



XII Seminario Latino-Iberoamericano de Gestión Tecnológica - ALTEC 2007

China : the Long March to Logistic Cyberspace

Cavalcanti, Marly

Universidade Metodista de Sao Paulo – Brasil

Cavalcanti.marly@gmail.com

Fúlvio, Cristófoli

Universidade Metodista de Sao Paulo – Brasil

fulviocristfoli@uol.com.br

Farah, Osvaldo Elias

Centro Universitário Nove de Julho

oefarah@terra.com.br

Abstract

Recent articles have been describing China as the “new workshop of the world”. Whether China is the world's “factory” or “workshop” does not matter; the important is that China is now serving as the world's manufacturing basis. Immediate reasons point to large, cheap labor force, but China's current economic success is certainly more complex than that. These conditions range from more calculated planning to more practical reform strategy. Opening up to the world brought in not only foreign capital but foreign experiences. China has learned the benefits of local economic development through industrial clustering and the cluster formation.

Key-Words: China; Globalization; Clusters

1.Introduction

Currently considered as the largest market in the world, China, with its 1.3 billion potential consumers (25 percent of them living in the cities), has a growing GDP that places the country as the seventh in the world – between 7 percent and 8 percent, surpassing Spain, Canada and Brazil. Since 1978, China has managed to keep its inflation rate at a single digit, and reduce poverty from 28 percent to less than 10 percent. According to the World Bank, China is predicted to become the world's top economic power in 2020, representing around 40 percent of the world's production. One factor for China's successful rapid growth is a carefully laid down gradual process of economic reform strategy (Lardy 1998, p.1). Towards 1990s, economic reform had extended from urban to rural areas. This strategy encouraged the development of private economy, integrated domestic market with foreign market through an open-door policy, and promoted economic development of interior regions through development of the coastal areas (Wu 1996).

Another factor is the large amounts of foreign investments, which are significant contributors to the formation of industrial clusters throughout China (Jiang 2003, p.16). Industrial clusters in China are mainly concentrated along the coastal region. Among these, the most outstanding are those that are located within the systems of the Pearl River Delta, the Yangtze River Delta, and the Bohai Bay Rim. Chinese clusters are either labor or technology intensive ¹. While foreign investments are a key motive force, the formation of these clusters is also stimulated by increase in rural agricultural business, scientific and technological endeavors, and expansion of state-owned enterprises (Wang 2003).

2. Globalization is imperative in local development of emerging economies

One of the more effective strategies that allow local enterprises to compete with big enterprises of national or global performance is to focus business in the service of specific segments of the regional market in which they are localized (Bassi, 2000). We can therefore analyze China's regions from their inclusion into a matrix of local competitiveness, in which one of the axes refers to the critical factors of success or failure of local strategies and the horizontal axis verifies the tendencies of these same critical factors through time.

Local external economies are in the core of discussion about “clusters,” because they are the ones that determine the very existence of the agglomeration by providing reduced costs for agglomerated enterprises. They are also called the Marshallian external economies, and include the advantages resulting from: (1) the existence of a dense local market of specialized labor; (2) easy access to the suppliers of primary materials, components, specialized resources and services, and often, also machines and equipments; and (3) the greater local dissemination of specialized skills that allow rapid processes of learning, creativity and innovation ².

1 According to Chinese Academy of Social Sciences researcher Wei Houkai, foreign investment in the country is transferring and expanding from southern China's Pearl River Delta to the Yangtze River Delta and the Bohai Bay Rim in East and North China, showing a trend of "moving northward" since China's entry into the World Trade Organization (WTO) in 2001.

2 -This can add to the external economies of the regions which are the result of joint and deliberated actions of the local enterprises and institutions such as, for example, the buying of primary materials, the promotion of management capability and professional development resources, the creation of export consortiums, the contracting of specialized services, the institution of collective technological centers, and credit cooperatives. From this sum shall result a collective efficiency that, in principle, determines the sustainable advantage, the social support for local institutions and the incentive for entrepreneurship.

However, adding to this the necessary form of organization and coordination of regional enterprises in similar or related activities which influence the formation and evolution of local productive systems (LPS).

A. Definition of cluster or Local Productive Systems (LPS)

A cluster or LPS is characterized by a geographic agglomeration of a large number of enterprises of varied sizes, a significant presence of small enterprises that are not vertically integrated, producers of the same type of product (or similar products) and their suppliers and service providers.

