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DOCTORAL PROGRAMME IN TERRITORIAL DESIGN AND GOVERNMENT

The City Network and the Regional Evolution in Yangtze River Delta, China

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ABSTRACT

A consensus was forming during the past 20 years in Europe about the assumption that the city network has been a new paradigm of a winning regional structure (see for example Camagni, 1993; Dematteis, 1997; Scott, 2001 and Capello, 2007). This study assumed that the city network would also emerge in Chinese cities system in these years when the industrialization is progressing vigorously and the post-industrialization is undergoing in several cities in China. It belongs to the regional and urban studies sphere, took the Yangtze River Delta (YRD), China as the case study, expatiated the phenomenon, factors and corresponding transformations of city network in the studied region, and contributed new features to the city network concept itself.

It utilized both quantitative and qualitative approaches in dealing with the study area. It started from the economic and geographical definitions, then applied the geographical models to the Fortune 500 (2012) database on cities and firms, and implemented the network analysis theories in quantifying the city network in study area. Later it used statistical approaches, narrative research on the case study in order to interpret the reasons behind. Finally it discussed the possible corresponding outcomes in terms of population and territorial spatial transformations by the means of correlation analysis.

Firstly, the study clarified that the city network concept that would be discussed in this thesis does not only refer to the various links among cities, but it more emphasizes the horizontal, not hierarchical relationships among complementary or similar centers. And the conceptual models of complementary network and synergy network were proposed, concerning the levels of specialized city functions and the rank of cities.

Further the study used the information of Chinese headquarters and subsidies of 18 multinational enterprises of Fortune 500 (2012), sketched the international and national level complementary networks in Yangtze River Delta, and verified the hierarchy of city-networks model proposed by Camagni (1993). On national level, it turned out that the links/ cooperation among cities/ functions of the same rank existed in this region, but the network is not very balanced, in the sense that most of the links of city network (representing the top 75% of the linkages) form the single center of Shanghai. Geographically, two principal linkage-passages existed in the region: from Shanghai towards Hefei and from Shanghai towards Hangzhou (the link to Hefei was stronger than that to Hangzhou); the three cities form a more connected triangle area in which the linkages within it were stronger, while the rest of the cities were connected preferentially with Shanghai

Then the thesis figured out that the topography-related economy and culture, the specializations and the relational proximity are the most important factors in shaping the

urban networks in this region and this is further proven by the case study based on the comparison of Suzhou city and Jiaxing city. Firstly the homogeneous topology provide similar economic base, cultural background and traditional traffic passages, and the city linkages and the network are primarily emerged and preferentially extended in this kind of place. Secondly, by examining the specializations of the YRD cities on primary, manufacturing and tertiary sectors 1990s, 2000 and 2010, the study argued that in the "central place era" (agriculture era), there were several compound cities in the hierarchical top with their dependent surroundings; in the industrial era, city network emerged basing on the urban specializations with incomplete presence of the entire mix of functions; while in the post-industrial era, city network would evolve into cities with specializations on manufacturing or services, but also with complete presence of urban functions, in other words, the location quotients of the most connected cities trend are decreasing. Thirdly, the relational proximity which is presented in the similar "development zones" policies, the similar cognitions of local government and the spillover of relations strongly affected the intensity of connections.

Finally the study has examined the related demographic and spatial outcomes. In the demographic dimension, both the population and employment transformations were evidently related with the city links in the region. The cities with the fastest population and employment growth (2006-2010), are located along the strongest linking path from Shanghai to Hefei in Southern Jiangsu, while less intense urbanization was taking place in the cities of Zhejiang, like Hangzhou and Ningbo which showed less connections with Shanghai compared with the previous ones. However the cities on the periphery of the region - Northern Jiangsu and Southern Zhejiang – contrarily lost population and employments.

Considering the spatial dimension, the city network turned out to be one of the most pertinent theoretical tools to explain the spatial expansions in this region. It succeeded in explaining some characteristics, but it has limits in the other, because the territorial transformation is a complicated process that could not be explained by only one factor. In fact, the gravitational model still matters in the interpreting of the spatial patterns, as it highlights the "attractive power/force", while the city network points out the "attractive paths" along which urbanization will take place. Without the links as paths, the attractive power could not spread or spill over. Thirdly, beside the increase of central districts, the growth of intermediate counties/ county-level cities is more obvious: where the linkages are more intensive, the intermediate counties/ cities get more robust growth. It not only means the density of towns is higher, but also the functions of towns get upgraded.

In conclusion, the study presented that the city network structure and the hierarchy of city network is verified in Yangtze River Delta, China in recent 10 years although it is not balance enough. And the topography-related economy and culture, the specializations and the relational proximity played important roles in shaping the urban networks in this region.

Especially it observed that the base of city network has evolved from strong towards weak specializations with mix urban services. The city network is corresponding to the urban pools, both metropolis and medium size cities, where knowledge and skilled jobs are concentrated and to the territorial expansions (within a limited territorial extension), but they are actually enhanced reciprocally: the city network has been a model for allocating production factors – human, land and knowledge, and these factors also feed-back enhancing the city network itself.

For the prospects, more relational data about firm ownerships and activities are expected. The inter-firm relations could also be studies besides the intra-firm relations which were investigated in this research. The observations and interpretations about economic activities and mechanisms in the study area are worth to be carried out in smaller territorial scales, for instance the county level and the industrial district level. Also the study of specializations on sectors is worth to go deeper.

Key words: City network, Regional evolution, Yangtze River Delta, Firm ownership approach, Specializations, Relational proximity

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PART I *General Analytical Techniques*

CHAPTER 1

INTRODUCTION

1.1 The rise of research questions

1.1.1 The research questions

A consensus was forming during the past 20 years in Europe about the assumption that the city network has been a new paradigm of a winning regional structure.

> *"The recent evolution of the city system has departed from the abstract Christallerian pattern of a nested hierarchy of centers and markets, and it proposes a new theoretical paradigm to understand its nature and evolution – the network paradigm" (Camagni, 1993)*
>
> *"While in the fifties and sixties, Italy (but also France and other European countries) saw that the growth of the metropolitan poles were drawing resources from the minor centers, slowing their growth, the last twenty years they have seen the opposite situation occurring. The proximity of the metropolitan poles now seems to stimulate the division of labor between the nodes of the regional networks, with threshold and development effects at all levels of the urban hierarchy" (Dematteis, 1997)*
>
> *"Global city-regions range from familiar metropolitan agglomerations dominated by a strongly developed core, to more polycentric geographic units as the cases of urban networks of the Randstad or Emilia-Romagna…The traditional planning and policy strategies in these regions increasingly problematical dealing with their vigorous expanding." (Scott , 2001)*

Assuming this transformation of paradigm of regional structure (city system), **this study intends to explore the city-network concept in Chinese regions, with the case of Yangtze River Delta region**.

Moreover, there was an intention to introduce and test the western concept and experiences into the Chinese territories, which are going through modernization, urbanization,

industrialization at the same time and in the short period also aggressively affected by globalization. Since the open up policies in 1978, the Chinese cities have been going through vigorous economic, social and spatial transformations. Until now it is still a great challenge to deal with the complicated situations accompanying with these transformations. In 2011, the urbanization ratio[1] of China has been around 51%, which implied China has a crucial way to go. However, lots of situations have happened in most European countries after the second war. Therefore, although Europe and China have completely different contexts, the European experiences and the latest theoretical breakthroughs would contribute a common reorganization of problems and a guided solution to the Chinese territories.

This general question further concerns several questions, which are also the outlines of this study:

Table 1- 1 Research Tasks and the aims

Research tasks	Aims / organization
***1*. the transformation of regional paradigm** due to the transformation from industrial to the knowledge based economy / society	**Theoretical framework** (Chapter 2,3)
***2*. Analysis** of the city network in study area	**The qualitative and quantitative description of city-network** (Chapter 5)
***3*. Reasons** for forming this city network	**Interpretation** (Chapter 6)
***4*. Corresponding transformations** of population and regional space	**Results** (Chapter 7)
***5*. Conclusions** and **perspectives**	**Conclusions** (Chapter 7)

Although the study objective is exploring the city-network performance in Chinese regions (Yangtze River Delta), and also the feedback of Yangtze River Delta experience to the theory itself, the whole study would concerns if city-network structure is suitable for regional development in the Chinese context. Therefore, "city-network", "regional structure","the Yangtze River Delta", and "regional/ urban development" are the important keywords. Other key words would include "measure of the city-network (firm ownership approach)" and "geographical, economical, cultural/ cognitive/ institutional interpretations".

[1] According to the <Standard for Basic Terminology of Urban and Rural Planning (exposure draft)>, the one which would replace the 1998 version, the urbanization level (urbanization ratio) is indicated by the urban population out of all population within one territory.

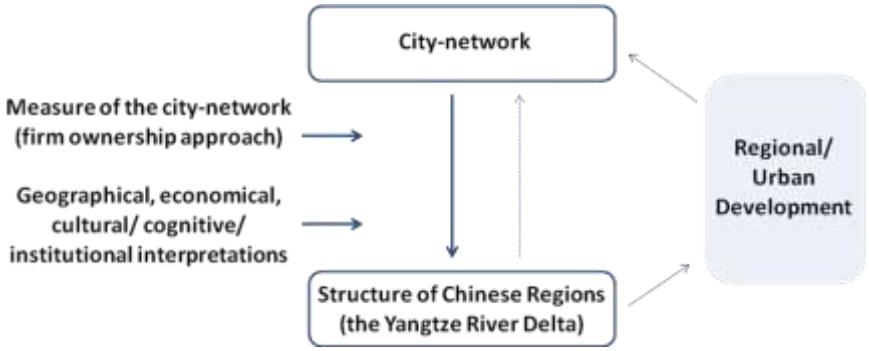


Figure 1- 1 Keywords

Source: draw by author

1.1.2 The relevance of city network study

The significances for the research on the city network, either on theoretical or on practical levels, can be interpreted in three aspects:

In the **city system** aspect, it contributes to the transformation of paradigms of city system and regional structures;

In the **territorial space** aspect, it helps discover and define the spaces of "flows", and reveal the reasons and phenomenon of the interdependency of the territorial development;

And finally in the **city strategy and policy** aspect, the network study would help define the positions of cities in different levels of network structure, for instance the "structural hole (Burt, 1992)", the "strong and weak ties" and the bridge or "broker" (Granovetter, 1973), which would determine their destinies in the competitions. Just as Jacobs said "cities are in a continuous state of becoming, determined by the changing relationships between dynamic cities" (Jacobs, 1969).

1.2 The background

The study was embedded in the background of two basic facts. Firstly, the globalization has been an unavoidable factor for regional transformation and especially the Chinese city development. And although the globalization would lead to both the hierarchical or relatively balanced and horizontal relations among cities within a region, generally speaking, it has enhanced the intra-regional interactions (linkages), and fostered the city network. Secondly, single city developments in China have reached a certain stage, and the regional development has been and would be the path for future development, moreover, the proposal of regional plans needs to be based on deeper understanding of the socio-economical linkages among cities.

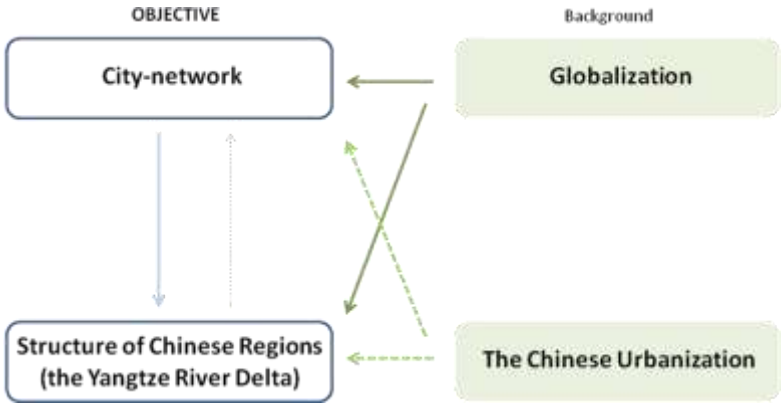


Figure 1- 2 Background and Study Objective

Source: draw by author

1.2.1 The globalization as the source for interpreting all the post-modern phenomenon

1.2.1.1 Globalization, network and local territory

The "**globalization**" is characteristically conceived as the international integration of three types of markets: commodity markets, labor markets and capital markets (see for example (Friedmann, 1986), (Sassen, 1988), (Bordo et al., 2005). The essential pursuit of globalization is the interest maximization, basing on the global operations of capital, technology, organization, education and entrepreneurial spirit. These operations make the unbalanced distribution of these resources flow.

These flows inevitably conquered the space of deficiency (either physical or abstractive) and certainly **weave the networks, either globally or locally, either economically or socially**, which firstly and frankly integrate the local economic activity into the global productive specializations with its original impulse for the interest maximization. And they are conducting the economic, political and symbolic life process, forming and characterizing our daily activities.

The traditional perspective of **space** is defined by the activities which happened on it, while the contemporary activities - capital flow, information flow, technique flow, institutional interactions flow and the media flow (image, sound, symbol) define the "space of flows" (Castells, 1996, 2000, 2010). However beyond the globalization basing on the abstractive space of flows, the side of locality (**territory**) is much more complicated, especially facing the multiple dimension concept of **regional/ territorial development**. It hosts the duality of globalization and locality, and it is functioning to integrate all the coinstantaneous practices (global or local, economic or social) to be a unity. Therefore the territorial process "offered a needed spatial perspective" and "a starting-point for political

enquiry" (Friedmann, 1986) and should be interpreted "towards a considerations of autonomous cultural and political practices" (Harvey, 1990).

Therefore the "**globalization", "network" or "productive specializations" are the same in nature**. They are acting as a trigger to bring about the social, spatial, political and governance transformation in all kind of societies. And **the interpretation of the complicated transformations of local territory/ space not only needs to trace to the globalization, but also to the local physical/ geographic and cultural/ cognitive/ policy resources.**

1.2.1.2 Globalization enhanced the city network

Because the globalization may lead to the regional polarization, there was worry about the global cities isolating from their local territory, and more intensively connect with other global cities. In fact global cities are like the nodes within the global networks, they host the converged global resource, and redistribute them within or around their territory – just as described by Tang & Zhao "global city as the junction of two sectors – it outwards connects the global networks, and inwards it organizes its hinterland"(Tang and Zhao, 2010). That is also why Scott extended the theoretical focus to the concept of "global city-region", and described global city-region "networks are typically to be found at the economic cores of the world's major city-regions today, and in many cases, they are the basis of significant new rounds of urban expansion." (Scott et al., 2001). Earlier than Scott, Dematteis has made his conclusion basing on the empirical studies in Italy: "Globalization processes **do not necessarily separate cities from their regional networks**. The most successful cases of recent urban development in Italy are associated with the formation of **metropolitan networked regions** in which a major metropolitan centre is linked with cities of a lower level by hierarchical, complementary and synergetic relations" (Dematteis, 1997).

Therefore, although the interactions/ connections could be hierarchical, complementary and synergic, the globalization has enhanced the intra-regional interactions.

1.2.1.3 Globalization fostered both hierarchical and polycentric regional structures

The (economic) factors flow globally, they also trend to stick around some nodes, where are suitable for them to get more profits. That is why Friedmann warned, the globalization trend to bring about the class polarization (huge income gaps, large-scale immigration and structural trends in the evolution of jobs) and the corresponding spatial polarization in global, regional and metropolitan levels (Friedmann, 1986). In the industrial aspect, the representation of polarization could be the agglomeration and specialization of certain sector.

At this moment, when the functions (especially high-ranking functions) concentrated in certain cities (usually global cities), it would lead to a **hierarchical structure** in a region. In a few cases, a growing metropolis and the shrinking peripheries have been observed (Paris, London). In this sense, the globalization seems to lead to a hierarchical regional system and an unbalanced development.

On the other hand, the functions (specialized or high-ranking functions) spread in different cities, due to the diffusion after the polarization (with the support of good accessibility), the historical inheritance (e.g. Italy), the political reasons (e.g. Germany), or a good milieu – relational proximity and collective learning (e.g. parts of France), the planning results (e.g. Netherland) In this case, cities form the **polycentricism/ relatively balanced and horizontal relations**, and also present very good performance in the globalization background.

Therefore, the globalization could foster both hierarchical and polycentric regional structures. There are other factors such as the capability to confront the globalization (e.g. the milieu innovation theory, endogenous growth theory) and the spatial policies/ strategies that matter.

1.2.1.4 Globalization greatly influences the Chinese city/ regional development

The globalization has been an unavoidable factor or dynamic for Chinese city and regional development. Take Yangtze River Delta for example, **on one hand**, the global enterprises have considered this area as the important sources of raw materials, places of manufacturing, regional control and management centers and remarkable markets – more than 480 of the Fortune 500 have located their branches there; **one the other hand**, those cities have more and more depended on the export-oriented economy - for instance, the annual increase rate of export amount of Shanghai from 1995 to 2005 has been 23.8%, of Suzhou has been 42.3%, and of Ningbo has been 25.9% (Zhao, 2010). Moreover, basing on the study of the evolution of urban system of Yangtze River Delta 1996-2005, Zhao pointed out that the globalization influenced the transformation of urban system through its influence on industrial value segments, division of labor and city network. Therefore the globalization, **is not only the background, but also the clue** (the global firms as active actors in regional development) to recognize the Chinese regional development.

1.2.2 Put the Chinese urbanization problem on the regional platform

1.2.2.1 "Urbanization" as a national strategy for the new government (Xi-Li government)

Within the background of global financial crisis and the increase of investment risk, "urbanization", with the intension of transforming from the investment-drive growth to the domestic-demands-drive growth, has become one of the most important strategies of the new

government. According to the world bank, the urbanization ratio 2011 of China was around 51%, approaching to the world average level, while that of EU was around 74% (TheWorldBank, 2011). Assuming that one city inhabitant contributes more to GDP and consumes more than one rural inhabitant, this around 23% urbanization potential would imply a great domestic market (every 1% of the urbanization rate increase, implies 10 million urban population increases). Li Keqiang, who is the Premier of China at this moment and was the Vice Premier at May 2012, firstly revealed this strategy on the "The EU-China Partnership on Urbanization summit, Brussels": "…China is transforming its development approach, and considers the urbanization as its important strategy for achieving its modernization"; then in December 2012 on the "Chinese Central Economic Work Conference", the qualified urbanization (well-organized immigrating agriculture population to cities) has been defined as one of the central economic tasks of 2013; and a national medium-and long-term urbanization development plan is said to be published by the State Council.

