variable lag.  $X_t$  is a exogenous variable (d-dimensional vector).  $K \times k$  dimensional matrix  $A_1, \dots, A_p$ , and  $k \times d$  dimensional matrix B is the coefficient matrix to be estimated.  $\varepsilon_t$  is assumed to be a normally distributed random shock orthogonal to the right hand side variables. For VAR model, in order to reflect the model's dynamic characteristics completely, p and r are generally required to be big enough. But we should notice that it is not the bigger the better for p, or degrees of freedom model will be lower. So we have to set up a state of equilibrium between them, which can be decided by the principle of AIC and SC.

### 3.3. Empirical Test

#### 3.3.1. Data instructions and Variable set

In this paper, samples are from Jiangsu Statistical Yearbook and China Industrial Economic Statistical Yearbook, selecting 26 industries as the research object. The sample interval selection is 1981-2012. Variables involved in the model are the E - G index of small and medium-sized enterprise agglomeration degree and Jiangsureal gross domestic product. GDP is used to represent real gross domestic product and E - G index shows the agglomeration degree of small and medium-sized enterprise. Logarithm of GDP and EG are LnGDP and LnEG respectively. The first order difference of LnGDP and LnEG are  $\Delta$ LnGDP and  $\Delta$ LnEG respectively while the second order difference is  $\Delta^2$ LnGDP and  $\Delta^2$ LnEG.

#### 3.3.2. Variable's stationary test

##### 3.3.2.1. The stationary test of Variable's time series

A stationary test must be carried out for the time sequence in order to prevent the occurrence of spurious regression phenomenon, so that the model can have the real explanation for the causal relationship between the dependent variable and independent variables. We use the unit root test in this paper and the result is in the following table:

<Table 1> Unit root test for LnEG, LnGDP

Variable	ADF	( 1% )	Terms of inspection ( c,t,k )	Result
LnGDP	-2.01	-3.22	( C , T , 1 )	Not smooth
LnEG	-2.21	-3.41	( C , T , 1 )	Not smooth
$\Delta$ LnGDP	-3.36	-3.66	( C , T , 1 )	Not smooth
$\Delta$ LnEG	-3.53	-3.15	( C , T , 1 )	smooth
$\Delta^2$ LnGDP	-4.79	-4.22	( C , T , 0 )	smooth
$\Delta^2$ LnEG	-7.16	-4.45	( C , T , 0 )	smooth

Note:c in the table represents the constant term, t is the trend term, k is the lag order number.

Cointegration test can only be taken when the time series is stationary. It can be seen from the table above that LnEG is first-order difference stationary, while LnGDP's first-order difference is non-stationary. However, both of them are stationary in the form of second order difference. That is, the above sequences are both second order, so co-integration test can be further performed.

##### 3.3.2.2. Cointegration test

This method is mean to test whether there is a long-term stable relationship between LnEG, LnGDP. Johanson maximum likelihood method is used to examine the co-integration relationship between LnEG and LnGDP in this paper. Results are in the following table (under the 5% significant level) :

<Table 2> Cointegration test for LnEG, LnGDP

Variable	Eigen value	The trace statistic	Results	Cointegration equation
LnGDP	0.2668	10.211 ( 13.41 )	one	LnGDP= 0.7712LnEG+3.5512
LnEG	0.1255	2.6098 ( 3.86 )		( 0.007 ) Likelihood ratio : 56.24

It can be seen from the above table that there is the only co-integration relationship between Jiangsu GDP and small and medium-sized enterprise clusters. The two variables have long-term and stable relationship, and has the same stochastic volatility trend, with the same direction change.

The equation's regression result shows that the long-term elasticity coefficient of small and medium-sized enterprises cluster's degree is 0.7712which means economic growth will increase by 0.7712% as Small and medium-sized enterprises cluster degree increase by1%. We can have further conclusion that in the long run, small and medium-sized enterprises cluster degree and economic growth share a stable positive correlation.

##### 3.3.2.3. Error correction model

Cointegration test tells us that a long-term stable relationship is existed between small and medium-sized enterprise cluster agglomeration degree and regional economic growth. However,

the stable relationship cannot be influenced by outside effect, or the long-term equilibrium may be destroyed. As a result, a short-term dynamic model is needed to set up.

Error correction model can explain the long-term equilibrium relations between small and medium-sized enterprise cluster agglomeration degree and regional economic growth as well as modifying the short deviate from the long-term equilibrium. In this paper, we explore the short-term volatility of the two variables through the establishment of error correction model. Error correction model results are as follows:

$$\Delta^2 \text{LnGDP} = 0.0369 + 0.7021 \Delta^2 \text{LnEG} - 0.33 \text{et} - 2$$

$$R^2 = 0.9623 \quad DW = 1.8921$$

It shows that the model fits well and there is no serial correlation. In the short term, the current regional economic growth has a increase of 0.7021% as small enterprise cluster agglomeration degree grows by 1%. In the long term, co-integration relationship plays an important role in pulling the balance adjustment towards the equilibrium state. The correction coefficient can illustrate the adjustments degree of non-equilibrium state. If the short term state deviates from the long term state, it will adjust by 0.331 to the equilibrium. In addition, it is concluded that error correction coefficient is negative, which means the correction mechanism adjust reversely.