A majority of the clusters originates from a remote past, from an event or “historic accident” that determines the localization of a particular productive activity in that region. In the cases of shoe and furniture industries, practically all of the agglomerations emerged this way. However, there are cases in which the formation of a cluster in turn offers a source of created externalities, for example educational and research institutions for public policies. This is the case of the agglomeration of companies producing telecommunication and informatics equipments in which the establishment of research centers in the telecommunication and informatics area is fundamental to the fostering of local capabilities..

However, the development of a cluster can be redirected towards an event that generates a split in its trajectory direction. This event can be a change in technology or a new form of industrial organization and new risks.

B. China's unpredictable future in 2010

Operating risks

Limited operating history makes it difficult to ensure internal or external targets will be met; Unproven business model puts revenues at risk; Ability to build, retain and manage relationships with content providers; Ability to attract and retain qualified management and employees; Potential fluctuations in exchange rates of Chinese, U.S., Taiwanese markets, etc; Access to funding when necessary for investment into growth or operations.

Market risks

Acceptance of the Internet as an advertising medium compared with traditional media; Ability to attract partners versus competitors; Ability to build sufficient network of users to attract advertisers; Dependence on a small number of advertisers that can cancel contracts on short notice; Increasing awareness of a customer loyalty; Customers' concerns about security, reliability, and cost of China Development of means of payment by customers inexperienced with credit cards; Ability to introduce new offerings both to attract new and retain existing customers, in cyberspace.

Competitive risks

Competitive pressures from new entrants in market with low barriers to entry; Entry into China of large, well-capitalized companies; Inability to match competitors' new products and services offerings in a timely fashion.

Technology risks

Ability to upgrade technology to support increased traffic and expanded services; Continued development of telecommunications infrastructure by China's government; Lack of access to alternative networks in case of disruption of ChinaNet Potential need to register encryption software with Chinese authorities and develop a new software.

Legal and regulatory risks

Potential content restrictions and regulations by Chinese government agencies; Lack of clarity about the legality of current and future foreign investment in China; Risks surrounding organizational structure separating out Chinese subsidiary to circumvent restrictions on foreign direct investment; Access to approval for foreign exchange; Uncertain legal environment surrounding privacy, pricing, content, copyrights, antitrust, etc; Inability to protect intellectual property within the Chinese legal system.

C. Taxonomy of production systems

Using Storper and Harrison's taxonomy of production systems, one may deduce that China's regional production systems are a combination of two types: all ring-no core, and core-ring with lead firm. It takes on the features of an all ring-no core system in that the production systems existing in each region are not necessarily competitive or carry a hierarchic relationship between systems. At the same time, it carries a core-ring with lead firm feature in that although individual systems are asymmetric, they do need to follow strictly the regulations of the government institution, which in this case takes the role of a lead firm.

3. Methodological Procedures

In the attempt to seek a common denominator for the various information contained in the survey or to encapsulate the observed characteristics into a complete indicator, we applied factorial analysis as our methodological guide and we obtained the factors that allow the recording of the dynamics of environmental changes. We materialized our research from secondary data available from the different economic regions in China with the view to design strategic "clusters" (Porter 1999, p. 211).

Due to the great disparity between the variables used in the area of performance of the regions, we verified that only one factorial analysis, with all the variables, could provide one solution of which factors are difficult to interpret and thus it makes it difficult to serve business competitiveness. We thus suggest the formation of homogeneous groups of variables, drawing independent or orthogonal factors from each. We use the method of Principal Component Analysis (PCA), and the criteria of Varimax rotation to obtain the easily interpretable factors.

Factors with greater expression were considered in each group (with a maximum of two factors), reaching a total of nine factors, all of which are interpretable.

Factorial Analysis was applied to each of these groups, drawing a maximum of two factors. PCA method with Varimax rotation and matrix of correlation (standardized data) were used. This procedure allows a high degree of flexibility:

- Seven methods of factor extraction;
- Five methods of rotation;

- Three methods of computing factor scores.

This procedure also allows the researcher to specify the method of factor extraction, principal components, unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, alpha factoring, and image factoring.

4. Exploring industrial clusters in China – A preliminary analysis

Models of local productive systems in China are Hebei's (Hu 2004) metal and steel industry, Fujian's shoe industry, Sichuan's motorcycle manufacturing, Henan's knitting industry, Guangdong's telecommunications industry, and various other examples of textile and medical industries (Wang 2003). More recent successful stories are the electronic industry in Dongguan, Guangdong; high-tech industrial clusters in Suzhou; the integrated circuit industry in Shanghai; and the Xingwang industrial cluster in Beijing (Jiang 2003).