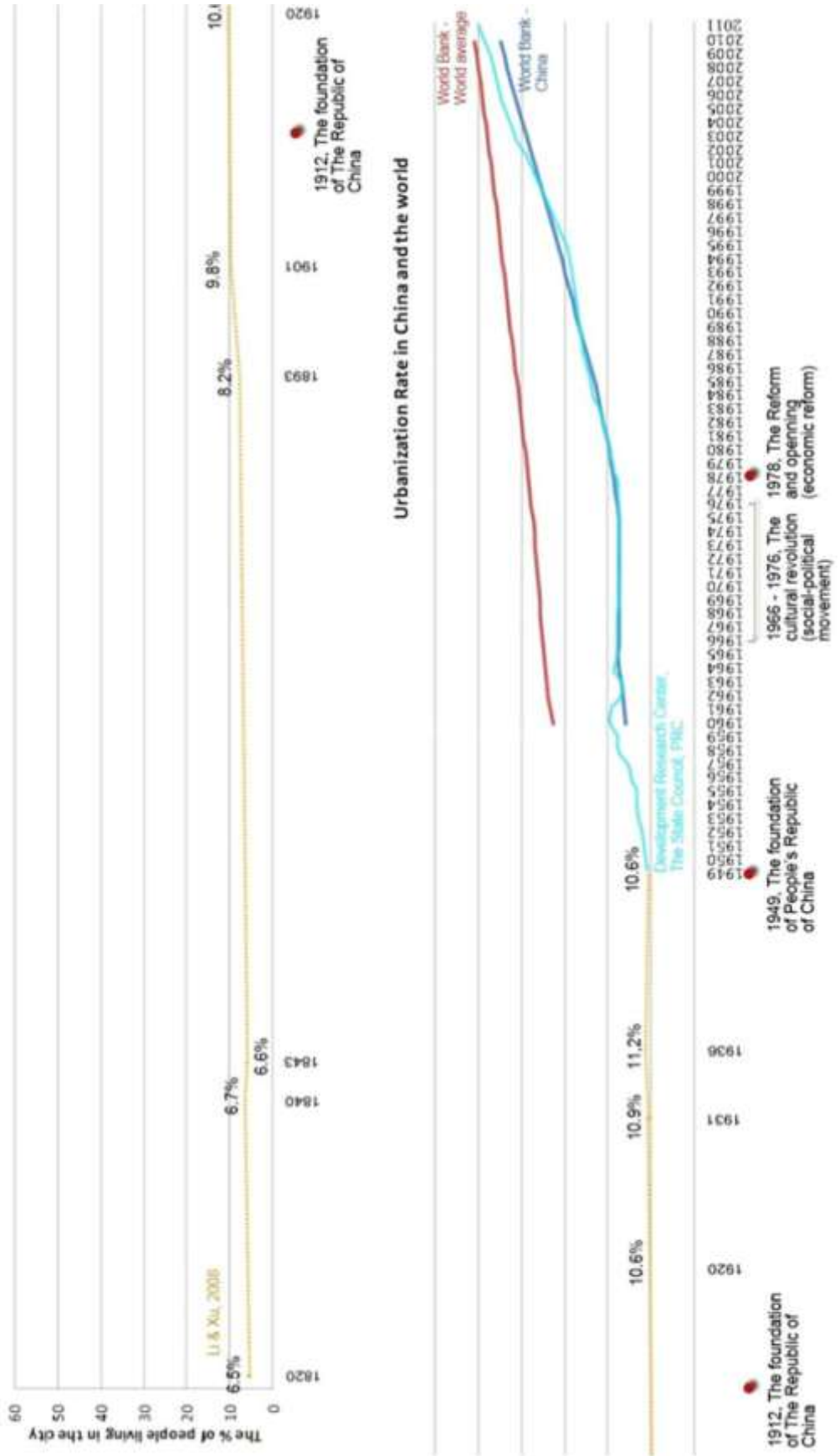


Figure 1- 3 Evolution of urbanization ratio in China

source: (TheWorldBank, 2011), draw by the author

1.2.2.2 A urbanization and polarization process

A question remained that what kind of city forms would be chosen for urbanization? Although the current urbanization policy is "on the basis of big cities, emphasizing the development of small-medium cities, gradually forming city agglomerations, and promoting the coordinative development of big, medium and small cities and towns", the facts are that: the share of population who lives in top 30 big cities out of national population increased from 24.6% 2000 to 26.7% 2010, and the top 20 fast-increasing cities took 57.2% of total increases (UN-Habitat, 2012) – population continually concentrate in big cities. Scholar has pointed out: few metropolises' excessive urbanizations accompany with the lagging behind of urbanizations of small-medium cities and towns (Shi, 2011).

Practically, there are two points of views. On the one hand, holding the idea that "agglomeration leads to economy" and "some developed countries have high percentage of population concentration (in Japan, 42% of populations live in cities more than 1 million population; in U.S. and Germany, the figure is 44%; in Euro zone, the figure is 27%)" (Li, 2009). Also a famous scholar pointed out: "the uneven regional economy and population layouts have been formed", and "the possibility to change this basic situation would be small", "the voluntary turning point from concentration to decentralization is very difficult to appear". Moreover, "the capability for metropolis to concentrate resources would be continually enhanced", "the fear about the big cities needs to be removed", while "the small-medium cities have no means to compete with the big cities in their scales, but they need to focus on their specializations". And the solution for urban diseases is the "polycentric urban structure" (Yang and Chen, 2011). On the other hand, the scales of several Chinese metropolises have surprised the scholars who concern about the optimal city scale: according to the census 2010, city of Chongqing has 28million inhabitants, Shanghai has 23million, while Beijing has 19million – there have been 30 cities with population more than 8 million, and among which there are 13 cities with population more than 10 million (UN-Habitat, 2012). And the concentration in one big city truly brings about the "city disease" such as congestion, extremely high house price, population and etc.

Therefore in the debate about the urbanization approach, we should be aware of the inefficiency if we focus on the development of the small-medium cities, but also be aware of the problems accompanying with the big cities (although the polycentric structure would help relief them). But if it is possible to put the paradox on the regional platform – achieving the agglomeration economies/ advantages, while avoiding the problems accompanying with the metropolises?

1.2.2.3 Put the urbanization problem on the regional platform

In the perception of urbanization evolutions, the city-network is a more advanced level of urbanization, as Dematteis mentioned about the European experiences (Dematteis, 1997): "While in the fifties and sixties, Italy (but also France and other European countries) saw that the growth of the metropolitan poles were drawing resources from the minor centers, slowing their growth, the last twenty years they have seen the opposite situation occurring. The proximity of the metropolitan poles now seems to stimulate the division of labor between the nodes of the regional networks, with threshold and development effects at all levels of the urban hierarchy…**Regional systems replace the metropolitan areas.** We must recognize that the driving structure of regional development is no longer the metropolitan area by itself." Similar conclusion has been made by Meijers (Meijers, 2005): "Regions in general are becoming the most important spatial level of international territorial competition. In addition, **polycentric urban regions are believed to be the next stage in the expansion of urban living space**, particularly in densely populated countries or regions. The daily urban space of actors would not only cover the city, its suburbs and its surrounding rural area, but would extend to include other cities as well."

It is true that China started to put focus on the regional development: since 2008, 12 regional plans have been approved as national level plan and it is said the integrate national plan about urbanization - the "National Plan of Promoting Healthy Urbanization (2011-2020)" is going to be published in July 2013 with 20 urban agglomerations as the key points. Meanwhile, scholar figured out: if the cities are not socio-economically connected, the strategy of "developing urban agglomeration" would be an idle talk. Therefore the socio-economical linkages among cities seem to be the key issues for regional planning.

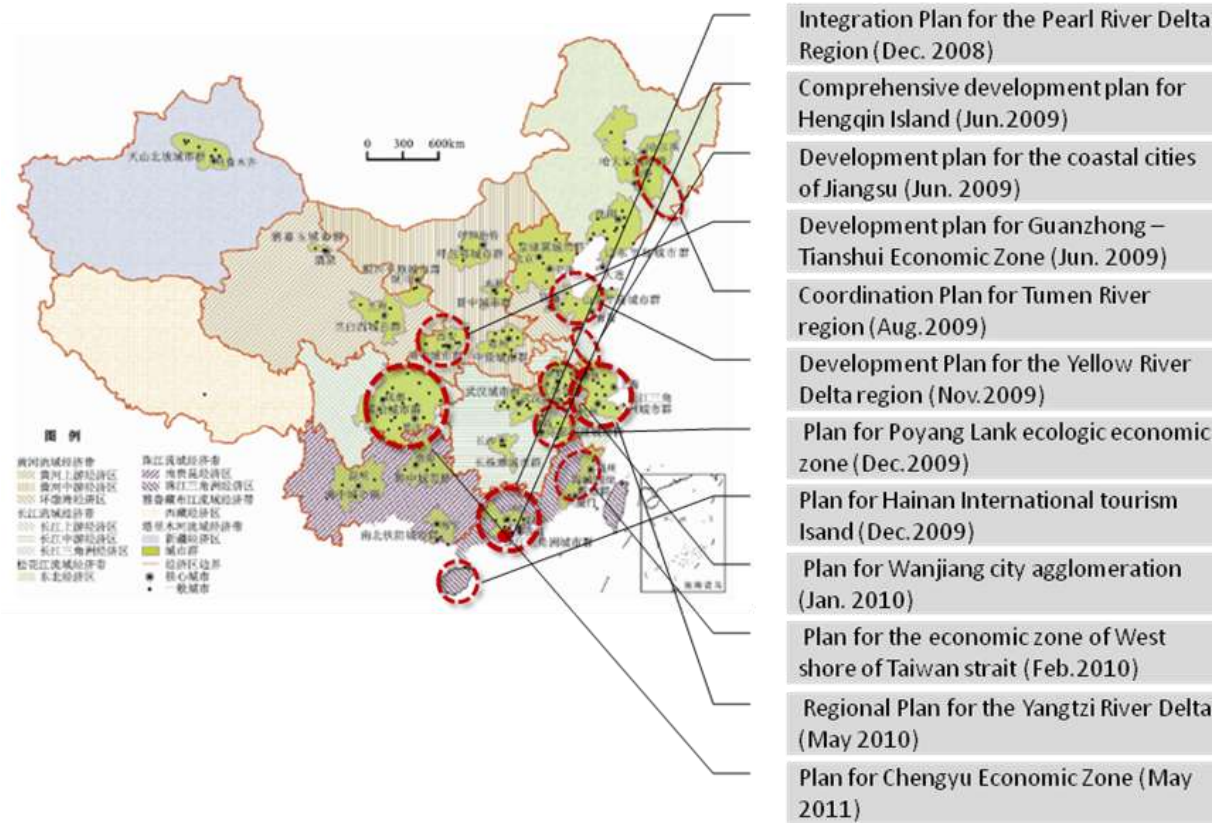


Figure 1- 4 National level regional plans since 2008

source: organized by the author

1.3 The research object: extent and temporal span

1.3.1 The extent of Yangtze River Delta

Because the city-network is a more advanced urbanization level, the relative mature region of China – Yangtze River Delta (YRD) was chosen as the research object. It is one of the most prosperous regions not only in the sense of economic performance but also in the sense of regional governance; therefore it provides affluent resources for studying the city-network in China. As showed in figure below, the population, GDP and increase of population of China are concentrated in few regions: the 3 regions in the east - Beijing-Tianjin-Tangshan Region, Yangtze River Delta Region and Pearl River Delta Region; and one emerging region of Chengdu-Chongqing Economic Zone in the middle-west. The Yangtze River Delta, which is in the red frame, takes around 1% of national territory, embraces 9,7% of the national population and contributes 21,7% of national GDP.

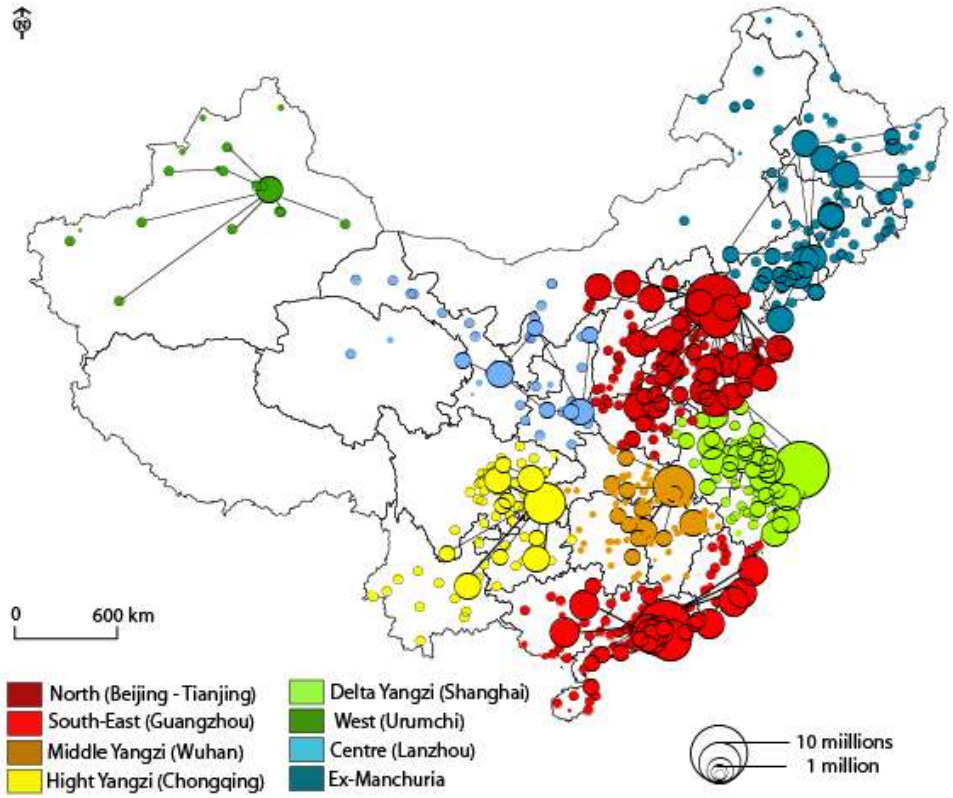


Figure 1- 5 Sub-systems of China

Source: (Swerts, 2013)

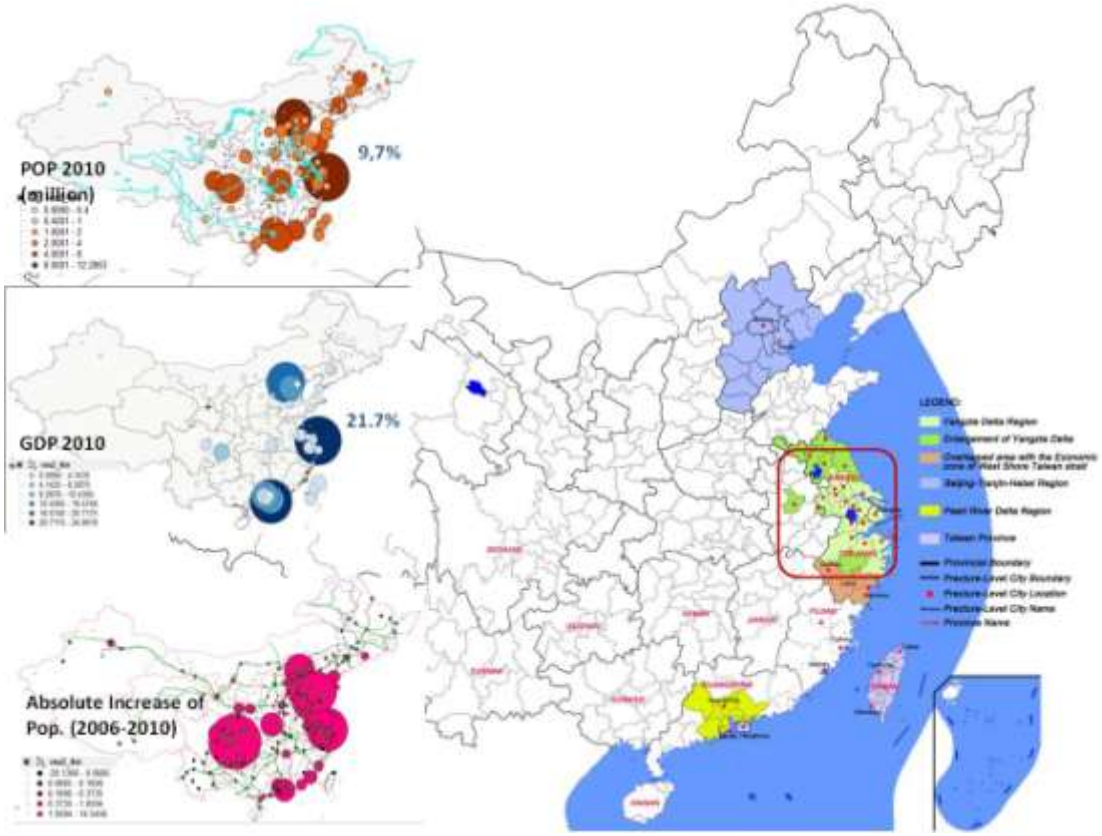


Figure 1- 6 Yangtze River Delta through China

source: (National-Bureau-of-Statistics, 2007, National-Bureau-of-Statistics, 2011), draw by the author

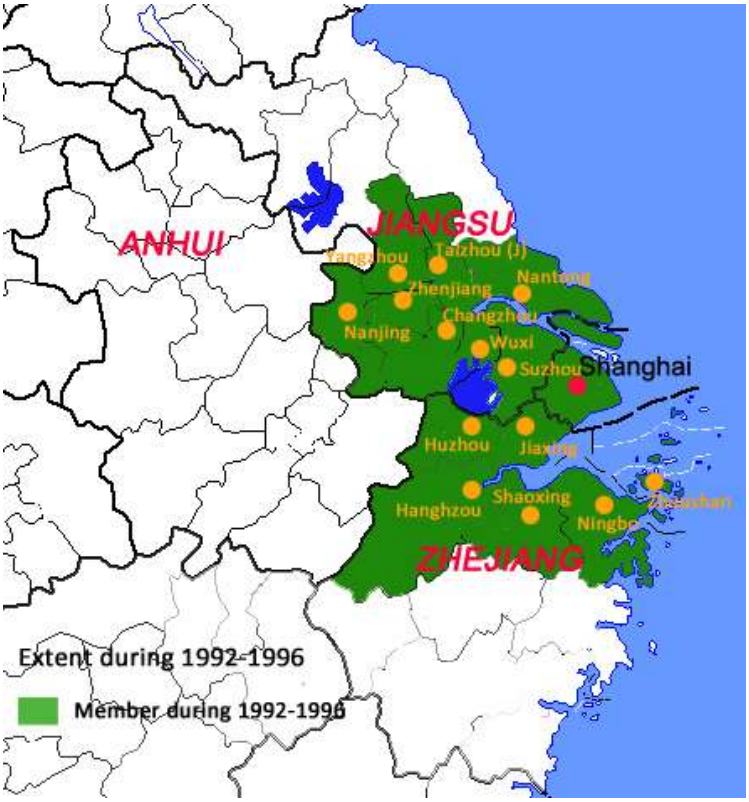
Yangtze River Delta is originated from the orographical and geographical concept and from the evolutional and historical perspective, Yangtze River Delta (YRD) Region was and is the most prosperous territory in China sustaining for the long term period, which economically and demographically raised up during 11th-12th century after its first large-scale immigration in 3rd-5th century and later was conceived as a homogeneity territory characterized in:

- its common and dominant industries of rice agricultures on the fertile land, the fishing in the natural water environment and silk manufactures;
- the approximate indigenous culture, language and life style;
- the prior industrializations and development in Chinese early modern time promoted by the initiative modernization of Shanghai forced the western world;
- A relative late prosperity or rapid development in contemporary time starting from Pudong, Shanghai was stimulated by the exploitation policy of national strategic significance since 1990.

