

The Spatial Distribution Characteristics of IT Enterprises in Shanghai Caohejing Hi-Tech Park: Take the 24 Buildings as Example

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Abstract: Due to the increasing returns to scale and the external economic effect, the industrial cluster, as a kind of geographical phenomenon in the process of industrial development, is the inevitable product of the process of economic development in the world. This paper selects 24 buildings in Caohejing Hi-Tech Park(CHJ, Shanghai, China) as a sample. Using the Gini coefficient method, from the three dimensions of 976 companies in the 24 buildings—industry types, company types, labor types, we found that the electronic information industry cluster in CHJ region has been initially apparent. Electronic information manufacturing industry (two digit industries such as C39) and its supporting services (such as the three digit industry F517, L721 etc.) has begun to take shape; and the corresponding industry talent reserves have also been able to support the electronic information industry chain of CHJ region of operation; private and foreign-funded enterprises have very strong economic vitality and thus the strong momentum of development CHJ areas; the quantity of SOE is not much but is strength.

Keywords: IT Enterprises, GINI Coefficient, Spatial Distribution, Industrial Agglomeration

1. Introduction

CHJ is located in the southwest of Shanghai, bounded by Guilin Road (East), Xin Jing Hong (West), Caobao Road (South) and Puhuitang (North), whose planning area is about 14.28 square kilometers. There are more than 2500 China-invested and overseas-funded high-tech enterprises in CHJ, of which 500 were set up by the world's top 126. By 2014, its annual sales revenue is up to 285.2 billion, of which the service sector contributing 190.8 billion; Gross Regional Product (GDP) is about 97 billion, 78.5 billion of industrial output, total imports and exports 12 billion U.S. dollars; all the given data proves CHJ one of the top development zone in the nationwide.

As an integrant phenomenon in its process of industry evolution, industrial agglomeration has obvious regionality. A successful agglomeration in electronic information industry will set a good example in the development of the high-tech industry [1, 2], even of the national economy.

Economic geography, new economic geography and institutional factors will produce obvious impact toward industrial agglomeration [2]. Shanghai possesses all the

factors above—developed infrastructure, huge amounts of enterprises, excellent human resources, advanced opening and reasonable local protection.

On the basis of Jiang-yong LU and Zhi-gang TAO [3], An-bo WU and Lin-yan SUN found that industries with high degree of agglomeration will have a high level of technique intensity, low profit margin and big non-SOE proportion, which are the main characteristics of CHJ.

This study selects 976 companies in 24 independent buildings of CHJ as the sample. We then analyze the spatial distribution characteristics of IT enterprises in CHJ from three dimensions—industry types, labor types and business forms, applying the Spatial Gini Coefficient.

2. The Calculation of the Spatial Gini Coefficient and Its Judgment Criterion of Agglomeration Degree

2.1. The Calculation of the Spatial Gini Coefficient

The Spatial Gini Coefficient measures the degree of spatial agglomeration, which was put forward by Krugman in 1991.

The expression of the Spatial Gini Coefficient is:

$$G_k = \sum_{i=1}^n \frac{|X_i - X|}{[\sum_{i=1}^n X_i + (n-2)X]}$$

Where G_k is the Spatial Gini Coefficient, k is a certain category—industry types, labor types and business forms; X_i is the amount of certain type of enterprises in building i ; X is the density of certain type of enterprises; n is the amount of buildings in our sample.

2.2. The Judgment Criterion of Agglomeration Degree

According to the United Nations, we rate the Spatial Gini Coefficient into six grades, and we set a threshold value (0.382) in judging with whether it was agglomerating obviously.

$G_k < 0.2$: Grade 1 (G1), uniform distribution, no agglomeration;

$0.2 \leq G_k < 0.3$: Grade 2 (G2), relative uniform distribution, slight agglomeration;

$0.3 \leq G_k < 0.382$: Grade 3-(G3-), relatively uneven distribution, unobvious agglomeration;

$0.382 \leq G_k < 0.4$: Grade 3+(G3+), relatively uneven distribution, obvious tending agglomeration;

$0.4 \leq G_k < 0.5$: Grade 4 (G4), uneven distribution, obvious agglomeration;

$G_k \geq 0.5$: Grade 5 (G5), extremely uneven distribution and super agglomeration.