Chinese industrial clusters are concentrated in the different provinces of the country's five economic zones – the Bohai Rim economic zone, the Yangtze Delta economic zone, the South China economic zone, the Central economic zone, and the Western economic zone. The most developed regions, however, are those along the coastal region – the Bohai Bay Rim (BHR), the Yangtze River Delta (YRD), and the Pearl River Delta (PRD).

Factors that contribute to these regions' rapid economic development include a combination of pragmatic economic policies, a willing market, China's entry to the WTO, and most especially the abundant supply of foreign direct investment that pours in by billions of dollars every year. One resulting phenomenon is the formation of large manufacturing systems in these regions that are quite unique in the world (Sigurdson 2004). They are so deeply integrated into a network of a highly globalized supply chain that China itself has indeed become the new workshop or factory of the world (Heath 2004), and thus a very vital member of the world's economy.

A. The Pearl River Delta

The Pearl River Delta is mainly the Guangdong Province and its 14 cities and counties Guangzhou, Shenzhen, Zhuhai, Foshan, Jiangmen, Dongguan, Zhongshan, Huizhou, Zhaoqing, Gaoyao, Sihui, Huiyang county, Huidong county, and Poluo county. This region is the China's traditional manufacturing basis, and has been leading the country's economic growth over the past two decades. This tradition is mainly because of the large capital that flows in from its immediate neighbors, Hong Kong and Macau.

It has unique geographical advantage thanks to its adjacency to Hong Kong and Macao. The scheme of building a free trade zone between Pearl Delta Region and Hong Kong is under way which will exert an enormous economic impact on this region once it is passed. It is a famous overseas Chinese hometown which makes it easy to attract the investment from overseas Chinese. The two Special Economic Zones will lead and influence the surrounding area. The unique climatic resource provides convenience for the development of tropic agriculture and tourism.

The PRD boasts a series of superlatives not just locally. It is the world's largest manufacturing complex; the most effective “just in time” global supply chain management; and possesses the largest market for industrial goods and technologies, and the wealthiest market for consumer products.

Before China's economic reforms of the 1980s, the province of Guangdong was no more than a small hub for Hong Kong and Macau's agricultural demands. Geographically far from China's industrial centers in the Northeastern and Eastern regions and lacking of efficient transportation links and natural resources, Guangdong was far from the country's list of top economic priorities in the 1950s, 1960s, and 1970s (Enright 2003).

This soon changed when China launched its economic reforms and “open door” policy in 1978. Three of Guangdong's cities – Shenzhen, Zhuhai and Shantou – were designated Special Economic Zones, and enjoyed greater political and economic autonomy. This gave Hong Kong's large manufacturing force a welcome alternative to the territory's diminishing labor supply and increasing labor costs (ACCCI 2002). Within five years, PRD's GDP increased 250 percent from 12 billion yuan in 1980 to 30 billion yuan in 1985 (Enright 2003). Today, the region's GDP registers over 1.3 trillion yuan (HKTDC 2004).

For the first ten years of China's economic reform process, the internationalization of the Chinese economy was largely a Pearl River Delta phenomenon, with the export-oriented production of foreign-invested entities based in Shenzhen, Dongguan, and Guangzhou leading the way. In recent years, the development environment for indigenous private-owned enterprises has improved dramatically in the Pearl River Delta Economic Zone and local firms are now playing an ever-growing role in the region's economy. In this regard, Shenzhen, Dongguan, Foshan and other parts of the Pearl River Delta Economic Zone have been at the forefront of private sector development in China.

With foreign direct investment mainly from Hong Kong and Taiwan, the region's manufacturing industries developed rapidly and dramatically changed the region's industrial feature.

The Pearl River Delta Economic Zone has become the world's workshop and is a major manufacturing base for products such as electronics products (such as watches and clocks), toys, garments, and textiles, plastic products, and a range of other goods. Much of this output is invested by foreign entities and is geared for the export market. The Pearl River Delta Economic Zone accounts for approximately one third of Mainland China's trade value.

Private-owned enterprises have developed quickly in the Pearl River Delta Economic Zone and are playing an ever-growing role in the region's economy, particularly after year 2000 when the development environment for private-owned enterprises has been greatly relaxed.

Nearly five percent of the world's goods were produced in the Greater Pearl River Delta in 2001, with a total export value of US\$ 289 billion. Over 50,000 Hong Kong companies have plants there, according to a 2002 survey.

PRD's light manufacturing industry accounts for the region's overall industrial output. Its products include household electrical appliances such as television sets, electric fans and refrigerators and consumer products such as garments, bicycles, toys, shoes and electronics. Guangdong, however, is markedly shifting its industries towards high technological products with electronics and telecommunications now accounting for 20 percent of the region's total industrial output (HKTDC 2004).