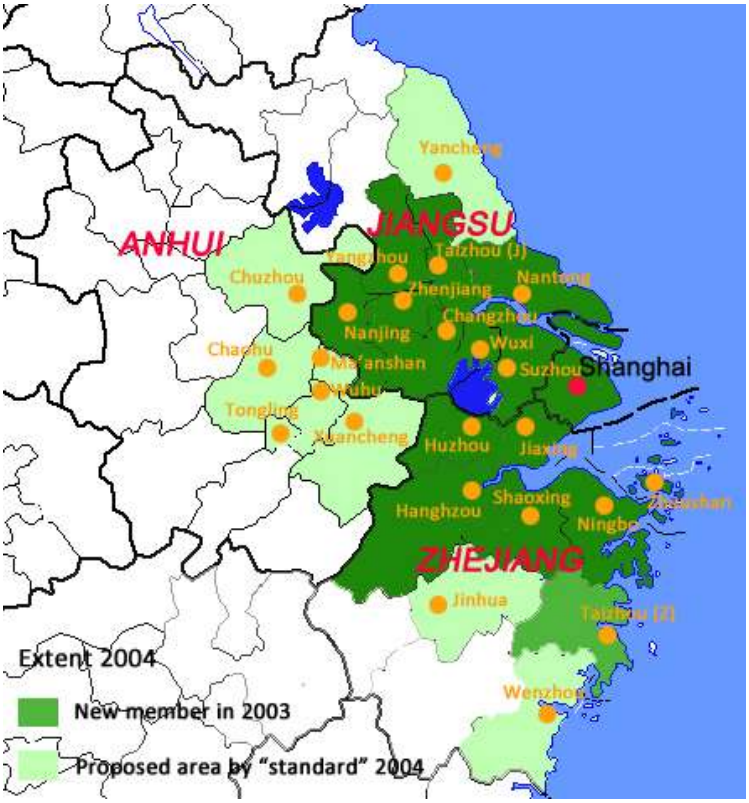
However beyond its pure original concept, it also posses much diverse definitions, among local governments, the discourse of administrative definitions set by the national government and also the academic researches.

Firstly from the perception of **local governments**:

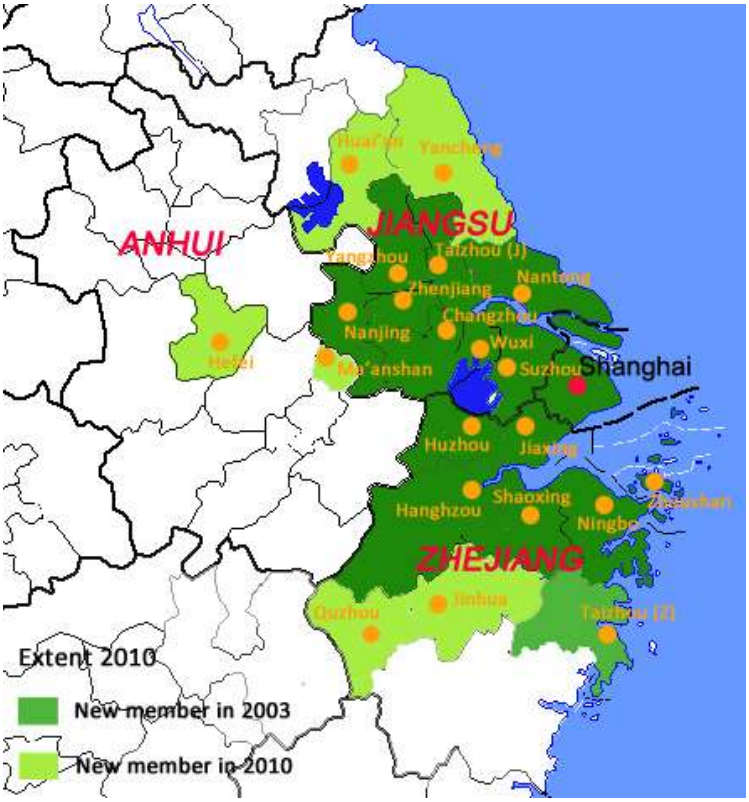
- in 1992 the "economic cooperation committees" of 14 prefectural level (and above) cities (see Appendix I) have initiated the "YRD 14-city cooperation meeting" (they are Shanghai, Nanjing, Suzhou, Wuxi, Changzhou, Nantong, Yangzhou, Zhenjiang, Hangzhou, Ningbo, Jiaxing, Huzhou, Shaoxing, Zhoushan).
- in 1996, because Taizhou (Jiangsu Province) was separated from Yangzhou, it became 15 cities, and the meeting changed its name as the "YRD economic coordination meeting".
- in 2003, Taizhou (Zhejiang Province) was admitted as new member by the "YRD economic coordination meeting", and it has become 16 cities.
- in 2004, the "YRD economic coordination meeting" authorized an institution to step the criteria to become a member, which would include 25 cities, and for the first time it included cities of Anhui Province.
- But not all the proposed new members have been admitted by the "YRD economic Coordination meeting", in the 2010 meeting, 6 new cities get approved, and it has 22 members.
- And the latest news was that in the "YRD economic coordination meeting 2013", 8 new member cities were approved (they are Wuhu, Lianyungang, Xuzhou, Chuzhou, Huainan, Lishui, Suqian, Wenzhou), thus there are 30 cities.



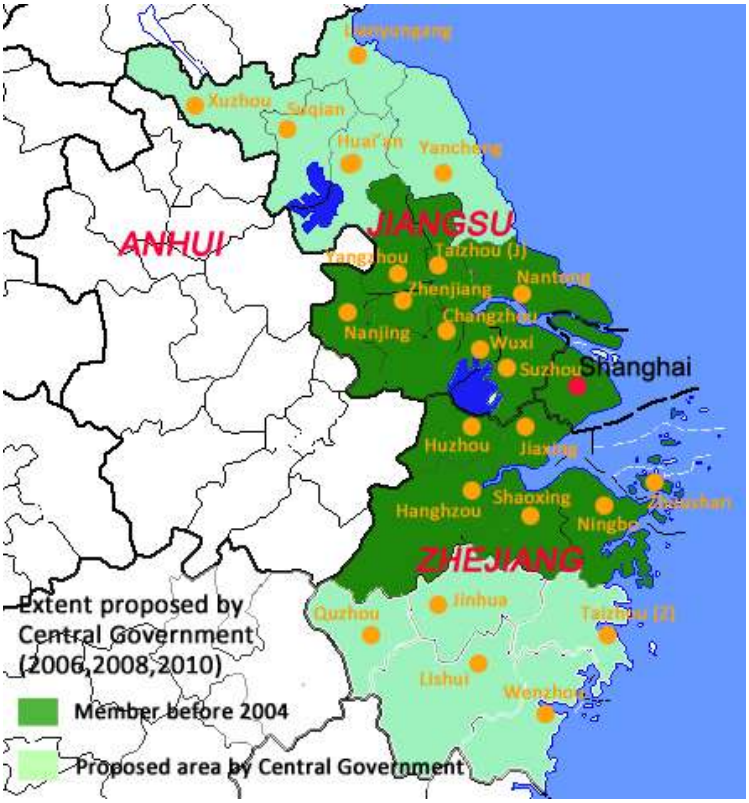
Extent 1992-1996 (14/15 cities)



Extent 2003-2004 (16-25 cities)



Extent 2010 (22cities)



Extension defined by the national government (2006, 2008 and 2010)

Figure 1- 7 Extensions of Yangtze River Delta Region

Source: draw by the author

Instead of the perspective of **central government**, on the national level, basing on the "The 11th Five-Year Plan" (The Chinese State Council, 2006), "Guidance about Promoting the Open up and Socio-economic development of YRD" (The Chinese State Council, 2008) and "YRD regional plan" (The National Development and Reform Committee, 2010), the extent of YRD all referred to Jiangsu Province + Zhejiang Province + Shanghai, which includes 25 prefectural level (and above) cities in total.

The different perspectives between the local and the national government may be due to the different aims they have. The local governments prefer a territory which could maximize their interests, therefore they prefer their territory extended along the Yangtze River – towards their hinterland. While the national government would not like a special area take 10 prefectural cities of Jiangsu province, 9 prefectural cities of Zhejiang province and 2 prefectural cities of Anhui province + Shanghai – this boundary is not coincident with any administration boundary, which has no meaning of control for the central government. Then it appears the warning of Scott about the global city-region: there would be different perceptions about the governance of the global city-region (Scott et al., 2001). Figure below concluded the different resources and different perceptions in this case.

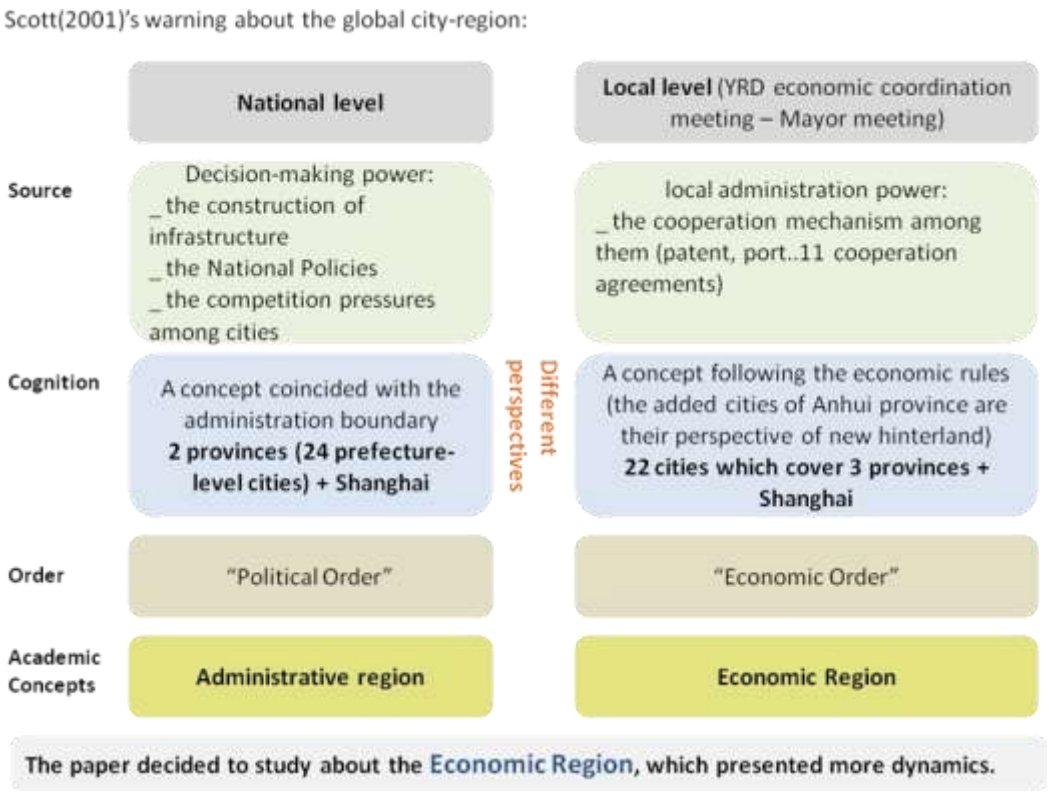


Figure 1- 8 Different perspectives of national and local governments about the extent of YRD

Source: conclude by the author

Even the **academic discourses** also did not achieve accordance about the definition of this area, which is easy to understand, because the "region" itself is not a closed concept. From example, when Zhao and his professor Tang carried out a series of researches to examine the evolution of the urban system in Yangtze River Delta (1996-2005) and the correlations with economic globalization, they used the territory of 15 cities considering the continuity of the data, but they stated the importance of Yangtze River Delta as an economic concept and especially the "YRD economic coordination meeting" has become a typical institution and mode in making decisions and implementation (Zhao, 2010), (Tang and Zhao, 2010), (Zhao, 2012). When Luo et al. analyzed the polycentric structure of Yangtze River Delta basing on the passenger traffic flow, they took the area of 16 prefectural level and above cities (Luo et al., 2011). When Yu and Wu interpreted the structure and restructuring of Global Region – Yangtze River Delta (1984-2000), they included 11 prefectural level cities of Jiansu province, all prefectural level cities of Zhejiang province, 8 prefectural level cities of Anhui province + Shanghai – 30 prefectural level and above cities in total (Yu and Wu, 2006). When Wang studies the spatial structure and its integrated efficiency of Yangtze River Delta (1995-2005), he referred to all the prefectural level cities of Jiangsu, Zhejiang and Anhui province + Shanghai – 42 prefectural level and above cities in total, which implied his anticipation to include all Anhui province as the hinterland (Wang, 2008). At the end, the author quote the potential energy diagram of this region basing on the GDP/km^2 2010 (gravitational model), and we will find the continual extension stopped towards the north on Yangzhou, towards the west on Nanjing and towards the south on Hangzhou and Ningbo, which actually included 15 core prefectural level and above cities. Therefore **considering the continuity of territory and the continuity of influencing relations**, the study of internal structure of Yangtze River Delta would be suitable to look into the dynamic core of 15 cities.

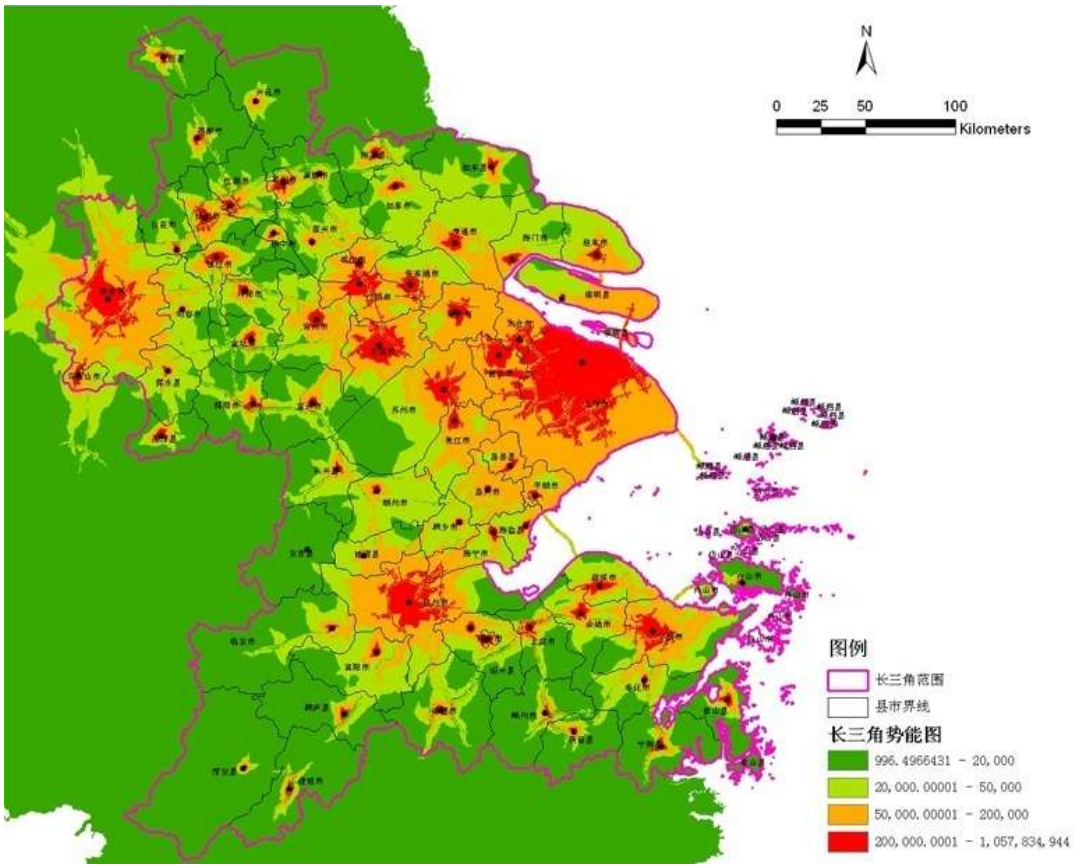


Figure 1- 9 The potential energy diagram 2010 of Yangtze River Delta

Source: (Internet, 2013)

Finally, the aim of this thesis is not only displaying the internal structure of this region, but also **revealing the dynamics and strategies for regional development**. Therefore this thesis extend the study area to 22 cities following the definition of "YRD economic coordination meeting 2010". Because on one hand, it is possible that there are cities which territorially are not connected with this region but relationally are connected, for instance Hefei, and these cities could act as a "broker" to bridge this region with other territories strategically; on the other hand, the "YRD economic coordination meeting" initiated local policies to reduce the transaction fees (reduce the cost of flow of population and goods) and promoted the co-operations among member cities, starting from an economic region concept, the thesis follow their definition.

1.3.2 The temporal span of the study

The first question to be confronted is the administrative adjustment of city territorial boundaries in some prefectural level cities in recent 30 years, which will influence the continuity of the statistics. For example, City of Taizhou was separated from Yangzhou in 1996 and in 2001 the prefectural city of Huai'An was restructured to integrate the original

prefectural city of Huan Yin, the county level city of Huai'an and the county level city of Huan Yin, and similar situations also happened to the prefectural city of Ma'anshan in Anhui Province in 2011 and 2012.

Secondly, some political-economic events also affected the period for research and the interpretation of some sudden changes of data, especially the milestones of national Open-up policy in 1978, the exploitation policy of Pudong, Shanghai in 1990, and China entrance to WTO in Dec, 2001.

Finally the temporal span concerned by this thesis would be 2000 and 2010. Beside them, the high way and high speed train information was extracted on 2013; in order to trace the traditions of the cities, the economic profiles were traced back to 1990; the resident population and employment data are those of 2006 and 2010, because the availability of national censuses data; the enterprise ownerships data were taken on the yearbooks of 2012.

1.4 Methodology for the whole research

Concerning the research tasks, the research utilized both quantitative and qualitative approaches. It started from the economic and geographical **literature review**, then applied the **geographical models** to **the Fortune 500 (2012) database** on cities and firms, and implemented the network analysis theory (also the graph theory) in quantifying the city network in study area. Later it used **statistical approaches, narrative research on the case study** in order to interpret the reasons behind. Finally it discussed the possible corresponding outcomes in terms of population and territorial spatial transformations by the means of **correlation analysis**.