3.3.2.4. Granger causality test of the VAR model

It can be concluded from the co-integration test and error correction model that small and medium-sized enterprise cluster agglomeration degree and regional economic growth has a stable relationship in the long term but there is no insurance of their causal relationship.

This paper uses the method of Granger causality test to verify the causal relationship and get lag period 1 from the residual analysis. Test results is in the below table:

<Table 3> Granger causality test for LnEG, LnGDP

The null hypothesis	F Statistic	P Values	Results
LnEG is not the cause of LnGDP	14.17	0.001	reject
LnGDP is not the cause of LnEG	0.0192	0.8569	accept

Conclusion: At the 5% significant level, small and medium-sized enterprise clusters agglomeration degree and regional economic growth has one-way granger causality. That is to say, small and medium-sized enterprises cluster development is conducive to regional economic growth. Regional economic growth is not the granger reason of small and medium-sized enterprises cluster agglomeration degree. There may be other factors.

4. Conclusions and Suggestions

4.1. Conclusions

Cointegration test results show that the small and medium-sized enterprises cluster degree and Jiangsu economic growth has a long-term stable equilibrium relationship. The co-integration relationship coefficient is positive which means 1% increase of small and medium-sized enterprises cluster degree will boost 0.7772% increase of Jiangsu economic growth.

Error correction model shows that in the short term, small and medium-sized enterprises cluster degree and Jiangsu economic growth have a dynamic adjustment mechanism: every 1% growth of small and medium-sized enterprise cluster degree will bring 0.697% increase in economic growth. It is smaller than long-term changes in the equilibrium level. At the same time, we can conclude that the magnitude of adjustment for the unbalanced state is 33.1%. In the short term, there is a lag of cluster's promoting effect for Jiangsu economic growth.

Granger causality test's results show that small and medium-sized enterprises cluster degree is the cause of the regional economic growth in Jiangsu, suggesting that increase of small and medium-sized enterprises cluster degree will promote Jiangsu's regional economic growth. But Jiangsu's regional economic growth is not the cause of the small and medium-sized enterprise clusters, namely economic growth will not necessarily increase industry concentration degree.

4.2. Suggestions

Through the empirical analysis, we know that small and medium-sized enterprises cluster has an important promoting effect on economic growth in Jiangsuprovince, especially industries with high degree of agglomeration. So Jiangsu's economic growth can be improved by the formation of small and medium-sized enterprise clusters. This paper puts forward the following policy suggestions in view of the reality in Jiangsu province:

4.2.1. Vigorously develop the regional economy, form the cluster centers in the region

The leading rise of the Sunan region shows that of high performance of economic growth is due to high concentration. Only to encourage the advanced spirit, cultivate small and medium-sized enterprise clusters, form its regional characteristics and insist on a new road to industrialization, can we form the regional core competitiveness and promote regional economic development. So it is necessary to seize the major opportunities such as global economy's moderate recovery and current government's economic reform, actively undertaking the international and domestic advanced transfer, improving the industrial chain based on Jiangsu industry development orientation and high-tech industrial park. Encourage and guide enterprises'restructuring and mergers. Cooperate with international strategic investors

with strategic alliances, give high quality resources priority into the key leading enterprise, so as to make the leading enterprises bigger and stronger and taking full advantage of leading enterprises' economic of scale. Guide the combination of relevant enterprises, promote the formation of industrial clusters, form the features of the region, attracting high quality resources into the region, so as to promote the development of local economy.

#### 4.2.2. Vigorously develop small and medium-sized enterprise clusters, promote regional economic growth

Develop small and medium-sized enterprises cluster according to the specific regional characteristics and resource advantages. Actively guide the regional development according to the different characteristics of small and medium-sized enterprises clusters there. Never make any simple administrative combination just for following the trends, or resources cannot be allocated effectively, having the opposite effect on economic growth. The government should guide the combination of enterprises, universities, research institutions and social intermediary organization and take advantage of their functions respectively, form resultant force, promote economic growth.

#### 4.2.3. The government should play its role to create favorable agglomeration conditions

Small and medium-sized enterprises clusters cannot develop without government's effective policy guidance. The government's appropriate policy will greatly promote the development of small and medium-sized enterprises in Jiangsu and increase the speed and quality of its economic growth.

Government at all levels shall formulate the development focus, clear strategic planning and guide regional industrial agglomeration development. Make plan of small and medium-sized enterprises cluster according to the main distribution of the area. Ensure the implementation of the strategy of small and medium-sized enterprises cluster through the coordination between city and county. Give full play to the role of government and market, actively cultivate and develop industrial clusters, so as to improve the comprehensive competitiveness of the city through implement the strategy of industrial cluster. In addition, it is required that government should make relative industrial policy to actively guide the direction and quality of small and medium-sized enterprises clusters.

#### 4.2.4. Establish and perfect the intermediary service institutions

At present, one of the main reasons for restricting the development of industrial cluster in Jiangsu is the imperfect matching intermediary organizations. The existing intermediary organization is small in size and obviously lack of professional knowledge and skills. So it is necessary to explore operation mode of intermediary service agencies within the regional scope. All kinds of intermediary service agencies are encouraged to establish in

the regional scale. Create a good environment for intermediary institutions to clear thought. It is suggested the relevant administrative departments conduct a comprehensive analysis for regional intermediary agencies. As a result, the development and planning of intermediary institutions and planning can get the corresponding policy support.

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