Conditions favoring this shift in the PRD's industries include industrial agglomeration, growth of local private enterprises, improved infrastructure, and an expanding consumer market (Kwan 2003).

B. The Bohai Bay Rim

The region that makes up the Bohai Bay Rim economic zone is constituted by the provinces that surround Beijing – Liaoning, Tianjin, Hebei, and Shandong – and represented by the cities Beijing, Qingdao, Yantai, Dalian and other major cities in the area.

It is an important passage connecting China with other countries in Northeastern Asia such as Japan and South Korea, etc. provided with the advantage of port cities of Tianjin, Dalian, Yantai, Weihai and Qinhuangdao. It is a solid hi-tech industrial development base with the number of its scientific research institutions, education organizations and talented persons ranked top of the whole country. It has some advantages in the aspects of information, policies and culture owing to Beijing, the capital of China, included in its scope.

Bohai-Rim Economic Circle, one of China's largest industrial area, has become an engine for economic development in

North China, and its economic growth has drawn the attention of the world. The circle boasts of its several thousands of large and medium-sized enterprises, and more than 60 large or small ports and 20 big cities along its 5,800-kilometer-long coastline.

Unlike the coastal regions Pearl River Delta and the Yangtze River Delta, the Bohai Rim is China's traditional base for heavy industries. Although the region's dependence on foreign capital is still comparatively low, foreign companies of large scale manufacturing like Sony, Mitsubishi, LG, Volkswagen and others have founded manufacturing bases in the region³.

Competitiveness of the Bohai Rim matches that of the Yangtze River Delta equally. While the Bohai Rim takes 22.5 percent of China's GDP, Yangtze River Delta claims 19.3 percent. The industrial output of the Bohai Rim is a little bit less than that of the Yangtze River Delta. The population of the Bohai Rim however is roughly twice that of the Yangtze River Delta. The latter is therefore more economically dominant in per capita terms than the other (. 1999).

Factors contributing to this trend include availability of different kinds of labor (Sigurdson 2004), good wharves, developed infrastructures, a conducive policy environment, cheap land, its heavy chemical industrial base, and large oil resources. With these factors and up to twenty development areas, developing industrial clusters have also proven successful in the Bohai Bay Rim (PRC Embassy in the US 2004)⁴.

5. Research results of data analysis

Analysed for this research were data from economic trends and the major industrial products of the two regions for the years 2000 and 2005 (See Tables in the following section.). Through this data, we aim at identifying the key regional clusters in China.

3 –However, with the “moving northward” trend mentioned earlier, this may soon change. This trend is mainly due to government policies that aim at increasing the region's economic activities to coastal levels. A proposal drafted by the National Congress of the Communist Party of China in October 2003 includes the following: to further the reforms and strengthen the management, finances, and administration of state-owned enterprises; to advance the upgrading and refinement of industrial structures; facilities; and, to broaden foreign trade relations (HKTDC 2004).

4 –China produces more than half of the world's cameras, 30 percent of the air conditioners, a quarter of the washing machines, about a fifth of the refrigerators, and 70 percent of the toys. Galanz produces up to 40 percent of the microwaves sold today in Europe. And Haier televisions a case study conducted by the Harvard University. The opportunities in China are enormous: strong public investment of 24 million dollars, an increasing acquisition capacity of the population, environment, urbanization, services, 2008 Olympic Games, 2010 Shanghai Expo, and so forth.

For economic trends, this study compares the gross domestic product, industrial output value, and the industry added-value for the years 2000 and 2005. All data used for this analysis were obtained from the National Bureau of Statistics of the People's Republic of China. From Tables 1 and 2, we can compare the evolution of economic trends in China from 2000 to 2005 represented as Component Matrices for both years using Principal Component Analysis.

The study reveals that within this time frame, while there is a general increase in the three variables mentioned above for all regions, cluster membership for Pearl River Delta and Bohai Bay Rim's Beijing municipality has changed quite dramatically. Being China's traditional and important manufacturing base, one could speculate that these variables for the Pearl River Delta region would at least remain strong. This analysis, however, has shown its weakening position. (See Tables 3, 4, 5 and 6.)

On the other hand, these variables for the Bohai Rim's Beijing region have increased significantly, while at the same time losing much of its agricultural activities. (See Tables 3, 4, 5 and 6.) This result shows not only a great shift in industrialization trends, but also confirms the “moving northward” trend of investments in China. This dramatic change also illustrates a concentration of new capital and new level of competence that also signifies the country's thrust to develop the economies not just in the traditional economic centers in the coastal region, but more especially towards the interior regions of China.