Table 1- 2 The research tasks and the methodologies utilized

Research tasks	Scientific Fields	Methodologies
***1*. the transformation of regional paradigm** due to the transformation from industrial to the knowledge based economy / society	Economics & Geography	• **Literature review and conclusion**
***2*. Analysis** of the city network in study area	Geography	• **Quantitative approaches**: an inductive analysis of database on cities and firms • **Network analysis and graph theory**
***3*. Reasons** for forming this city network	Economic, Geographic & Policy analysis	• **Statistics approaches**: Factor Analysis, Cluster • **Narrative research**

		• **Case study**
***4.* Corresponding transformations** of population and regional space	-	• **Correlation analysis**
***5.* Conclusions** and **perspectives**	-	

1.5 The organization of the research

The thesis is composed by 3 parts: the first part aimed to search for the analytical tools, and it included the 1st Chapter - Introduction, the 2nd Chapter - theoretical framework and the 3rd Chapter - methods for network modeling; the second part deals with the empirical studies, and it includes the 4th Chapter - the current conditions and ranks of YRD cities, the 5th Chapter - the city network of YRD resulting from the multinational firms network, the 6th Chapter - the reasoning of city network in YRD: topography, economy, cognition and governance, and the 7th Chapter - the correlation between regional evolution and city network; and the last part, which is chapter 8 - the conclusions and discussions of the findings.

The 1st Chapter unfolded 4 questions: first, it raised the hypothesis and research question, further five research tasks are proposed. Second, the globalization and Chinese urbanization were discussed as the background to make city network research in Chinese territory. Third, the study area and the temporal span were defined. Fourth, it described the methodologies and the configuration of the thesis.

The 2nd Chapter clarified the concept of city-networks: first, the city network concept that would be discussed in this thesis does not only refer to the various links among cities, but it more emphasizes the horizontal relationships among complementary or similar centres. Second, the conceptual models and their logics were proposed. Third, concepts of network analysis were introduced. Fourth, the determinative factors of city network were discussed, including Industries, Culture/ cognition/ relational proximity, Governance and Geography. Forth, the corresponding outcomes of city network – the presence of network externality, were expected. Fifth, the clarifications about city network, cities with equal size and polycentric region were stated. Last, the studies concerning city network in YRD regions were presented.

The 3rd Chapter introduced the theories and models as the tools for recognizing the city-network: Methods for dealing with non-relational and relational data were introduced, especially the firm ownership approach were explicated. The Software "UCINET" and Software "TULIP" were presented because of their advantages in analyzing and visualizing the relational data.

The 4th Chapter presented the current conditions and city ranks of Yangtze River Delta, including different administration levels of cities, the 3 sub-territories determined by

orography, the infrastructure conditions and distance, the population and employment transformations 2006-2010, the economic conditions and industrial districts and lastly the general policies and regional governance platform – "YRD economic coordination meeting".

The 5th Chapter revealed the city network in Yangtze River Delta basing on the multinational firms network. The international and national level complementary networks in YRD were sketched. Especially on the national level, the most connected cities and area were illustrated.

The 6th Chapter explored the reasons leading to the city network in Yangtze River Delta: the topography-related economy and culture, the specializations of cities, the relational proximities of different actors, and lastly the governance. The case of city of Suzhou (strongly connected city) and Jiaxing (weakly connected city) was investigated from the dimensions above.

The 7th Chapter explicated the related demographic and spatial outcomes of the city network in YRD: the city network is corresponding to the urban pools, where knowledge and skilled jobs are concentrated; and the city network is related with the territorial expansions (within a limited territorial extension).

Lastly the 8th Chapter concluded the main findings and proposed the discussions and prospects.

Abstract

This chapter makes an introduction to the whole thesis:

- Firstly, it raised the hypothesis and research question that: in the recent 20 years, the city network has been considered as the new paradigm of a wining regional structure theoretically and empirically, and does it also emerge in China within its background of fast industrializations and post-industrialization? Then five research tasks are proposed.
- Secondly, the globalization and Chinese urbanization were discussed as the background to make city network research in Chinese territory.
- Thirdly, the study area of 22 prefectural-level cities was defined according to the regional economic coordination meeting, and the temporal span focusing on 2000 and 2010 were chosen;
- Finally, the logic of research and the organization of the thesis were unfolded.

CHAPTER 2

THEORETICAL FRAMEWORK

2.1 The definition of city network: just connections among cities?

Generally there are 2 kinds of definitions in the city network studies:

The first one concerned only the connections among cities, therefore the city network would refer to various kinds of network: for example the physical form, like hydrographic, transportation and infrastructure networks, but also the relational network and the intangible flows, including the capitals, techniques, formal and informal organizations.

The logic of these city network studies is: due to the electronic technologies, fast transportation means, and the political and economical integrations, production factors (capital, labors, natural resources, technology and power) broke the administration boundaries and the rule of central place theory, flowed among territories, and created different kinds of factor networks.

Since the late 1980s, this network metaphor emerged in social sciences field, and later attracted wide echoes in different levels, from different perspectives. For example, Castell (1989, 1996) figured out the network of information flow, and considered the "space of flow" would be the key point in the network society, from his sociological and political points of view; Sassen (1988) studied the transnational network of capital and labor force, and pointed out the strategies for global cities to grab the competitiveness within it, from her sociological and political economy points of view; Rozenblat and Pumain (1993, 2007) illustrated that the locations of subsidiaries of multinational firms have broken the national boundaries, forming the supra-national networks, and also leading to the trend of metropolisation, from their economic geography point of views; similarly Taylor (2002) examed the network basing on the leading advanced service firms and constructed the interlocking network model to explain the linkages among world cities; and Hall and Pain (2006) exploited the inter-city relations through the 8 European metropolis commuters flow in the metropolis level.

Basically the city network in these discussions is scale free, discussing the positions of cities in the whole structure where the production factors unequally distribute.

The other city network studies especially emphasized the horizontal relations among cities. As defined by Capello: "city networks consist of sets of horizontal, not hierarchical, relationships among complementary or similar centres. (Capello, 2007)"

This series of studies was initiated by Camagni from the economic point of view. The logic was that, due to the transformation of behavioural logic of firms from Christaller's territorial logic (agriculture era) to the competitive logic (industrialization era), and finally to the network logic (post-industrialization era), there would be also transformations of spatial organization paradigm in city and city system, from the hierarchy to the specialization and finally to the city network (Camagni, 1993). As he and his colleagues explicated later:

> *"The control of the market of outputs, inputs and innovative assets is performed by the firm, not only in terms of management of a gravity area, but also increasingly in terms of network relationships. The new behavioral logic of the firm parallels and partly determines the new organizational logic of the city system, where phenomena of specialization and networking also appear (Camagni et al., 1994)."*

Table 2- 1 Prediction of the transformation of Paradigm: from City Hierarchy to City Network

		Territorial logic	**Competitive logic**	**Network logic**
Firm	Nature	Local market firm	Export firm	Network firm
City System	Principles	Domination	Competitiveness	Cooperation
	Structure	Nested Christallerian hierarchy	Specialization	City networks
	Network of cities	Hierarchical, vertical networks	Complementarity Network	Synergy networks
Single City	Nature	Traditional city	Fordist city	Informational city
	Form	Relative internal homogeneity	Mono functional zoning	Multifunctional zoning, Policentric city

Source: (Camagni, 1993)

Capello continually pointed out the features of this kind of city network (Capello, 2007):

- "**Urban specializations**, especially in industry but also in service;
- **Incomplete presence of the entire mix of functions** in each city;
- **High-rank functions in lower-order centers**;

- **Horizontal linkages among cities performing similar functions**;
- **Synergies among similar centers** performing advanced production functions and services"

This kind of city network has close relation with the Localization & urbanization economy theories, Industrial district, Spatial spillover theory and etc., therefore distance matters in these researches.

Both definitions of the city network studies do not contradict each other, but they have different emphases. Even the first one would be the base of the second one – it provides source to study the different locations of the same level function. **Finally this study would follow the second definition of city network.**

2.2 The patterns and the conceptual models

2.2.1 Two patterns of city networks and their logics

As Camagni (1993) has defined, there are **two patterns of the city-networks: the complementarity networks and the synergy networks**. Similarly, Meijers referred to the complementarity networks as the "web-type networks", while synergy networks are labeled as the "club-type networks" (Meijers, 2005):

> *"…Complementarity leads to vertical synergy possibly achieved within web-type networks (A typical example is a chain of enterprises or business units each undertaking a certain phase in the production of a product.). Vertical synergy is the surplus value following from agglomeration or specialization effects….Web-type networks are of particular relevance for polycentric urban regions.*
>
> *…Co-operation leads to horizontal synergy possibly achieved in club-type networks…Actors share a common objective, activity or service, while also having parallel interests and transaction chains… Horizontal synergy derives from co-operation leading to economies of scale and so-called positive network externalities."*

Also Capello figured that logic of the city network discarded the principle of economic efficiency (minimization of transportation cost and maximization of the market area controlled from the centre), but presents **the new principles of economic efficiency which originated from the economies of scale and agglomeration economics of cooperative or complementary activities**. And she elaborated that both two types of city networks would achieve the economies of scale and agglomeration economics through different approaches (Capello, 2007):

"The complementarity network consisting of specializaed and complementary centres linked by a set of input-output relations. Sectoral specialization guarantees economies of scale and agglomeration economics even in centres of small size. Examples of this type of urban network are the Randstad in Holland or the Veneto region in Italy;

The synergic network consisting of similar and mutually cooperating centres, and economics of scale are guaranteed by the cooperation network itself, which links the markets of the industrial centres together….Examples of this type of network are financial centres operating worldwide (for example, Zurich, a city of only 300,000 inhabitants, fulfills a function of prime importance to international finance together with megapoloises like New York and Tokyo), or network of cities connected by the religious tourism itineraries created during the Vatican Jubilee celebrations."

2.2.2 The conceptual model of each pattern and the hierarchy of city network

More specifically, the conceptual models were proposed, **concerning the levels of specialized city functions and the rank of cities**.

- According to Meijers (2005), there are 2 preconditions of complementarity: (1) There must be differentiation (specializations) in the supply of activities and/or places; (2) The geographical markets of demand for these activities or places must at least partly overlap. Therefore when different cities (of the same rank or some of them of the lower rank) undertake different tasks/ specialized functions in order to achieve one goal, this study considered **the complementary city-network** exists among them. And the measure of differentiation (specializations) becomes an important task.
- While cities (of the same rank or some of them of the lower rank) share resources, decide and act together in one specific sector, we could consider the existence of **synergic city-network**.
- While **the Hierarchical city-networks**, its mechanism is the provision of goods, service and political control from higher level city to lower level city (central place theory) – the lower level city has lower level function or does not have certain function.

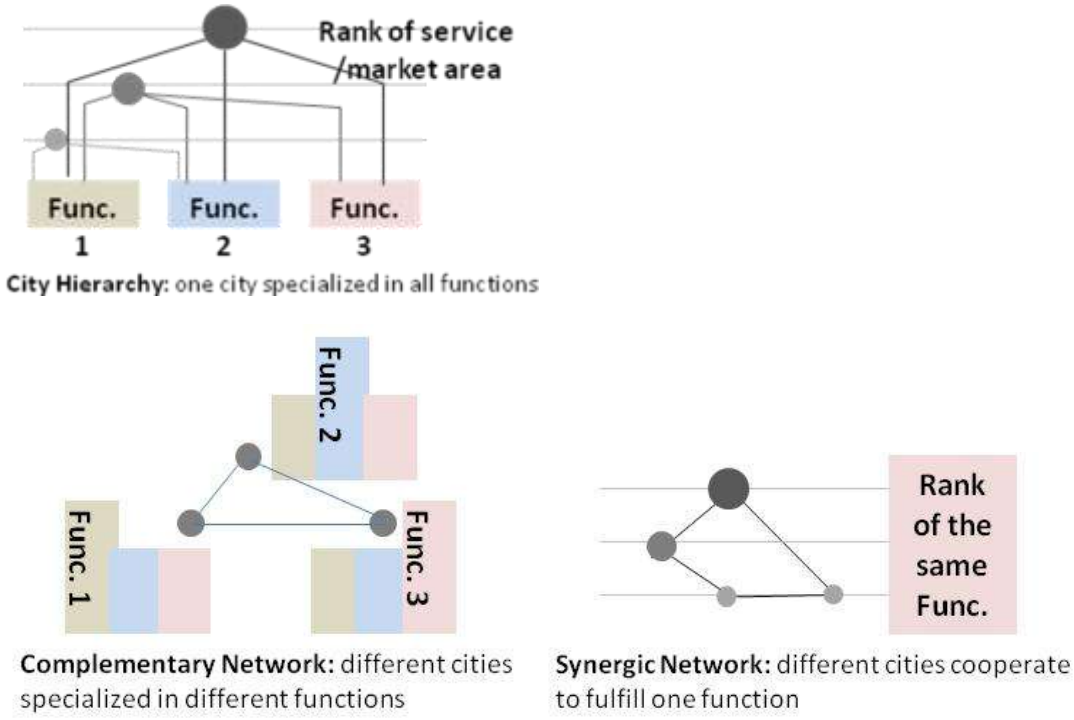


Figure 2- 1 Conceptual models of City Networks

Source: draw by the author

The city network has a complex nature. In fact, as Capineri and Kamann has stated, in real life, networks will have both club-type aspects and web-type dimensions (Capineri and Kamann, 1998), as it is also found in the case of the polycentric urban region of Randstad (Meijers, 2005). And also situations happen that - "in the case of Lombardy, the two typologies – the hierarchical, monocentric one and the network, polycentric one – overlap and combine (Dematteis, 1997)." Therefore, the study considered **the Hierarchy of city-networks model** proposed by Camagni (1993) is very helpful in recognizing different levels of city networks, basing on different hierarchical levels of functions.

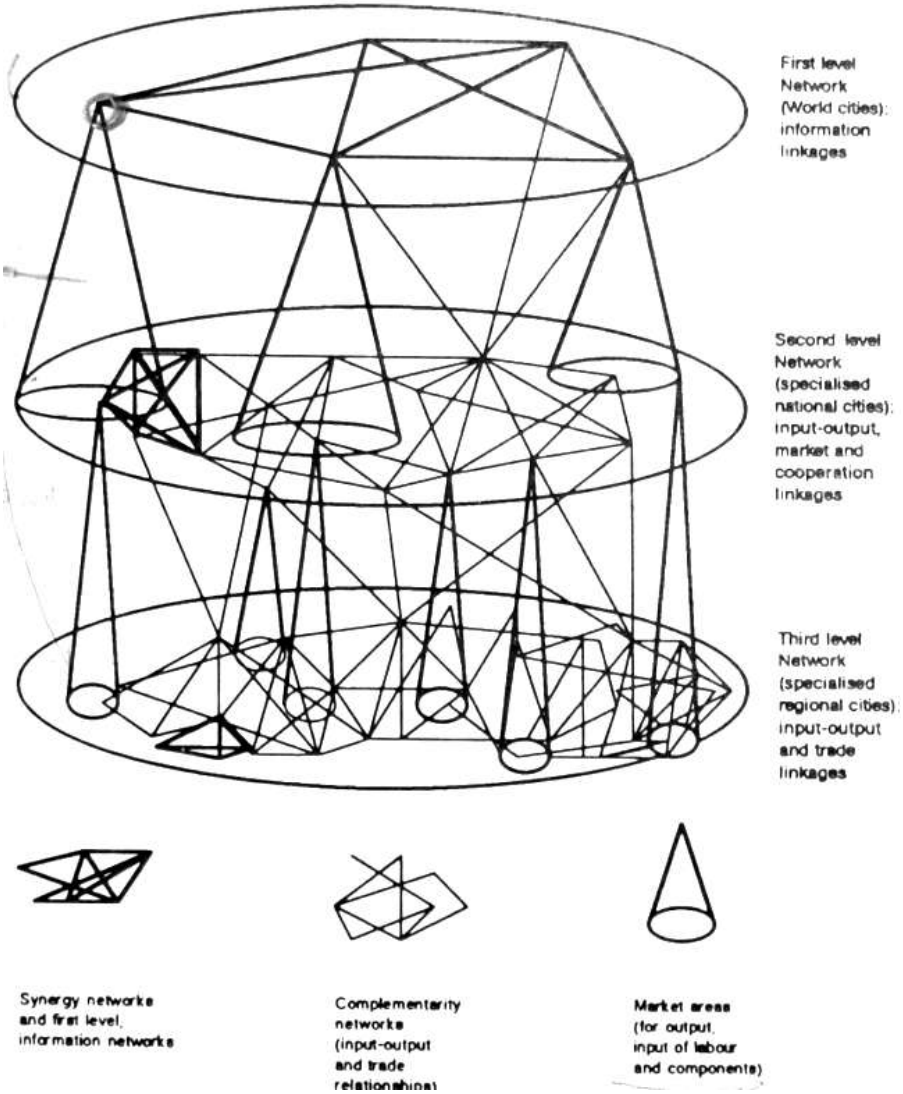


Figure 2- 2 The Hierarchy of city-networks

Source: (Camagni, 1993)

2.3 The structural analysis of networks

Although distance matters in the city network which was talked about by this thesis, it is also useful to look into **the structural analysis concepts** of the scale-free networks. These concepts are originated from the Graph theories and later the Social network analysis, and they could help us recognize the structure of the networks, compare different networks and find out the (strategic) position of certain city in the network.

One of the most important analytical concepts is the Centrality concept, including Degree centrality, Closeness centrality, Betweenness centrality. The thesis would introduce them following "Kite Network" example - developed by David Krackhardt, a leading researcher in social networks.

Diane has the highest Degree centrality in the network, because she has biggest amount of direct links with others. For example she has 6 links while Fernando has 5 links. And in the network which contains in-out relations (someone gives, someone receives), it exists the In-degree and Out-degree concepts. A person or a city holding the highest degree centrality in the network, is the most active member, the "connector"' or "hub" in this network.

Fernando and Garth both have the highest Closeness centrality, in the sense that they have the shortest links (direct and indirect) all together, in order to access all the others in the network – they are close to everyone. They hold a position that more easily to control the information circling in this network.

Heather has the highest Betweenness centrality, because she would have the biggest amount of shortest indirect links – she is a node connecting the 2 parts. She plays a role of "bridge" or "broker", and she hold a position of controlling the source of information from outside. That is what Granovetter said "**weak ties**" (Granovetter, 1973), and what Burt said "**structural hole**" – around Heather, there seems to be a hole in the structure (Burt, 1992).