3. The Spatial Distribution Characteristics of IT Enterprises in the 24 Sample Buildings in CHJ

3.1. One-Digit Industry Perspective

Based on the <National Economy Industry Classification Standard> and the main business of 976 enterprises in CHJ, certain classifications are made as followed.

As one-digit-industry statistics showed, the five industries with the most amount of companies—Wholesale and Retail Trade (F), Manufacturing Industry (C), Software and Information Technology Services (I), Scientific Research and Technical Services (M), Leasing and Business Services (L)—occupy 86.17% of all the samples. Taking Building Industry (E) and Financial Industry (F) into consideration, we get:

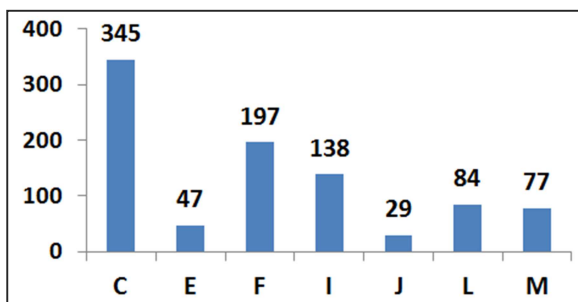


Fig. 1. The amounts of companies in the seven industries in CHJ.

Then we use the one-digit-industry data above to calculate our Spatial Gini Coefficient.

Table 1. The Gini coefficients of one-digit industries.

| Industry Code | C | E | F | I | J | L | M |
|---------------|--------|--------|--------|--------|--------|--------|--------|
| GINI | 0.5525 | 0.3378 | 0.5053 | 0.5115 | 0.3261 | 0.5248 | 0.4670 |
| Grade | G5 | G3- | G5 | G5 | G3- | G5 | G4 |

It's easy to get agglomerating degree series by ranking the values in the table: $C > L > I > F > M > E > J$.

3.2. Two-Digit Industry Perspective

In the same way, we can gain our coefficients of all the two-digit industries.

Table 2. The Gini coefficients of two-digit industries.

| Industry Name | Industry Code | GINI | Grade |
|---|---------------|--------|-------|
| Textile Industry | C17 | 0.2250 | G2 |
| Chemical Raw Materials and Chemical Products Manufacturing | C26 | 0.3194 | G3- |
| Rubber and Plastic Products | C29 | 0.1827 | G1 |
| General Equipment Manufacturing Industry | C34 | 0.3856 | G3+ |
| Special Equipment Manufacturing Industry | C35 | 0.4358 | G4 |
| Automobile Industry | C36 | 0.1917 | G1 |
| Electrical Machinery and Equipment Manufacturing | C38 | 0.4684 | G4 |
| Computers, Communications and other Electronic Equipment Manufacturing Industry | C39 | 0.5069 | G5 |
| Instrument Manufacturing | C40 | 0.2948 | G2 |
| Housing Industry | E47 | 0.1389 | G1 |
| Civil Engineering Construction | E48 | 0.2500 | G2 |
| Construction and Installation | E49 | 0.1927 | G1 |
| Building Decoration and other Construction | E50 | 0.3109 | G3- |
| Wholesale Business | F51 | 0.5042 | G5 |
| Retailing | F52 | 0.1732 | G1 |
| Telecommunications, Broadcasting and TV Transmission and Satellite Services | I63 | 0.1417 | G1 |
| The Internet and Related Services | I64 | 0.3750 | G3- |
| Software and Information Technology Services | I65 | 0.4748 | G4 |
| Monetary and Financial Services | J66 | 0.1065 | G1 |
| Capital Markets Services | J67 | 0.3657 | G3- |
| Business Services | L72 | 0.5296 | G5 |
| Research and Experimental Development | M73 | 0.2837 | G2 |
| Special Technical Services | M74 | 0.4132 | G4 |
| Science and Technology Popularization and Application Services | M75 | 0.3826 | G3+ |

3.3. Three-Digit Industry Perspective

Similarly, we get some weighted three-digit-industry coefficients:

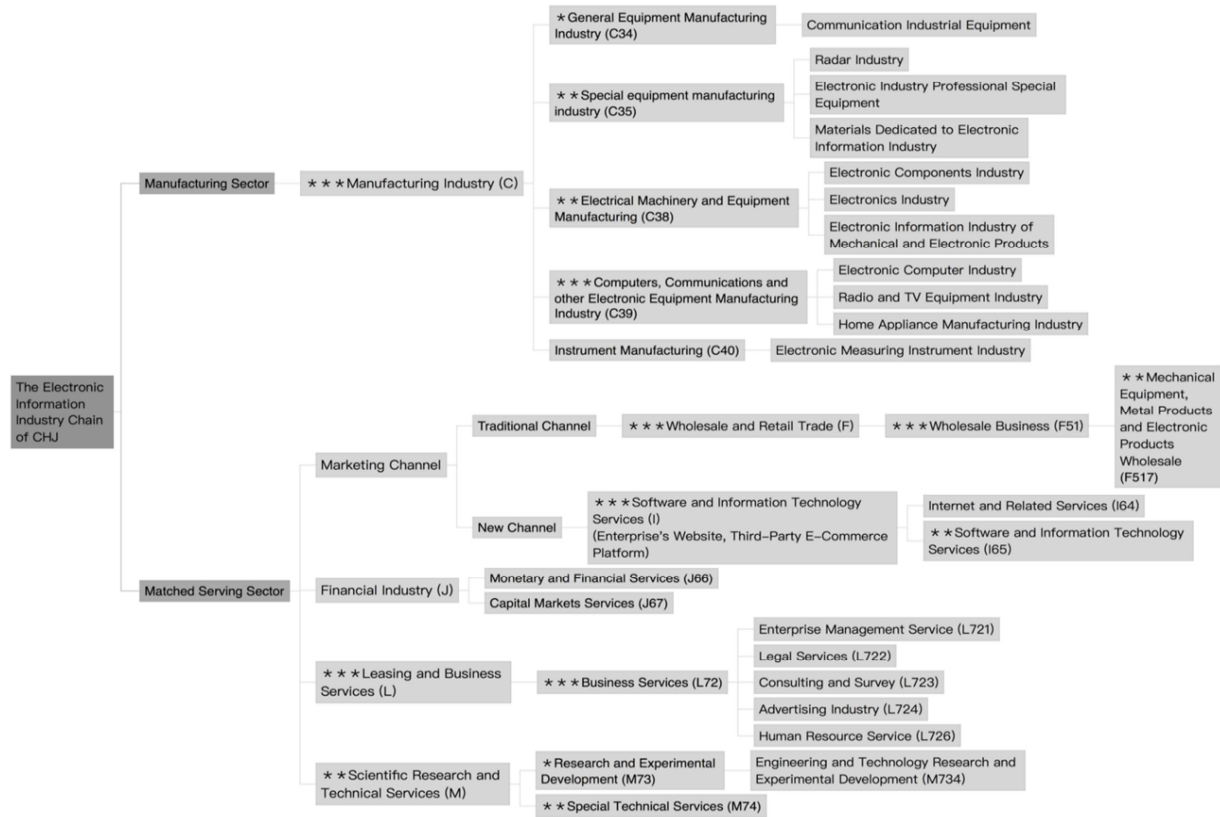
Table 3. The Gini coefficients of three-digit industries.

| Industry Code | F517 | L721 | M732 |
|---------------|--------|--------|--------|
| GINI | 0.4190 | 0.3750 | 0.2344 |
| Grade | G4 | G3- | G2 |

Till now, we conclude that the electronic information

industry chain has been established, mainly in collaboration with C39, I65, F517, L721 and M732. However, there still exists a broad development space for CHJ's R&D ability.

Referring to < Electronic information industry classification annotations (2005-2006) >, let's portray an integrated electronic information industry chain:

**Fig. 2.** The Electronic industrial chain in CHJ.

Added Symbol * represents higher degree of agglomeration.

3.4. Careers Style Perspective

Referring to the <Classification of the People's Republic of China>, especially the definitions and the characteristics of all the BigClassNames in that reference, we also made some statistics.

Same with the calculation of the Spatial Gini Coefficient in the perspective of different-digit industries, we compute that coefficient with all aspects of careers.