For the region's major industrial products, with the choice of products reflected from those given by China's National Bureau of Statistics, this study focuses on the clustering in terms of products produced between the years 2000 and 2005. (See Tables 8 and 10.) This analysis has revealed that a significant shift in production has taken place for some of the key regions, especially from household electrical appliances to high-tech components such as microcomputers and integrated circuits.

Analysis for 2000 reveals differentiated clusters between the Bohai Rim and the Pearl River Delta. (See Tables 7 and 8.) The Pearl River Delta shows a strong shift into this same direction. Leader in microcomputers production in 2000, the Bohai Rim is now surpassed by the Pearl River Delta as well. As the results for 2005 are examined, the clustering of both regions is clearly defined. (See Tables 9 and 10.)

While a large amount of industrial investments are now shifting toward the Yangtze River Delta and the Bohai Bay Rim, the Pearl River Delta remains as a strong manufacturing base especially for domestic appliances in China. With its large capital base, some areas in the Pearl River Delta have invested in the development of electronic industry. But one may make a forecast that this base may likely move to other regions that are yet being developed, and not cited in this study. Meanwhile, an industrial park established in Beijing is forecasted to become China's first mobile telecommunications industrial base as led by Nokia with a complete industrial chain.

6. Tables of Results

Table 1: Component Matrix (a) 2000

	Component			
	1	2	3	4

Total Population	0.942	-0.310	-6.776E-02	9.694E-03
Available Labor Force	0.953	-0.279	-0.100	4.777E-02
Agriculture	0.918	-0.368	-0.110	0.100
Manufacture	0.964	-0.206	8.951E-02	-0.121
Transport, storage, post and telecommunications	0.736	-0.589	-0.105	0.280
Real Estate	9.351E-03	0.867	9.975E-02	0.475
Gross Domestic Product (GDP)	0.989	-5.019E-02	0.127	-4.135E-02
Primary Industry	0.935	-0.324	-0.104	1.694E-02
Secondary Industry	0.983	-6.206E-02	0.126	-0.102
Tertiary Industry	0.964	0.112	0.237	3.167E-02
GDP per capita	-0.764	6.734E-03	0.608	0.203
Industrial Output Value	3.458E-02	-0.620	0.218	0.532
Agricultural Output Value	0.918	-0.371	-7.210E-02	3.573E-02
Added-Value Industry	0.203	0.388	-0.262	0.732
Total Value of Exports and Imports	0.577	0.775	-0.113	-0.143
Imports	0.429	0.885	-0.132	4.952E-03
Exports	0.674	0.648	-9.146E-02	-0.259
Fixed Asset Investment	0.958	9.999E-02	0.230	-3.271E-02
Capital Construction	0.913	0.340	0.181	-3.539E-02
Innovation	0.818	0.111	0.493	0.124
Real Estate Development	0.377	0.898	0.162	0.124
Total Revenues	-0.234	-7.008E-02	0.967	7.675E-02
Taxes	7.389E-03	-1.296E-02	0.907	-0.226
Extraction Method: Principal Component Analysis.				
a 4 components extracted.				

Table 2: Component Matrix (a) 2005

	Component			
	1	2	3	4
Total Population	0.975	-0.198	-9.666E-02	-3.567E-02
Available Labor Force	0.977	-0.196	-2.414E-02	1.270E-02
Agriculture	0.935	-0.299	-0.150	-4.638E-02
Manufacture	0.989	-0.102	6.499E-02	-7.519E-02
Transport, storage, post and telecommunications	0.736	-0.561	-0.234	1.793E-02
Real Estate	0.223	0.391	-0.643	0.493
Gross Domestic Product (GDP)	0.994	2.842E-03	0.109	3.087E-03
Primary Industry	0.941	-0.324	-9.349E-02	-2.025E-02
Secondary Industry	0.987	-4.403E-02	0.151	-3.633E-02
Tertiary Industry	0.965	0.215	0.109	8.135E-02
GDP per capita	-4.023E-02	-0.148	-0.462	0.838
Industrial Output Value	-4.585E-02	-7.117E-02	0.833	0.388
Agricultural Output Value	0.578	-0.774	9.739E-02	0.232
Added-Value Industry	0.297	0.447	-0.610	0.583
Total Value of Exports and Imports	0.570	0.786	6.067E-02	-0.227
Imports	0.450	0.886	4.172E-02	-9.690E-02
Exports	0.649	0.681	7.392E-02	-0.325
Fixed Asset Investment	0.985	-0.108	8.968E-02	0.104
Capital Construction	0.892	0.246	0.323	-2.655E-02
Innovation	0.964	-8.635E-02	0.246	1.139E-02
Real Estate Development	0.319	0.871	2.503E-02	0.374
Total Revenues	-0.204	-8.407E-02	0.884	0.361
Taxes	4.503E-02	4.767E-02	0.925	0.371
Extraction Method: Principal Component Analysis.				

a 4 components extracted.