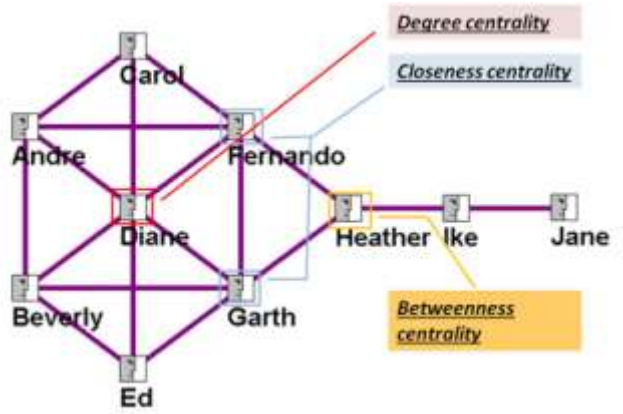


Figure 2- 3 Example for the centrality concepts

Source: (Krebs, 1995-2013)

2.4 The reasons of city-network forming

As we stated in the era when firms have to transfer from controlling the market area to controlling the market share, the economies of scale and agglomeration economics are the key points, to support the specializations in the complementary network, and the synergies in the synergic network. But what still attract scholars' attention is that why certain kind of production factor (capital, labors, natural resources, technology and power) would concentrate in certain kind of territory (especially traditional low rank cities), leading to the specializations and the bases for synergies?

Scholars has pointed out the network and the agglomeration economies as the common-effect of several dimensions. Rozenblat (2010) reorganized Gereffi's (1996) opinion about Global Value Chain and considered that **Economical system, Governance (Intra-firm**

organization) and Territory (Space and Institution) were the formative components of firm network (her first quotation was in 2003). Also, Capello (2009) reviewed the theoretical evolution of the interpretation about the agglomeration economies, and pointed out six interpretations basing on **Industry, Geography and Culture/Cognition dimensions**, finally she emphasized the integrated approach of all three dimensions. City network and firm network share lots of common characters; and it is also related with the agglomeration economies. So the thesis tried to explore the factors leading to the city network in Yangtze River Delta basing these two frameworks.

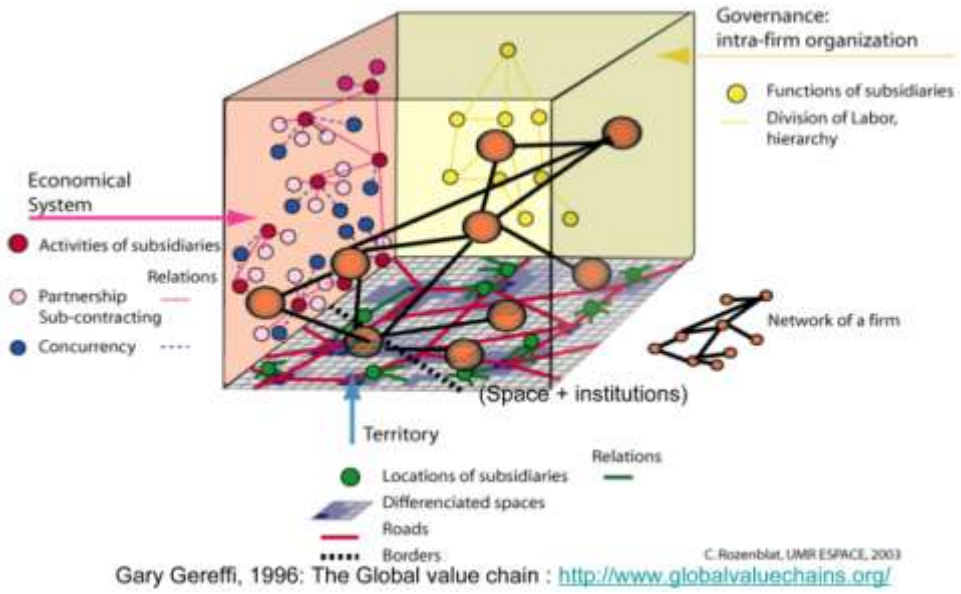


Figure 2- 4 Three dimensions in Firms networks (Global value chain)

Source: (Rozenblat, 2010a) from Gereffi, 1996

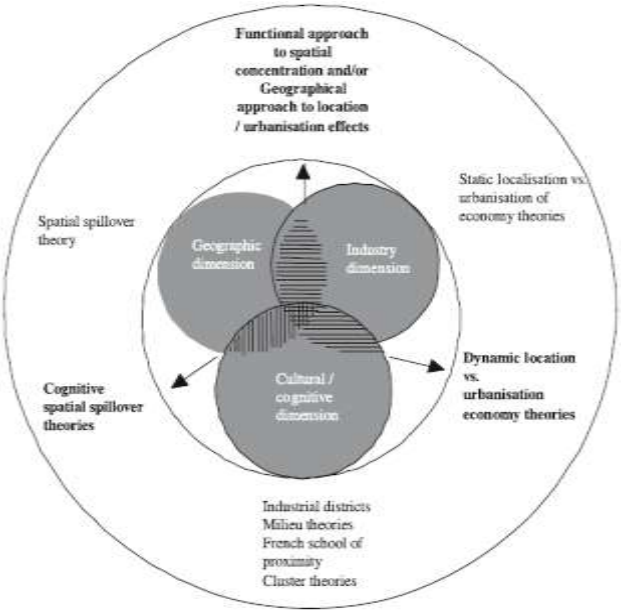


Figure 2- 5 Theoretical evolution in interpreting the agglomeration economies

Source: (Capello, 2009)

The thesis considered it is useful to involve **the Industrial interpretations**, in the sense that:

- the complementarities exist basing on the specializations on certain products on the industrial chain.
- Or all the activities on the industrial chain of certain products were carried out in one certain city, due to the special resources or traditional industries of that city (Path dependence), but complementarities also exist in the sense that different products could belong to the same sector/ company (for example SAINT-GOBAIN company provides glass, gypsum, ceramics, plastics and etc.).
- It would also include the Urbanization economy theories, in the sense that maybe the specializations on certain products are not high in certain cities, but they would also be active in the network.

It would also involve **the Culture/ cognition or what Camagni called "relational proximity"[2] (Camagni, 2003) interpretations**. This dimension of interpretation would mainly include the collective learning, milieum theory and cognitive/relational spatial spillover theories, to explain why the factors would embed in certain territories, and make these territories have high level functions in some aspects.

It would involve the **Governance interpretations**, including the strategies of governments and the coordination of regional actors. Different strategies and coordination (basing on different cognitions), would lead to different results of networking.

Also the **Geographical interpretations** would be a base for explaining the city network, in the sense of topography and gravitational model.

2.5 The corresponding outcomes of city-network

The **corresponding outcomes** of city network would include two aspects: one is related with **the (economic) performance of the cities**, and the other one is related with **the spatial transformation of single city and the cities system**.

Basing on the economic theory, Capello explained the emergence of network advantages and network externalities (Capello, 2000):

> *"network advantage is a real club good, achieved only by those economic actors who are partners in the economic and spatial network and distributed among partners despite the private marginal costs each partner bears in order to participate in the network. In this sense, the private marginal costs of network participation differ from private marginal benefits, and network advantages turn*

[2] Camagni's first proposal about this concept was in 1999.

out to be network externalities, in the real economic sense of the concept (Meade, 1954; Nijkamp, 1977; Scitovsky, 1954).”

With the image below proposed by Capello (2000), readers would recognize that the “open approach”, “organizational changes” and the “seriousness of participation” could be the private marginal costs, and different participation aims – participate in order to achieve efficiency goals, synergy goals and competence – would lead to different costs and benefits (network externalities). Still a question remained that: as for a club good, every member would gain; but actually would the leader gain the most, because it is leading the direction of the club?

Further she carried out the empirical studies and measured the network externalities, basing on World Health Organization members. She pointed out: “ the results of the estimated regression model show that a positive and significant relationship exists between the performance of a city in terms of successful urban policies implemented, and the degree of connectivity.”

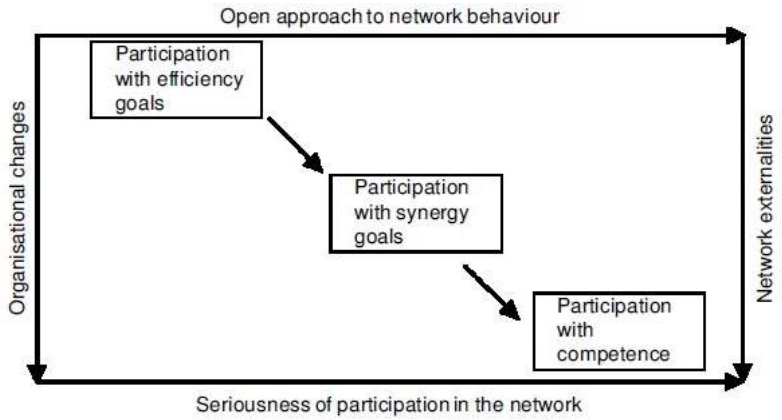


Figure 2- 6 The logical relationship between network externalities, the preconditions for network exploitation and goals for joining the network

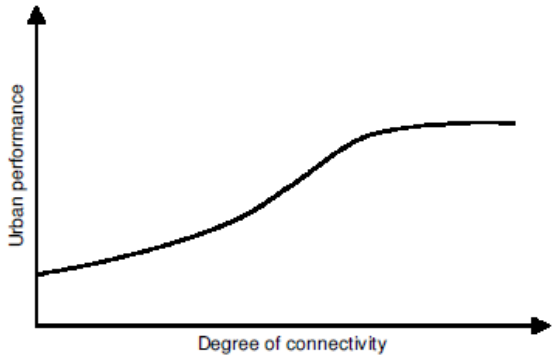


Figure 2- 7 The relationship between urban performance and the degree of connectivity to a city network

Source of Figure 2-6 and 2-7: (Capello, 2000)

Considering **the spatial transformation of the cities system**, it seems that the complementarity is of particular relevance for polycentric urban regions, while the spatial effects of synergy still need to be explored. Considering **the spatial transformation of single city**, it is assumed that the city network would lead to spatial proximity.

2.6 Clarifications of the city-network concept

2.6.1 Form of city network: Cities with similar/equal size and Metropolis-based network

Basing on the Hierarchy of city network model (Camagni, 1993), there are still "market area" relations between the 1st level and the 2nd level networks, and also the 2nd and the 3rd ones. It means the classic hierarchical law still exist, although the horizontal relations among cities of different rank (size) emerged. Cities could have various roles, consisting all 3 level functions, acting on all 3 levels, and if we overlap the three levels, we may find **a network with different city sizes**, with 3 main kinds of relations among them. It is pretty much the reality of a city network. As said also by Dematteis (1997):

> *"Against it (territorial fragmentation), the European Commission (1994, Comité de Développement Spatial, 1996) and some member countries, such as France, recommend the formation of regional networks of small and medium sized cities…. the cohesion of regional urban networks seems difficult to achieve simply by voluntary networking of small and medium sized cities in competition with metropolitan systems. A more practicable and realistic way seems to consist in supporting and managing the present growth of* ***regional metropolitan networked systems****. They would include at least one metropolitan centre (or a potential one) and cities of lower levels, all linked together not only by hierarchical relations, but also by complementary and synergetic ones."*

Therefore, although the classic case of city-networks – Ranstadt region – is composited by cities with similar population scale - Amsterdam has 790 thousand inhabitants, Rotterdam has 616 thousand, The Hague has 502 thousand, and Utrecht has 316 thousand (Statistics Netherlands, 2012), the regions with one metropolitan centre and cities of lower levels are also city-networks. The thesis clarified that **a city-network does not restrict the size of the cities.**

2.6.2 Morphology and function: Polycentricity and City network

The terms of "Polycentricity" or "Polycentric urban region" also used to be confounded with the "City network" concept, both in academic research and also in plans and polices making. As Meijers said (Meijers, 2005):

> *"as the literature on polycentric urban regions is still limited and therefore rather unconsolidated (Bailey and Turok, 2001), a diversity of concepts is applied, which are largely synonymous with the polycentric urban region concept used here. Include 'multicore city-regions' (Westin and Osthol,1994), 'network cities' (Batten, 1995), 'city networks' (Camagni and Salone, 1993) and 'polynucleated metropolitan region' (Dieleman and Faludi, 1998a). In terms of ideas on spatial structure and interurban relationships, the polycentric urban region concept builds on older concepts such as the 'dispersed cit' (Burton, 1963), 'megalopoli' (Gottmann, 1961) or the ideas of Stein and Mumford on 'the regional city' (Stein, 1964).*
>
> *...**planning policy concepts referring to polycentric urban regions often make use of the network metaphor**...**the network metaphor has become part of the standard vocabulary of administrators, planners and other policymakers**...their appearance as planning concepts in planning policies in a wide variety of European countries including Belgium ('urban networks'), Denmark (polycentric 'national centres'), Estonia ('urban networks'), France ('reseaux des villes'), Germany ('Metropolregionen'; 'Stadtenetze'), Greece ('twin poles'), Italy ('city networks'), Ireland ('linked gateways'), Lithuania ('Metropolis Vilnius–Kaunas'), the Netherlands ('urban networks'), Poland ('duopols') and Switzerland ('vernetzte Stadtesystem')...in Flemish Diamond and in the proposals for a new national spatial policy in the Netherlands, the concept of 'urban networks' (for instance, the Randstad region) plays a prominent role."*

Although the "Polycentricity" and "City network" have similarity in the sense that they describe the horizontal relations among cities, but actually they have different theoretical emphases: the **Polycentricity** more emphasizes that the region has several centers that could counter with each other, both in sizes (morphology) and in functions; while the City network on one hand does not restrict the size of the cities (morphology of metropolis-based network or morphology of equal size cities) as said above, on the other hand it emphasizes the complementary or synergic cooperation relations among cities. And extreme case would be: in the central place model, same-order places have similar sizes and functions, they form the

polycentric structure, but they do not form a city network in the sense of specialization and cooperation.

2.7 City network studies concerning Yangtze River Delta

There are a few experts especially concern the city network in Yangtze River Delta, especially Prof. Zhiqiang Wu and his team with the key concept "global region" (Wu, 2002), Prof. Zilai Tang, Miaoxi Zhao and their group concerning the "city network", Prof. Yuemin Ning and his team concerning the "city network basing of the firms ownership", Prof. Zhendong Luo and his group concerning the "functional polycentric structure". The researches about the functional transformation of YRD have been initiated since around 2000 in China, while the researches with regard to the "flow and relational data" have been started since around 2010.

Yu and Wu figured out the distribution of the same level functions – functional structure, basing on the analysis and cluster of the spatial density and the proportions of employments on 15 sectors of 238 county-level administration units (county, central district and county-level city). This study laid the foundations for the researches of policentricity and city network (Yu and Wu, 2006).

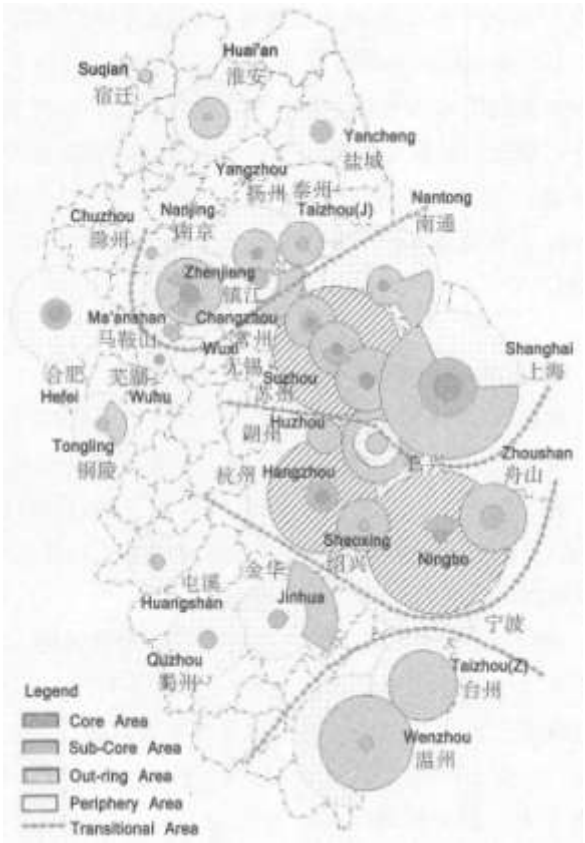


Figure 2- 8 Functional structure of Global Region of YRD basing on employments on 15 sectors

Source: (Yu and Wu, 2006)

Zhao initiated the network study (in the sense of Hall and Taylor's theoretical frameworks) in China, and led the approach of using non-relational data towards the approach of tracing relational data. He and his group studied the evolution (upgrading) of specializations on sectors of Yangtze River Delta cities, the global production layouts of several multinational enterprises and later the firm ownership database of Chinese firms, and pointed out the YRD cities have been more and more integrated into the global network of labor division, basing on the global value chain since 1996 until 2005. In the aspect of advanced producer service, Shanghai has been a significant center and integrated into the global network; in the aspect of high-tech production, Suzhou and Wuxi have been a specialized area; Nanjing, Hangzhou, Ningbo as the sub-centers partly providing the service of global cities; while the rest of YRD cities laid at the bottom of the global productions network. Intercity network in this region has both the hierarchical and territorial properties. And the enterprises are the actors contributing to this network (Zhao, 2010), (Zhao and Tang, 2010), (Zhao, 2011), (Zhao, 2012).

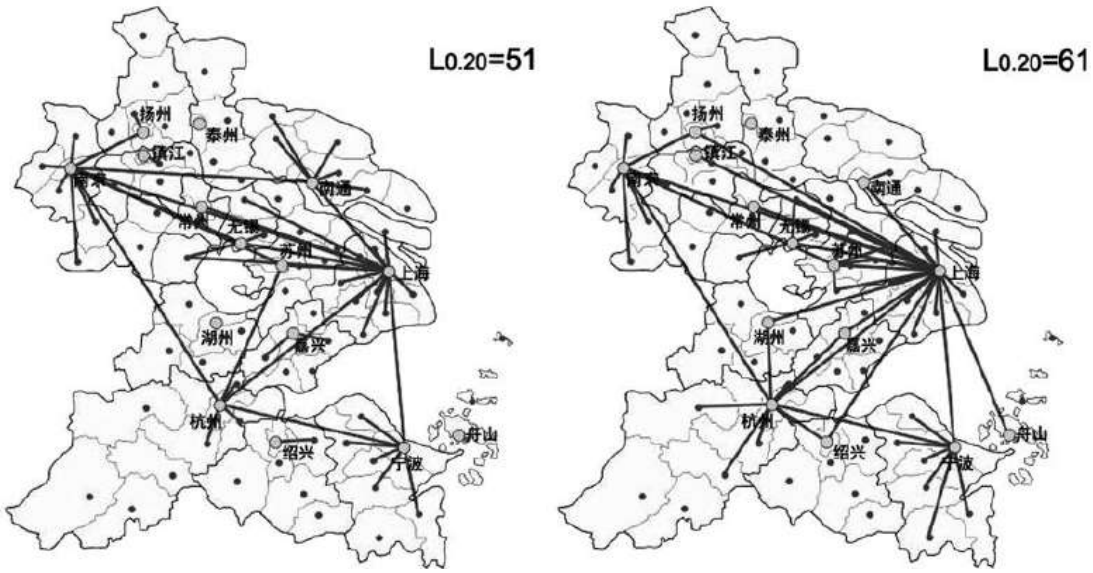


Figure 2- 9 City network (L0,2) in YRD basing on firm ownership 1999 (left) and 2004 (right)

Source: (Zhao, 2011)

Ning and his team carried out wide researches about the locations of Fortune 500 Global, Fortune 500 of the Chinese manufacturing enterprises, listed companies in the Chinese stock market, further the firms of electronic information sectors, advanced producer services, headquarter and research activities, especially focused on the city network basing on firm network (Wu and Ning, 2012), (Li, 2012).