Table 4. The Gini coefficients of different occupations.

| Career Types | Professional and Technical Personnel | Social Production and Life Service Personnel | Manufacturing and Related Personnel |
|--------------|--------------------------------------|--|-------------------------------------|
| GINI | 0.5899 | 0.5105 | 0.5446 |
| Grade | G5 | G5 | G5 |

3.5. Business Forms Perspective

According to Chinese <Companies Law of the People's Republic of China>, <The Law of the PRC on

Chinese-Foreign Equity Joint Ventures>, we classify all the companies into three types—SOE, Joint Ventures and Private Enterprises.

Further, we explore the distributions of different types of companies in all the sample buildings.

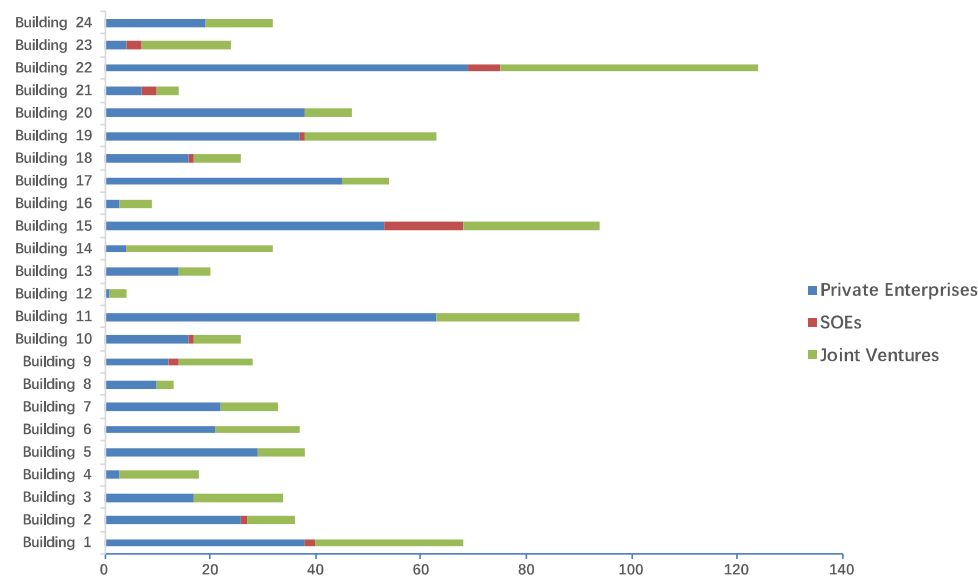
Private enterprises and joint ventures are distributed in almost every sample building, and they occupy the majority room. On the contrary, SOEs are few and far between and are mainly distributed in few buildings.

Then we calculate our Spatial Gini Coefficients.

Table 5. The Gini coefficients of three types of companies.

| Type of Enterprises | Private Enterprises | SOEs | Joint Ventures |
|---------------------|---------------------|--------|----------------|
| GINI | 0.5616 | 0.2060 | 0.6359 |
| Grade | 5 | 2 | 5 |

SOEs are uniformly distributed and show a slight agglomeration. However, private enterprises and joint ventures are extremely uneven distribution and show a super agglomeration. The amount and the distribution of private enterprises and joint ventures show that CHJ has a powerful economic vitality, a strong developing momentum and a high degree of opening.



4. Conclusion

In conclusion, CHJ has established an integrated industrial cluster chain with pillar industries, key industries and supporting industries, and that chain has a potential of continuously booming development.

The electronic information industry chain, the pillar of CHJ, is composed of two sectors—manufacturing sector and its matched serving sector. The manufacturing sector is mainly concentrated in PC, integrated circuit, electronics and communications equipment, etc. And the matched serving sector is referring to software and IT services, e-commerce platform, capital market services, business services, research and service outsourcing, etc.

However, our data also describe a possibility of further development.

Professional and Technical Personnel, Social Production and Life Service Personnel and Manufacturing and Related Personnel have become the mainstays of the chain. Meanwhile, high value-added modern service talents are beginning to take shape. And our data show a fact that CHJ has a big potential of the top talents’ agglomeration.

Private Enterprises and Joint Ventures have a huge developing momentum and they drive the development of CHJ powerfully. SOEs are relatively rare and dispersive, but are very strong. It’s unadvisable to set a fixed model for the three business forms. A negative list as the Shanghai Free Trade Zone carried out may help CHJ to reach a more effective market.

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