Table 3: Cluster Membership 2000

Case Number	V1	Cluster	Distance
1	Pearl River Delta - Guangdong	1	7138.725
2	Yangtze R.D. - Shanghai	2	9747.102
3	Yangtze R.D. - Jiangsu	1	4677.030
4	Bohai B.R. Beijing	2	2898.247
5	Bohai B.R. Tianjin	2	6885.798
6	Bohai B.R. Shandong	1	2908.238

Table 4: Cluster Centers 2000

	Initial Cluster		Final Cluster	
	1	2	1	2
Total Population	7022	1322	7716	1114
Available Labor Force	3861	673	4027	565
Agriculture	1589	89	1813	54
Manufacture	732.4	323.1	738.2	213.0
Transport, storage, post and telecommunications	130.7	36.7	198.1	32.9
Real Estate	10.6	9.3	7.0	8.3
Gross Domestic Product (GDP)	950.6	455.1	887.8	289.0
Primary Industry	99.03	8.16	109.58	8.17
Secondary Industry	485.3	218.7	451.2	131.4
Tertiary Industry	366.3	228.3	327.0	149.4
GDP per capita	0	34600	7085	24864
Industrial Output Value	0	692	417	409
Agricultural Output Value	164.1	21.6	193.5	18.9
Added-Value Industry	429.5	199.2	395.5	332.3
Total Value of Exports and Imports	170.1	54.7	80.2	40.5
Imports	78.19	29.36	35.84	25.18
Exports	91.92	25.35	44.41	15.32
Fixed Asset Investment	320.6	187.0	291.5	122.4

Capital Construction	116.8	70.4	90.9	47.7
Innovation	43.28	39.63	38.98	23.14
Real Estate Development	83.12	56.62	47.11	40.74
Total Revenues	0	175	44	80
Taxes	0	42	14	14

Table 5: Cluster Membership 2005

Case Number	V1	Cluster	Distance
1	Pearl River Delta - Guangdong	2	4999.661
2	Yangtze R.D. - Shanghai	2	5353.298
3	Yangtze R.D. - Jiangsu	1	8279.876
4	Bohai B.R. Beijing	1	8279.876
5	Bohai B.R. Tianjin	2	5700.855
6	Bohai B.R. Shandong	2	11405.480

Table 6: Cluster Centers 2005

	Initial Cluster		Final Cluster	
	1	2	1	2
Total Population	1456	1342	4431	4858
Available Labor Force	799	813	2634	2572
Agriculture	68	84	720	986
Manufacture	145.2	268.5	445.3	494.0
Transport, storage, post and telecommunications	35.2	32.3	84.8	133.0
Real Estate	16.7	8.8	11.3	9.2
Gross Domestic Product (GDP)	361	625	803	863
Primary Industry	9.5	9.3	60.1	68.5
Secondary Industry	129.9	313.1	404.1	451.0
Tertiary Industry	222	303	339	343
GDP per capita	31613	0	24205	3414
Industrial Output Value	317	1127	1060	391
Agricultural Output Value	0	24	98	79
Added-Value Industry	840.4	286.6	635.7	375.6

Total Value of Exports and Imports	68.5	112.4	91.1	117.5
Imports	51.6	63.9	53.1	56.9
Exports	16.9	48.5	38.0	60.6
Fixed Asset Investment	181.4	245.2	357.5	345.4
Capital Construction	41.5	92.7	114.1	107.3
Innovation	16.96	38.80	41.93	45.94
Real Estate Development	99	90	90	67
Total Revenues	59	283	128	107
Taxes	0	69	35	17
Enterprise	0	7	0	2

Table 7: Cluster Membership 2000

Case Number	V1	Cluster	Distance
1	Pearl River Delta - Guangdong	3	3768.228
2	Yangtze R.D. - Shanghai	2	0.000
3	Yangtze R.D. - Jiangsu	3	3768.228
4	Bohai B.R. Beijing	1	7952.364
5	Bohai B.R. Tianjin	1	7775.666
6	Bohai B.R. Shandong	1	15721.113