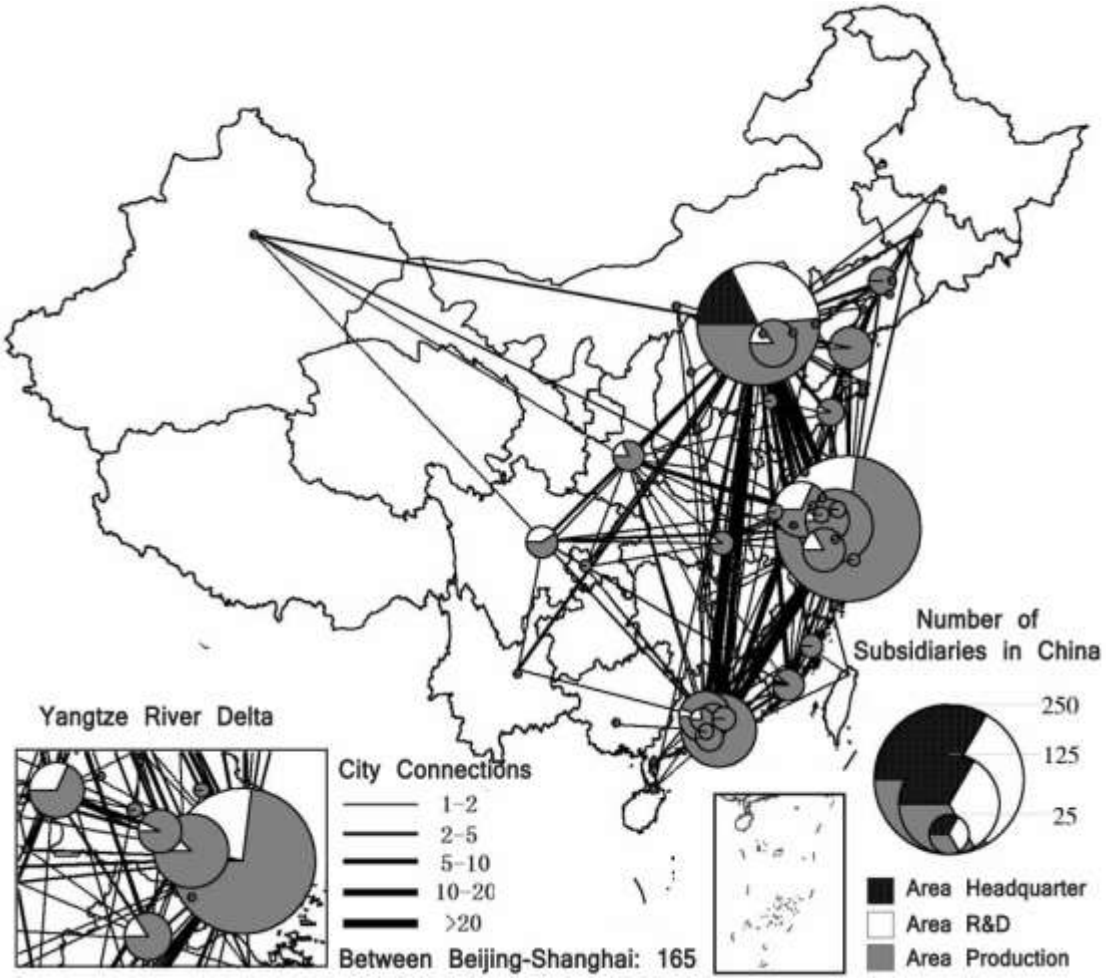


Figure 2- 10 Urban production network based on spatial organization of 42 electronic information enterprises of Fortune Global 500 in China

Source: (Wu and Ning, 2012)

Luo et al. made their effort to sketch the intercity links of YRD basing on the daily frequencies of High-speed train and Bus. The found out that: firstly, the intercity networks of the north wing (Jiangsu Province) with the center of Nanjing and the south wing (Zhejiang Province) with the center of Hangzhou are relatively independent, and Shanghai is the "bridge" for these two sub-networks and the center of the whole structure. Secondly, southern Jiangsu cities (Suzhou, Nantong and Wuxi) emerged as the hinterland or commuter zones of metropolis of Shanghai. And thirdly the hierarchical position of Shanghai and the network of the whole region both have been enhanced.

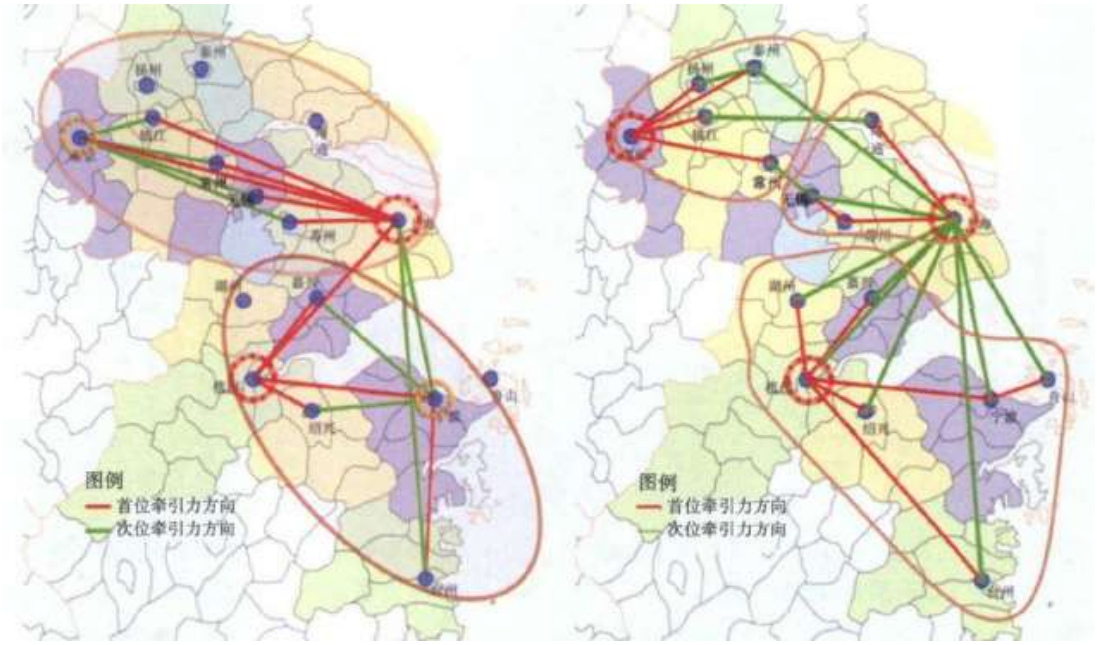


Figure 2- 11 Intercity links basing on High-speed train & Bus daily frequencies in YRD 2010

Image on the left: the primary links (in red) and secondary links (in green) among cities basing on high-speed train daily frequencies; image on the right: the primary links (in red) and secondary links (in green) among cities basing on bus daily frequency.

Source: Luo et al., 2011

Abstract

This chapter illustrated different theoretical dimensions of city network study:

- The city network concept that would be discussed in this thesis does not only refer to the various links among cities, but it more emphasizes the horizontal relationships among complementary or similar centres.
- The conceptual models of complementary network and synergy network were proposed.
- Concepts of network analysis were introduced for helping recognize the positions of cities in the network.
- City network is not determined by single dimension, but multi-dimension including Industries, Culture/ cognition/ relational proximity, Governance and Geography.
- The corresponding outcomes of city network – the presence of network externality.
- The city network could be in the form of polycentric region and also metropolis-based region. The emphasis of this concept is not the scale/ morphology, but the cooperation relations.

CHAPTER 3

METHODS FOR CITY NETWORK MODELING

3.1 Methods for City-network modeling

3.1.1 The approaches dealing with the non-relational data

As Pumain has said, one of the hinders of network research was the scarcity and the high price to acquire relational data (Pumain, 2013). Therefore several approaches were applied to process non-relational data (population, employment, infrastructure conditions and etc.), in order to describe the networks. Pumain mentioned the models such as **Horton's law or accessibility and connectivity indices** in order to describe the hydrographic, transportation or infrastructure networks initiated in 1950s (Pumain, 2013). Also the classic model of **Gravitational model** was widely used in describing the interaction powers (potential energies) between cities.

But both approaches are not able to reveal the cooperation (complementary or synergic relations) among cities. Having the non-relational data, we could only look for the high level functions (for example international functions) in low rank cities, to traced the city network in our sense. Furthermore the study considered the two cases below would be useful.

When describing the "the major Italian Daily Urban Systems (DUS) classified by their degree of integration into global networks", he applied **the comprehensive classification about 3 sets of indicators**: size, specializations and degree of internationalization. And **about the connections among cities, he used the morphologies of settlement patterns**, such as "within metropolitan and upper level functional regions, or within dense and articulated settlement patterns" (Dematteis, 1997).

> *"1. Size of the DUS (Daily urban system) measured in resident population and jobs (1991). The assumption is that network interaction grows with size.*
>
> *2. Economic base specialization of the DUS (1991), measured with location quotients (over 1) in (a) business services, (b) manufacturing industry, (c)*

consumer services (as an indicator of tourist services). The assumption is that network interaction increases with specialization and its importance increases with the quality of activities, in this order: (c), (b), (b and a), (a).

3. The degree of internationalization. The assumption is that network interaction increases with the number of international functions, ranging from 0 to 20, present in the DUS (Bonavero, 1997)."

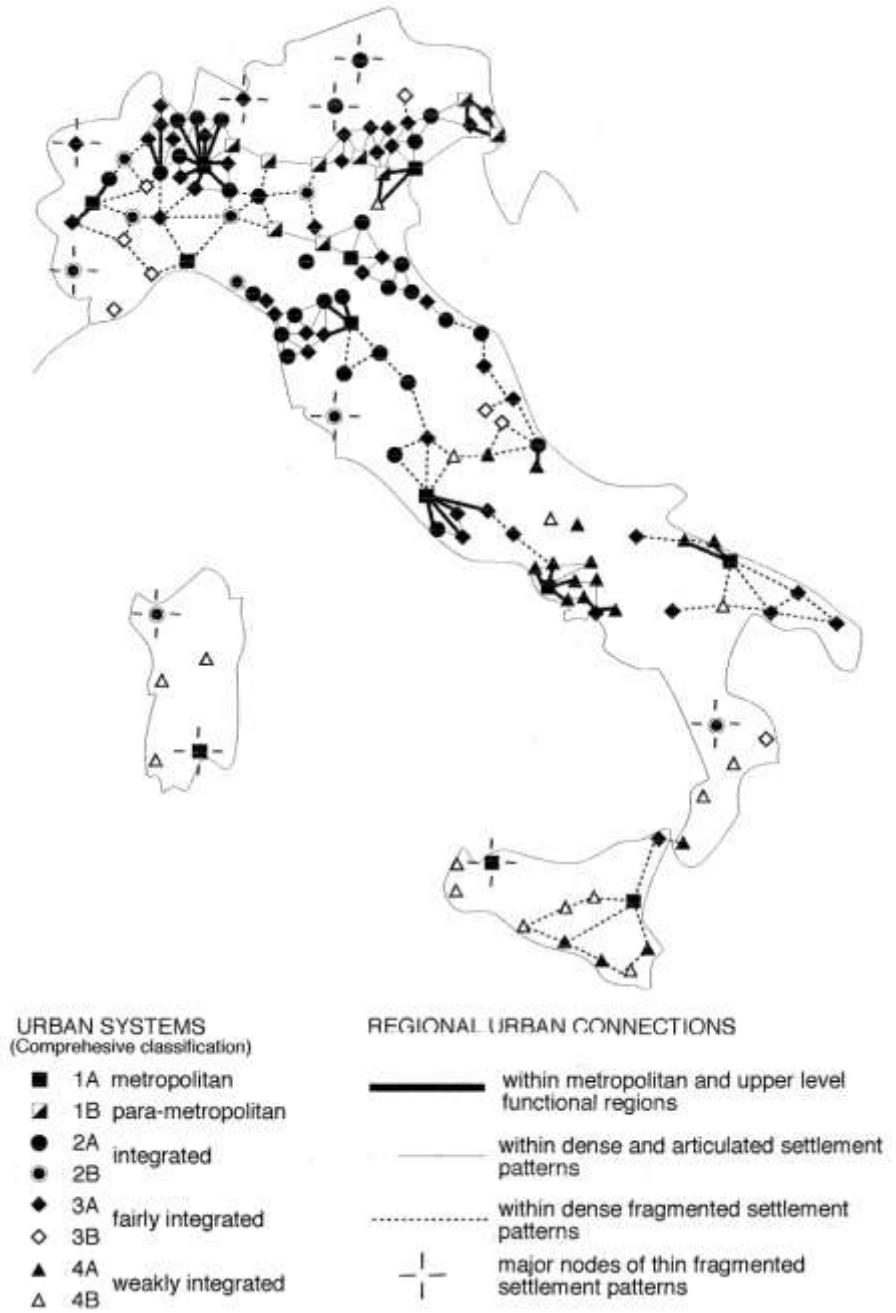


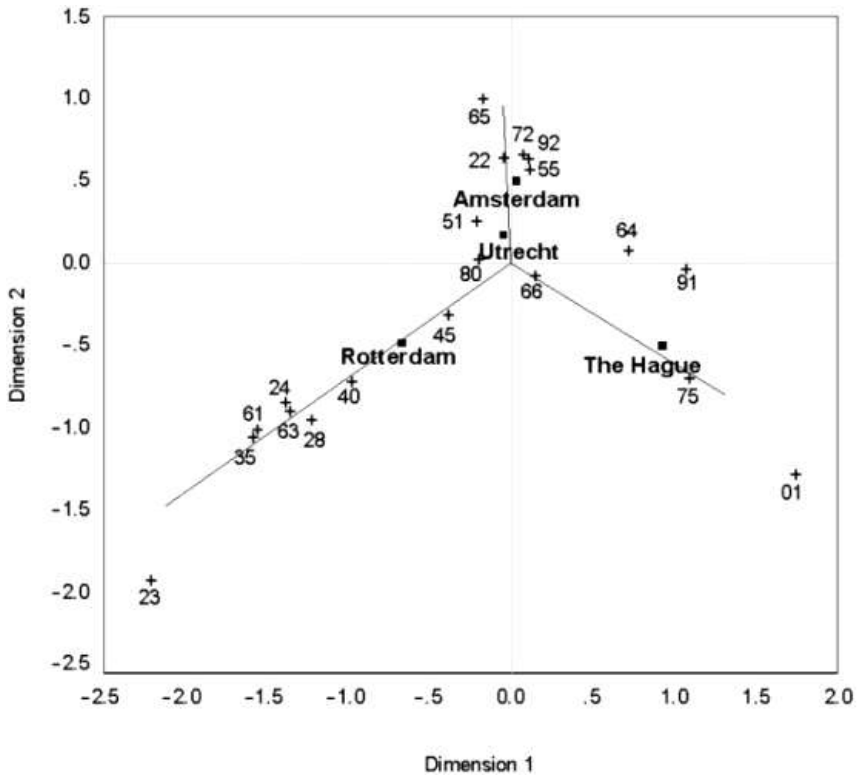
Figure 3- 1 The Position of Italian daily urban systems in the relationship between network interactions and regional interactions

Source: (Dematteis, 1997)

Sometimes the verification the city network has been transferred to the verification of specializations or the complementarities among cities, then the statistics approaches such as **Factor analysis, Cluster, Correspondence analysis** have been applied. Just as the case proposed by Meijers, he used the "correspondence analysis" to reveal the complementarities among main Randstad cities, and the evolution of complementarities (change of standardized Total Inertia) during 1996 – 2002 (Meijers, 2005).

> *"We used a data-set derived from the National Information System on Employment (LISA) database. This database is a registration of all the establishments in the Netherlands, including government and non-commercial organizations. An establishment in this database is defined as a location of a firm, organization, institution or independent profession in which or from which an economic activity or independent liberal profession is being practiced by at least one employed person.*

...Amsterdam has a relatively dominant position in the commercial services sector; Rotterdam holds a strong position in manufacturing and transport; Hague is particularly dominant in public administration, and it has a position in agriculture; while Utrecht has a more general and average profile and is, therefore, located closer to the origin. Still, Utrecht's economic profile is more similar to that of Amsterdam than to the other cities."



Key

01	Agriculture, hunting and related service activities	61	Water transport
22	Publishing, printing and reproduction of recorded media	63	Supporting and auxiliary transport activities; travel agencies
23	Manufacture of coke, refined petroleum products and nuclear fuel	64	Post and telecommunications
24	Manufacture of chemicals and chemical products	65	Financial intermediation, except insurance and pension funding
28	Manufacture of fabricated metal products	66	Insurance and pension funding
35	Manufacture of other transport equipment	72	Computer and related activities
40	Electricity, gas, steam and hot water supply	75	Public administration and defence; compulsory social security
45	Construction	80	Education
51	Wholesale trade and commission trade	91	Activities of membership organisations n.e.c.
55	Hotels and restaurants	92	Recreational, cultural and sporting activities

Figure 3- 2 Correspondence analysis approach applied on Randstad cities

Source: (Meijers, 2005)

3.1.2 The approaches dealing with the relational data

When the relational data (commuters, traffic flow, Maritime flow, phone connections, IP links, and firm ownership) would be available, the description of city network becomes more tangible. Cases could be traced from "SE England commuting 2001" (Hall and Pain, 2006), "Intra-European IP links" (Nijkamp and Tranos, 2007) and various cases about maritime links and firm ownership links (Rozenblat and Melançon, 2013). Especially the case below is instructive to the study of city network in our sense.

Utilizing the telephone flow data 1990 of the Milan compartment (covering the whole territory of Lombardy administrative region), Camagni, Diappi and Stabilini elaborated the existence of network relations in Lombardy region in two spatial contexts: within the metropolitan area of Milan, the "synergy networks" occurred among similar centres performing headquarter and advanced production services functions, and it implies a polycentric structure; within sub-regional industrial districts, mainly "complementarity network" and "milieu" type of interactions are revealed (Camagni et al., 1994).