Table 8: Cluster Centers 2000

	Initial			Final		
	Cluster			Cluster		
	1	2	3	1	2	3
Chemical Fibers	40	47	191	17	47	118
Yarn	94.43	14.95	118.40	35.77	14.95	67.70
Cloth	27.60	3.34	33.74	10.58	3.34	22.29
Silk	0.54	0.02	1.42	0.18	0.02	0.74
Machine-made paper products	436.7	0	205.3	157.5	0	232.8
Bicycles	47	0	583	120	0	291
Watches	0	0	0	39	0	0
Beer	296.5	33.1	76.8	160.7	33.1	117.8
Cigarettes	230.1	122.4	103.2	88.1	122.4	140.3

Household Refrigerators	280.3	43.1	127.7	97.4	43.1	224.2
Air-Conditioners	0	186.1	165.9	45.2	186.1	431.9
Household Washing Machines	312.4	62.1	241.6	123.5	62.1	242.9
Color TV	255	148	285	109	148	878
Plastics	92.9	95.5	160.3	81.6	95.5	140.0
Cameras	0	0	247	0	0	123
Motor Vehicles	0	25.27	8.34	3.39	25.27	6.09
Microcomputers	31.1	42.0	11.6	96.7	42.0	90.6
Integrated circuit	24	239330	125007	15738	239330	121313

Table 9: Cluster Membership 2005

Case Number	V1	Cluster	Distance
1	Pearl River Delta - Guangdong	1	0.000
2	Yangtze R.D. - Shanghai	3	13242.929
3	Yangtze R.D. - Jiangsu	3	13242.929
4	Bohai B.R. Beijing	2	5830.010
5	Bohai B.R. Tianjin	2	13164.314
6	Bohai B.R. Shandong	2	18983.180

Table 10: Cluster Centers 2005

	Initial			Final		
	Cluster			Cluster		
	1	2	3	1	2	3
Chemical Fibers	44.78	52.06	303.80	44.78	24.92	177.74
Yarn	23.87	186.80	198.80	23.87	66.73	106.40
Cloth	15.42	46.00	37.60	15.42	16.58	19.83
Silk	0.11	0.73	1.67	0.11	0.24	0.85
Machine-made paper products	410.1	592.6	315.3	410.1	210.9	179.0
Beer	188.6	321.7	102.1	188.6	155.8	70.7
Cigarettes	189.9	214.0	132.6	189.9	86.2	135.4
Household Refrigerators	317.3	499.0	243.7	317.3	178.1	139.8
Air-Conditioners	1324	460	433	1324	196	325

Household Washing Machines	162.2	358.6	280.3	162.2	122.7	188.1
Color TV	1793	553	467	1793	210	302
Plastics	142.1	108.1	516.0	142.1	107.2	322.8
Motor Vehicles	6.52	14.00	21.30	6.52	14.63	30.24
Microcomputers	416	49	200	416	155	138
Integrated circuit	225812	119	365969	225812	19087	352732

7. Final Remarks

China produce 75 percent of the world's toys, 58 percent of clothes, 29 percent of mobile phones (Heath 2004), 40 percent of microwave ovens, 70 percent of photocopiers, 80 percent of artificial Christmas trees, and half of the world's computers (Guinness 2004).

Through this study, we learn that the successful formation of clusters in the regions examined have greatly contributed to this new global position. But we also learn that this success depended not only on the large amounts of foreign investments that poured into the three regions, but also on the material resources that helped tap regional abilities and competence, therefore demonstrating the crucial role of globalization to the development of local economies, so the dynamic reality of Chinese economy is now a global focus.

The data analysis clearly illustrates a strong characterization of competences among the different productive systems, showing a dynamic tendency to shift from one industry to another. A good example of this dynamism is the laptop industry, which once established its base in Beijing, but soon moved to Shanghai because of the formation and existence of a complete industrial chain for laptops manufacturing in the latter region (Jiang 2003, p.23).

For the following years, we can already begin to envision a continuation of these shifts of traditional labor intensive clusters to the more demanding technology intensive clusters, and we can also begin to foresee the movement of these labor intensive clusters from these traditional coastal regions toward the interior parts of China, thereby accomplishing the goals of Deng's classic "T-shaped Development Strategy," thence making China a virtual manufacturing base in the world.

While this study manages to illustrate a general view of cluster formation in China's key industrial regions, problems in the development of industrial clusters do exist. They include the lack of cooperation between innovation centers and firms (Arvanitis 2004), lack of foundation for local innovation, weak policies with regard to cluster development, lack of expertise, lack of active understanding between social and industrial networks (Wang 2003), a weak banking and financial system, a growing gap between social classes, negligence of environmental welfare, and lack of adherence for international business protocols .

8. References

ARVANITIS, Rigas, "Success and limits of the South China industrial model: Enterprises, clusters and local governments in Guangdong province," Perspectives Chinoises, June 20, 2004. <http://www.cefc.com.hk/uk/cefc/seminaire.php?idsem=59>.

BASSI, Eduardo, *Empresas Locais e Globalização*. São Paulo: Cultura, 2000. Chinese Industrial Clusters Online. <http://www.chinacluster.org>. Cluster Studies of China.

<http://www.clusterstudy.com/index.php>.

“FIEs Forming Alliance in Coastal Areas,” *Key to Economy and Trade*, Issue 05. Hong Kong Trade Development Council (HKTDC), May 1, 2004. <http://www.tdctrade.com/alert/cba-e0405h.htm>.

GUINNESS, Paul, “*China: Recent Industrial Development and Trade Patterns*,” Online Geofile, No. 463, January 2004. geography.wincoll.ac.uk/geofiles/GF463.pdf.

HEATH, Allister, “*China – New workshop of the world*,” *The Business – Europe's Global Business News*. November 28, 2004. <http://thebusinessonline.com/modules/news/view.php?id=31976>.

HU, Baomin, et al, “*Growth Pattern and Models for Localized Typical Industrial Clusters: Case Study of Hebei Province*,” Social Science Fund of Hebei Province, Mode and Policy Research of characteristic industry cluster in county region in Hebei province, 2004. http://www.globelics.beijing.cn/paper/Baominpercent20Hu_Growthpercent20Patternpercent20andpercent20Modelspercent20forpercent20Localizedpercent20Typicalpercent20Industrialpercent20Clusters.pdf.

[JIANG, Xiaojuan, “Geographical Distribution of Foreign Investment in China: Industrial Clusters and Their Significance,” *China and World Economy*, Number 1, 2003, pp.16-24. www.iwep.org.cn/pdf/2003/wec_2003_1-2_jiangxiaojuan.pdf.](http://www.iwep.org.cn/pdf/2003/wec_2003_1-2_jiangxiaojuan.pdf)

KWAN, Chi Hung “*Pearl River Delta to Remain the Engine of the 'Workshop of the World' - Factors Favoring Industrial Upgrading Firmly in Place*,” *China in Transition*, December 12, 2003. <http://www.rieti.go.jp/en/china/03121201.html>.

LARDY, Nicholas, *China's Unfinished Economic Revolution*. Washington, DC: Brookings Institution Press, 1998.

LIU, Youjin, *Analysis of Mode of Clustering-Innovation*, China Soft Science, page71-75,2002. “Market Profiles on Chinese Cities and Provinces,” Hong Kong Trade Development Council (HKTDC). <http://www.tdctrade.com/mktprof/china.htm>.

MARTIN, Will and Vlad Manole, “*China's Emergence as the Workshop of the World*,” A World Bank Report. Stanford Center for International Development, Working Paper No. 216, June 2004. <http://scid.stanford.edu/publications/abstracts201.html#216>.

NG, Sam, “*China: Tale of Two Deltas*,” *Asia Times*, September 6, 2003. <http://www.atimes.com/atimes/China/EI06Ad01.html>.

PORTER, Michael, *Competição*. Rio de Janeiro: Campus, 1999.

SHEFF, David. *China Down*. New York. HarperBusiness. 2002

SIGURDSON, Jon, “*Regional Innovation Systems (RIS) in China*,” Working paper no. 195.

European Institute of Japanese Studies, July 2004.
<http://ideas.repec.org/p/hhs/eijwp/0195.html>.

STORPER, Michael and HARRISON, Bennett, *“Flexibility, hierarchy and regional developments: the changing structure of industrial production systems and their forms of governance in the 1990s.* Research Policy, vol. 20, no. 5, North-Holland, 1991.

SULL, Donald N. *Made in China.* Boston. Harvard Business School Press, 2005.

WANG, Jici, *“Industrial Clusters, Industrial Parks Development and a New Model of Industrialization,”* A Report on New Model Studies of Industrialization, January, 2003.)
<http://www.clusterstudy.com/wxcn/index.php>.

WU, Jinglian, *“The Trends of China's Economic Reform,”* The Chinese Academy of Social Sciences and the Development Research Center of the State Council, People's Republic of China, September 15, 1996.