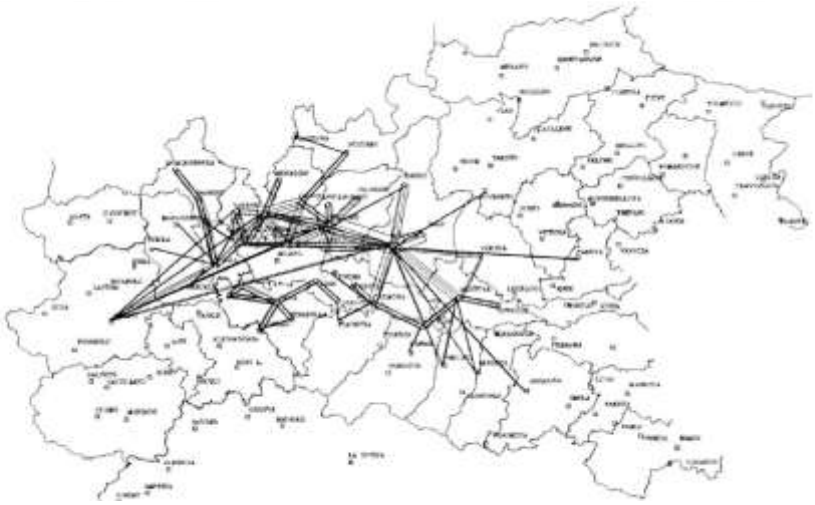


Figure 3- 3 Macro-level telephone flows in the Po Valley

Note: interactions with Milan are not shown, in order to avoid hiding the underlying structure of interactions.

Figure 3- 4 Micro-level (inter-sector) telephone flows in the Po valley, representing a metropolitan network around Milan

Figure 3- 5 Networks in Lombardia appear to link to industrial districts or metropolitan synergies

Source of Figure 3-3, 3-4 and 3-4: (Camagni et al., 1994)

Still some city networks are difficult to be quantized, especially for some synergic network - the formal and informal frameworks for regional issues and developments. In the research about the participation willing, cost, benefit to the World Health Organization carried out by Capello, she adopted the approach of the **questionnaires** to collect information.

3.1.3 The analytical and visualization software

Having the relational data, we would have a matrix describing the interactions among actors. The **Social Network Analysis software – UCINET** is very useful for acquiring the centrality (degree centrality, closeness centrality and betweenness centrality) information, making statistics on these information, and visualizing them.

In recent years, the software of **TULIP** presented its powerful capability in the analysis and visualization of relational data. Having origins and destinations, it does not need a matrix to process a network, which eases the tasks of the researchers. It has also advantages in making more vivid images, dealing with bigger amount of information and associating with real maps (with the coordinates of cities).

3.2 The firm ownership approach for exploring the city network

3.2.1 Firm ownership network applying on different levels of urban and regional studies

Among various approaches for exploiting the city network, the firm ownership and structure approach is a very useful one.

- Firstly, the informational flow and communication flow are difficult to be acquired, and the financial, labor, and commuter flow need deeper survey to define their origins and destination, while firm ownerships and functions (activities) of firms could be easily acquired from the various sources (for example the Annual Reports of the quoted companies, the websites of other companies, or some databases).
- Secondly, the firms provide a bridge connecting cities and functions (activities). The inter-firm linkages or intra-firm linkages, activities in the same sector or different sectors help the researchers explore the complementary or synergic relations in different territorial scales (Rozenblat, 2010a), while the other flows mainly represent the structure, but not those mechanisms of cooperation.
- Especially because of the richness of the data – inter-firm/ intra-firm, sectors, activities, hierarchy of the enterprises, it becomes possible to inquire the phenomena about cities on different levels within different scientific fields and different theoretical instructions: on the Macro level (international, national and regional), the City systems could be studied according to the relations among cities; on the Meso

level, the Cities or Clusters/districts could be explored according to the agglomeration of firms within the territory; on the Micro level, the relations among Agents or of Agents (companies' strategies, social network, personal network and etc.) could be inquired (Rozenblat, 2010a) (Rozenblat, 2010b).

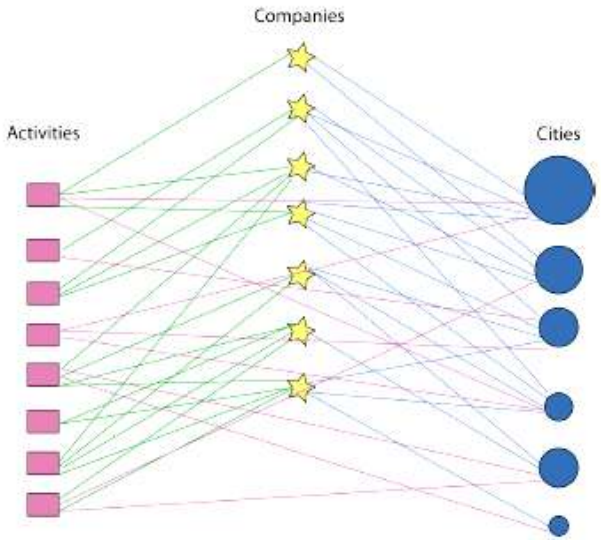


Figure 3- 6 Firms provide a bridge connecting cities and functions (activities)

Source: (Rozenblat, 2010a)

Table 3- 1 Network Processes According To Urban Levels

Levels	Types of networks	Dominant fields	Main theory	Concepts or processes	Main authors
Macro	inter-firm	Geography, Regional science	Localization	Spatial transaction costs	Weber (1909), Isard (1951)
	intra-firm		Globalization	Competitiveness, Complementarity	Pred (1974, 1977), Friedmann (1986), Hall (1986), Taylor, Derudder, Witlox (2000), Rozenblat, Pumain (1993, 2007), Kratke (2007), Wall (2009)
Meso	inter-firms	Economy, Regional science, sociology	Spatial endogenous development	Agglomeration economies	Marshall (1920), Ohlin (1933), Hoover (1948), Krugman (1993), Fujita (1998), Henderson (1988), Glaeser (2000), Camagni (2002), Duranton & Puga (2004), Capello (2001, 2009)
			Regulation	Districts, Clusters	Becattini, Bagnasco (1987), Porter (1998, 2004), Enright (1998, 2003)
Micro	intra and inter-firms	Sociology, Political economy, Management, communication	transactional costs	Contracts, bounded rationality, opportunism	Coase (1937), Williamson (1975), Zajac & Olsen (1993),
			Social networks	Social network structures. embeddedness	Granovetter (1973, 1985), Burt (1982, 1992, 2005), Powell (1990), Grabher (1993), Uzzi (1996), Walker et al. (1997), Gulati et al. (2000), Monge & Contractor (2003)

Source: (Rozenblat, 2010b)

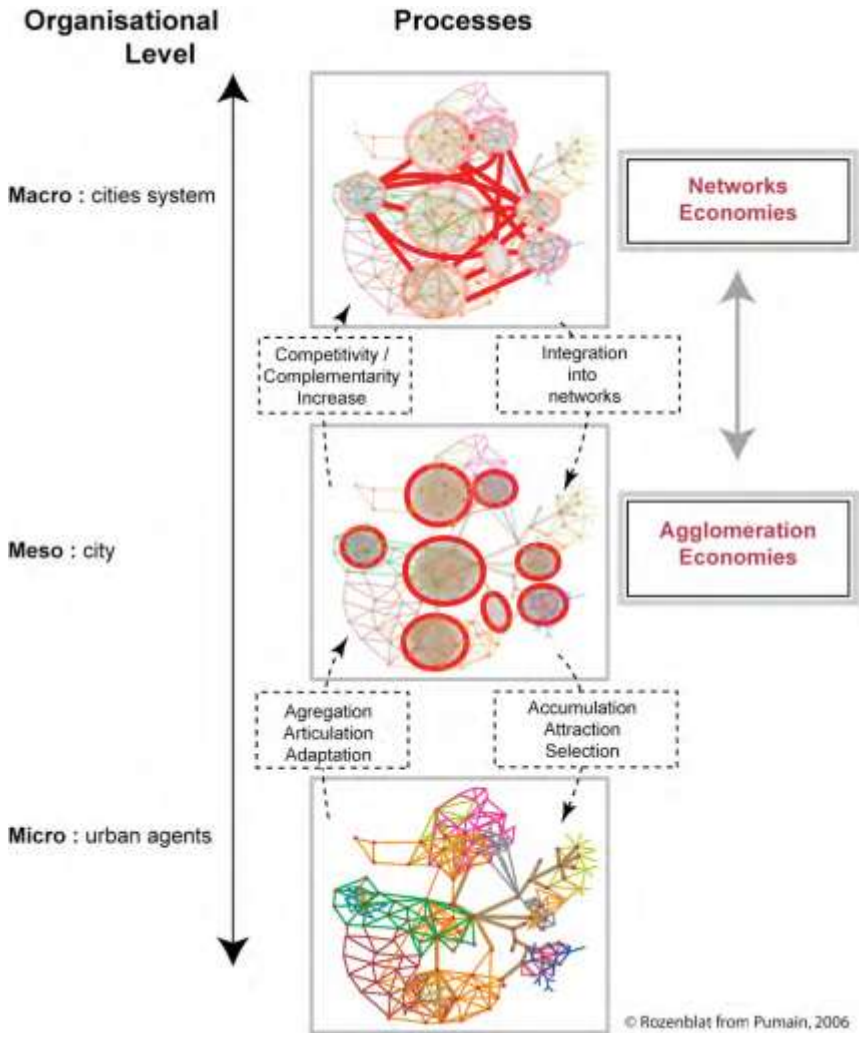


Figure 3- 7 City network process

Source: (Rozenblat, 2010a)

3.2.2 Deeper exploration of firm networks: Main function of the firms, Levels of subsidiaries

As Duranton and Puga has argued, cities are increasingly distinguished by their functional specialization rather than by their sectoral specialization (DURANTON and PUGA, 2001). Therefore it becomes important for this study to classify the functions of the firms, instead of the sectors[3] on which the firms work, in order to inquire the complementary or synergic relations among cities. Actually the city network studies basing on the complementary or synergic firm-functions are not a lot.

- Rozenblat and Pumain have classified eight principal types of firms: "Production", "Research, production, distribution", "Finances", "Sub-headquarters", "Distribution", "Production and distribution", "Research", "Unknown" (Rozenblat and Pumain,

[3] In Europe the NACE codes are applied to classify sectors. One-digital, two-digital, three digital and four-digital are applied in order to recognize different detail degrees of the sector activities.

1993), among which four functions are carried out: decision (strategy making/ management), research, production and distribution.

- Also Porter's Value Chain (Porter, 1985) is useful for this study to classify the functions of the firms, the author extracted 7 functions (figure below), to carry out the exploration of this research.

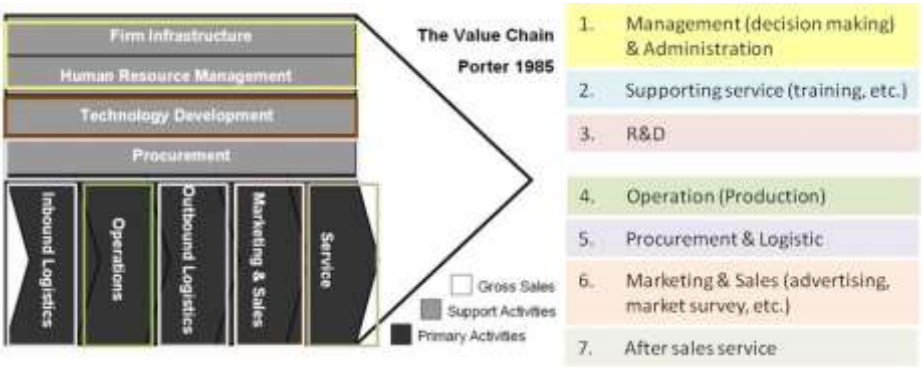


Figure 3- 8 Seven functions extracted from Porter's Value Chain

Source: (Porter, 1985), organized by the author

Further **the levels of subsidiaries** are defined. This concept is different from the hierarchical structure of the enterprises: for example some subsidiaries are on lower position in the hierarchy than the (regional) headquarter, but they actually work with the headquarter on the same controlled market, then these subsidiaries should be on the same level with the regional headquarter, in order to describe the complementarities among cities. Therefore this study defined: if the firms/subsidiaries work on the global continental market (for example headquarter of enterprise and the headquarter of a specific product, they both work on the global level), they are on the 1st level; if the firms/subsidiaries work on the national/ regional market, they are on the 2nd level; if they work on the city/ local market, they are on the 3rd level.

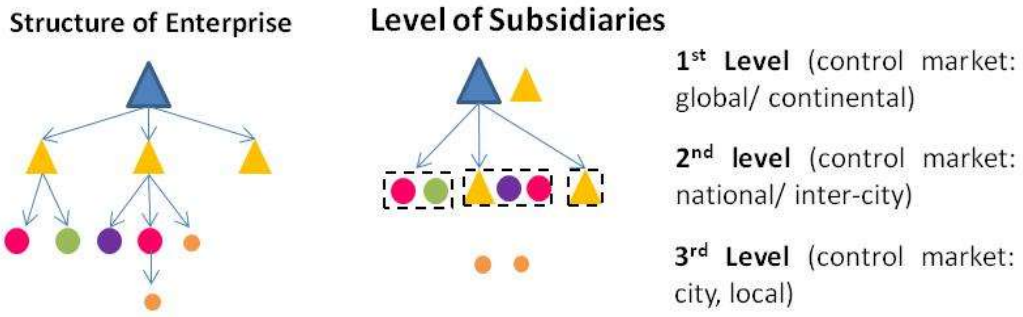


Figure 3- 9 From Structure of enterprise to the levels of subsidiaries basing on the controlled market

Source: draw by the author

3.2.3 From firm ownership to territorial structure

Having the firm ownership data, there are different logics in building the networks, and they would influence the analyses of the result of territorial structure. A traditional one would be the calculation and presentation of the amount of firms/ functions/ hierarchical functions (see for example Rozenblat and Pumain, 1993), it would describe the hierarchical structure of a territory; the hypothesis utilized by Gawc group maximized the potential interactions (Typelogy II), and it is a presentation mixing different levels of networks; the centralized power hypothesis without having several hierarchical levels of the firms was also applied (Typology III), it mainly describe the hinterland of the cities where the headquarter locates; while Rozenblat proposed the decentralized power hypothesis, which could be able to sketch all of the other 3 scenarios, and it would describe city network by different hierarchical levels.

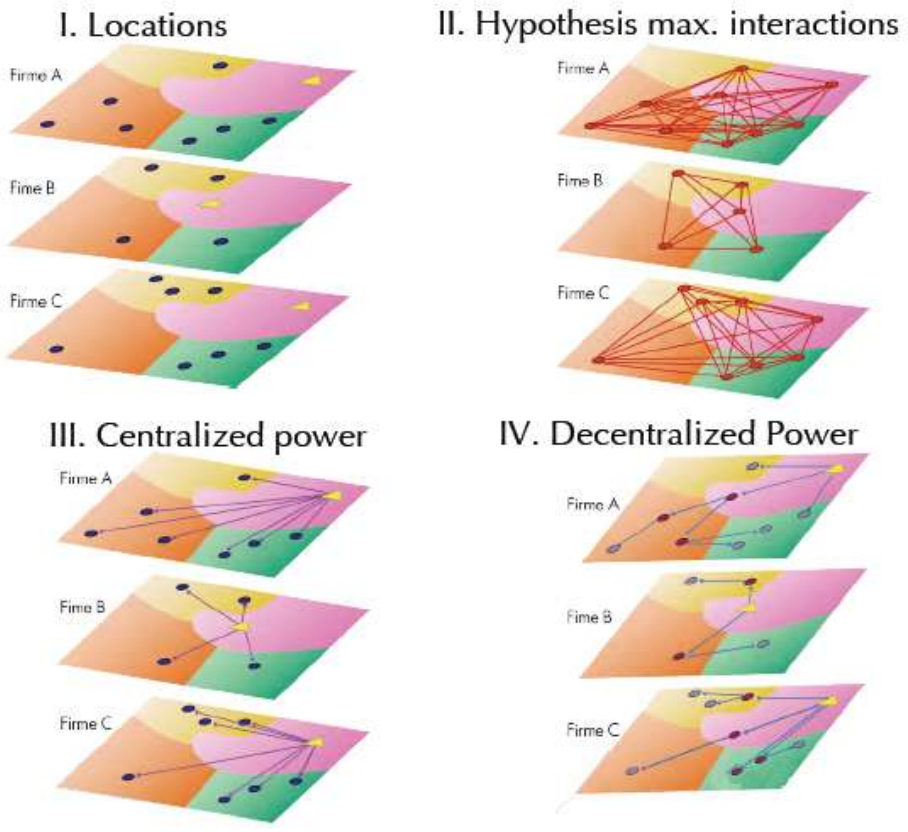


Figure 3- 10 Logics of building firm networks and their capabilities to describe the territorial structure

Typelogy II: Gawc Hypothesis; Typology III: Alderson & Beckfield, 2004, 2010

Source: (Rozenblat, 2010a)

Abstract

This chapter dealt with methods for network modeling:

- Gravitational model as the most important one in dealing with non-relational data, also the correspondence analysis was utilized in revealing the complementarities of cities.
- Firm ownership approach provides the source for (city) network study
- The Social network Analysis (with Software "UCINET") and Software "TULIP" presented their advantages in analyzing and visualizing the relational data about networks.

PART II *The Empirical Studies*

CHAPTER 4

THE CURRENT CONDITIONS AND RANKS OF YANGTZE RIVER DELTA CITIES

4.1 Administration levels and general information

The studied area is composed by 22 prefectural level cities, among which there are 10 prefectural level cities of Jiangsu Province (the whole Jiangsu Province has 13 prefectural level cities), with the capital city of Nanjing; 9 prefectural level cities of Zhejiang Province (the whole Zhejiang Province has 11 prefectural level cities), with the capital city of Hangzhou; 2 prefectural level cities of Anhui Province (the whole Anhui Province has 16 prefectural level cities), with the capital city of Anhui and city of Shanghai as Provincial Municipality. The different administrations implied the challenges in regional governance. Table below explicated the information of 22 cities on 2010. They are various in territorial area, residential population and urban development stage. But except city of Quzhou, the urbanization ratio of all other cities has exceeded the national average of 50%, which implied a new step of city development – the developing model is going to be transformed from single city development towards the regional or city aggregation development.

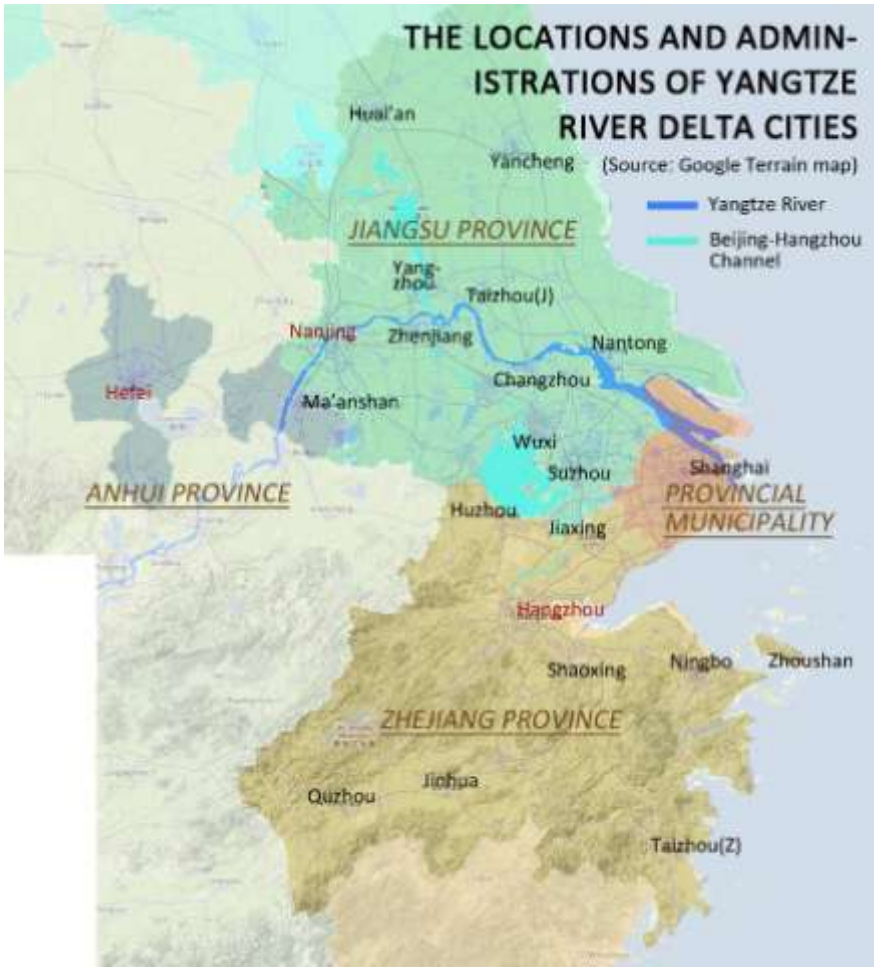


Figure 4- 1 The locations and administrations of Yangtze River Delta cities

Source: Google Terrain map, organized by the author

Table 4- 1 General information about Yangtze River Delta cities on 2010

City name	Administration level	Territorial area (km^2)	Residential population (Million)	Urbanization ratio (%)
Shanghai	Provincial municipality	6340	23.0	89.0
Nanjing	Prefecture-level cities, Capital of **Jiangsu Province**	6587	8.0	77.9
Wuxi	Prefecture-level cities in **Jiangsu Province**	4627	6.4	70.3
Changzhou		4372	4.6	63.2
Suzhou		8488	10.5	70.0
Zhengjiang		3847	3.1	62.0
Nantong		8001	7.3	55.8
Yangzhou		6591	4.5	56.8
Taizhou(S)		5787	4.6	55.6
Yancheng		16972	7.3	52.0
Huai'an		10072	4.8	50.8
Hefei	Prefecture-level cities, Capital of **Anhui Province**	7047	5.7	68.5
Ma'anshan	Prefecture-level cities in **Anhui Province**	1686	1.4	69.1

Hangzhou	Prefecture-level cities, Capital of **Zhejiang Province**	16596	8.7	73.3
Jiaxing	Prefecture-level cities in **Zhejiang Province**	3915	4.5	53.3
Huzhou		5818	2.9	52.9
Shaoxing		8279	4.9	58.6
Ningbo		9816	7.6	68.3
Zhoushan		1440	1.1	63.6
Taizhou(Z)		9411	6.0	55.5
Jinhua		10941	5.4	59.0
Quzhou		8841	2.1	44.1

Notes: this thesis adopts the statistics of the whole territory, instead of the central urban area; it adopts the residential population, instead of registered population (see Appendix I).

Source: (Shanghai-Bureau-of-Statistics, 2011), (Jiangsu-Provincial-Bureau-of-Statistics, 2011), (Zhejiang-Provincial-Bureau-of-Statistics, 2011) and (Anhui-Provincial-Bureau-of-Statistics, 2011), organized by the author.

4.2 Orography and three sub-territories

The whole territory of Yangtze River Delta is articulated by three orographies (Figure below), which basically configured the infrastructural, developing condition, cultural and economic conditions of this region and formed three sub-territories.

- The first orography is **the alluvial plain**, surrounding the Taihu Lake and in southern Yangtze River, which includes Shanghai, the south part of Jiangsu Province and the north part of Zhejiang Province (orange frame).
- The second orography is **the mountain-hill area** in southern of Zhejiang Province (green frame).
- The third is **the plain** to the north of Yangtze River (red frame).

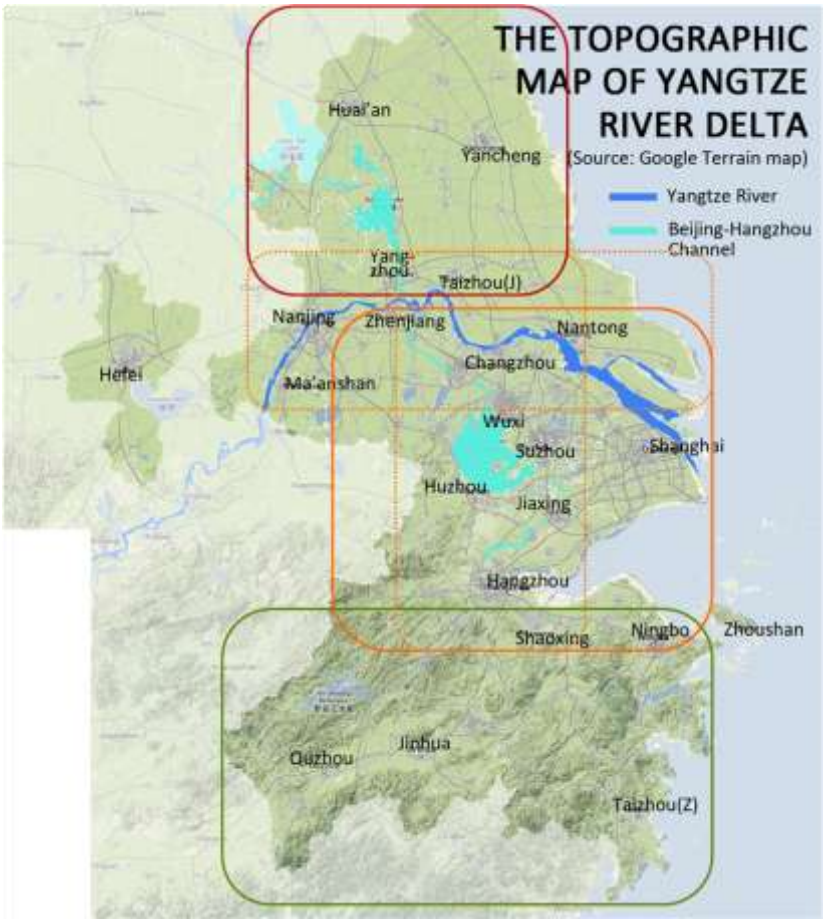


Figure 4- 2 Orographic map of Yangtze River Delta

Source: Google Terrain map, draw by the author

The first sub-territory is the alluvial plain, which especially include the cities around Taihu lank and Beijing-Hangzhou canal and the cities along Yangtze River.

- In the historical perception, the most important network was the internal canals and lakes connecting all the cities (Ningbo, Hangzhou, Jiaxing, Huzhou, Suzhou, Wuxi, Changzhou, Shanghai) settling in the alluvial plain and along with the cities (Yanghzou, Zhenjiang, Taizhou) on the Jinghang Grand Canal (as the most critical national transportation channel connecting north and south from Beijing to Hangzhou with the length of 1794km and dated back to 486 B.C.) comprising a homogeneity economic region in strict and traditional sense. Although this traditional network nowadays doesn't play the key transportation role (the interior navigable course is about 1440km) currently, it transformed into another form of cooperation and competitions between these cities basing on the historical-cultural resources integrated in the Grand Canal for conservation, exploitation and tourist development.
- In the culture and economy senses, because the canals and lakes traditionally comprise a homogeneous economic area (Ningbo, Hangzhou, Jiaxing, Huzhou,

Suzhou, Wuxi, Changzhou, Shanghai), not only the economic base, but also the dialects and customs of those cities are approximate, which make the knowledge and policies easily to spread, and it is especially important in the post-modernization world. While the southern mountain-hill area and the northern plain area have different type of language and cultures. Therefore the 2 important economic developing models are associated with the orographical varieties: Sunan model and Wenzhou model.

- Sunan (Southern Jiangsu) model and Wenzhou model. Sunan model was originated from Taihu lake area around 1980s. At that time the manufacturing was mainly carried out in cities and by the state-owned enterprises, while the villages and countryside in Southern Jiangsu opened the collective-owned enterprises, and the incomes fed back to villagers or village constructions. It is an approach that the industrialization was firstly achieved, and the marketization followed (later most of these collective-owned enterprises have been privatized, the percentage of collective-owned enterprises dropped from more than 70% in 1985 until around 1% in 2010).
- The cities in Jiangsu Province allocate their ports along the Yangtze River and conveniently reach westward its hinterland of Inland China, because Yangtze River is the principle interior shipping tunnel and also is considered as the very important dynamic axis for the whole territory.

The second sub-territory is the mountain-hill area in south of Zhejiang Province.

- The infrastructure condition was restricted, because of the high construction costs of express/high way or railway, resulting its weak connections with the other orographies and also its interior mobility.
- The consideration to balance the overall proportions between constructed areas and agricultural lands in Zhejiang Province make the northern Zhejiang, where is actually the alluvial plain, constrain its construction land.
- The southern locates more international ports with the throughput numbers over 10 million TEU/year, including Port Shanghai, Zhoushan and Ningbo because of their strategic locations and better natural conditions of water depth (although Shanghai and Ningbo also belong to the alluvial plain), while the coast of Jiangsu Province is not well exploited.
- The other economic model of Wenzhou model prevailed in the southern Zhejiang mountain-hill area in 1990s, where does not have large agriculture land, therefore the small and micro private enterprises have become the dominating economic forms, and the cooperations, especially the financial debits and credits, are very active among

these small enterprises. Compared with Sunan model, the disadvantage would be the path dependency on the low-tech industries.

The third sub-territory is the plain in north of Jiangsu Province, where embrace vast agriculture lands.

4.3 The infrastructures, distances and time cost: from main traffic axis to a network

Infrastructures as the physical channels are the inseparable elements corresponding to the development of the city network. Some cities have increased their connections after the completion of new infrastructural constructions, while in the other cases, because of the close relationship between cities, new infrastructural construction is initiated.

1. Airports

Airports hint the functional (international functional) areas for more convenience and easiness to allow the cities connecting with the national and international cities. According to the report by "The Civil Aviation Administration of China (CAAC)", in YRD Region in 2010, there have been 14 civil aviations (Figure below), more in detail 6 of 10 prefectural level cities of Jiangsu Province, 5 of 9 prefectural level cities of Zhejiang Province, 1 prefectural level city of Anhui Province are equipped with airport, and Shanghai posses two. Concerning the international airports, Shanghai have two, and Nanjing, Wuxi, Hangzhou, Ningbo, Yiwu (Jinhua) and Hefei have one respectively. The situation confirmed the fact that these cities have the closest connections within the city networks of YRD Region.

2. Ports and Shipping

The shipping on Yangtze River is the most traditional and important transportation mode, while in recent years the ocean shipping is growing rapidly in Shanghai, Ningbo and Zhoushan equipped by the international ports as the extension of interior river shipping. The connections among the cities along Yangtze River and the east coast could be interpreted by the distributions of ports. And they even potentially affected the earliest formation of the highway in the shape of "Z" in the territory.

3. Highway

Highway as the connecting channel is functioning notably in the YRD Region. Before 2000, the specialization of the cities was not so obvious and their networking was still weak in the functional aspect. Basing on the "Z" shape highways 2000, the urban economy and connections developed dramatically and until 2010, the closest urban connections were absolutely relying on the "Z" shape highways.

4. Railway (High speed lines)

The construction of high speed railway changed the structure of transportation connections again. After the completions of high speed railways between Shanghai and Nanjing and Shanghai and Hangzhou, the "Z" shape infrastructural and regional structure was got rid by another high speed railway connecting Nanjing and Hangzhou completed in 2013, which integrated the territorial core cities together. And this area is the first area in China where the high speed lines have connect as a network, while the other parts have only the main line and sub-lines structure. However considering the short period after realizing the high speed railways, their affects towards city network still need further verifications.

Figure 4- 3 Airports in Yangtze River Delta by 2010

Source: CAAC, 2011, draw by the author

Figure 4- 4 The Highway and the Ordinary Railways on 2000

Source:(Wang and Huang, 2010)

Figure 4- 5 The Highway, Railways (high speed and ordinary lines) and the Ports

Source: draw by the author

Figure 4-6 below showed the accessibility of Shanghai based on the highways in range of 0.5 hour, 1 hour, 3 hours, 4 hours and 6 hours, and the range of 3 hours by automobile from Shanghai reaching Nanjing, Yanghzou and Ningbo critically comprised the "daily communication area" (the possibility of doing a round way in one day) (Wang et al., 2001), and it implicated the direct hinterland of Shanghai or the traffic integration are with Shanghai. Figure 4-7 illustrated the accessible area of Shanghai basing on the high speed trains.

Table 4- 2 Distance and time cost of automobile travels between cities

		Distance (km)	Time Cost by highway (hours)	Time Cost by High speed trains (hours)
Westwards	Shanghai - Nanjing	302	3h 18min	1h 58min
	Shanghai - Hefei	482	5h 8min	3h 1min
Northwards	Shanghai – Huai'an	426	4h 36min	--
Southwards	Shanghai-Hangzhou	177	2h 5min	1h 4min

Source: organized by the author

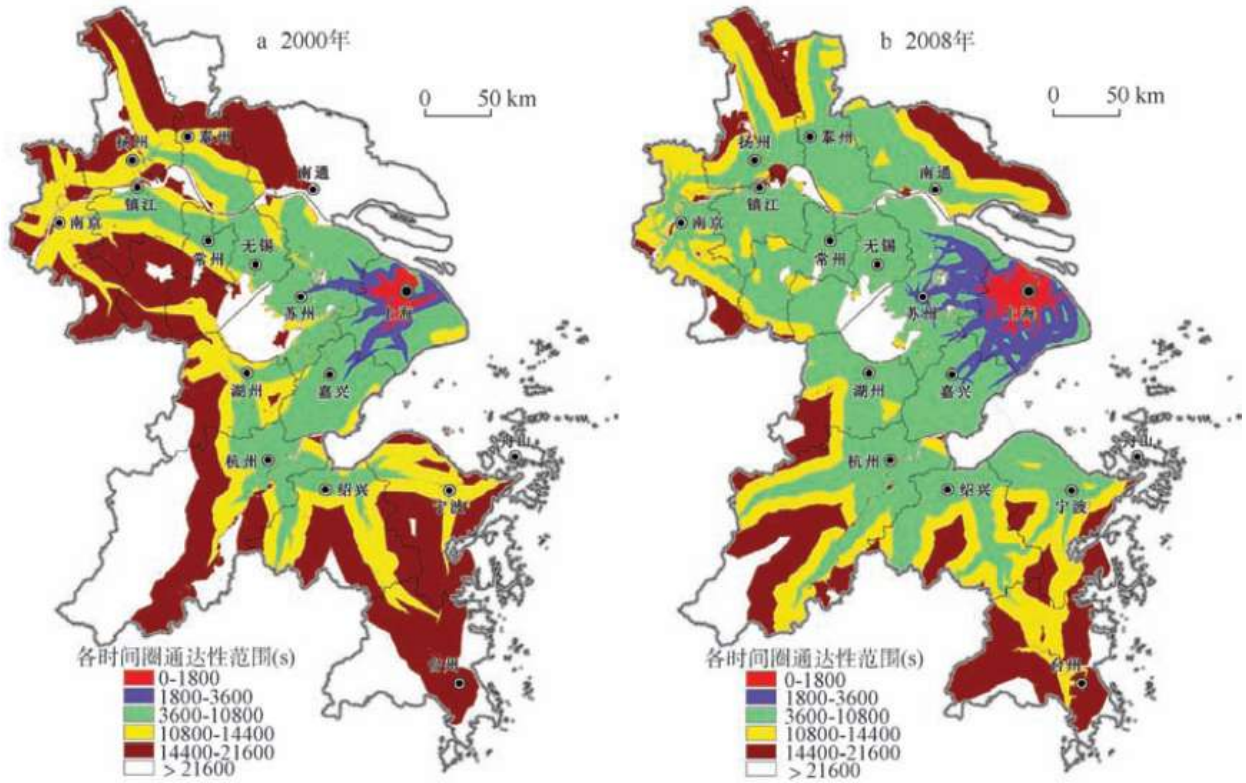


Figure 4- 6 Accessibility of Shanghai basing on highways in range of 0.5, 1, 3, 4 and 6hours on 2000 & 2008

Source: (Lu et al., 2013)

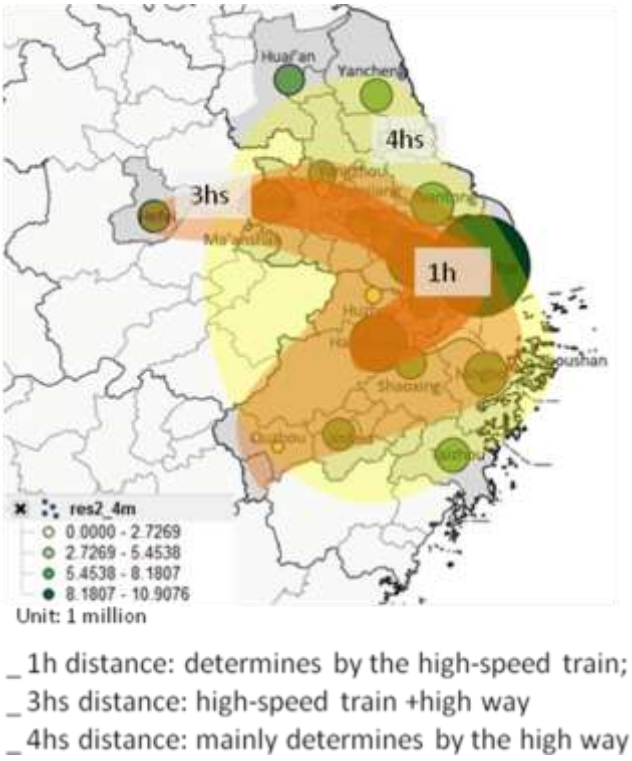


Figure 4- 7 Conceptual image of accessibility of Shanghai basing on high-speed train and highway

Source: draw by the author

4.4 The Transformations of Population and Employment

4.4.1 Population: unbalance growth and geographical polarization

Between the five years 2006 - 2010, the YRD Region had witnessed the population growth with the absolute increment of 11.9 millions (from 122.17 to 134.25 million) and the ratio of 9.9%. However the dynamic transformations were characterized by a polarizing process (the polarizing slop was sharper from 0.64 to 0.7) that population was moving towards the major cities and presented an unbalanced distribution till 2010.

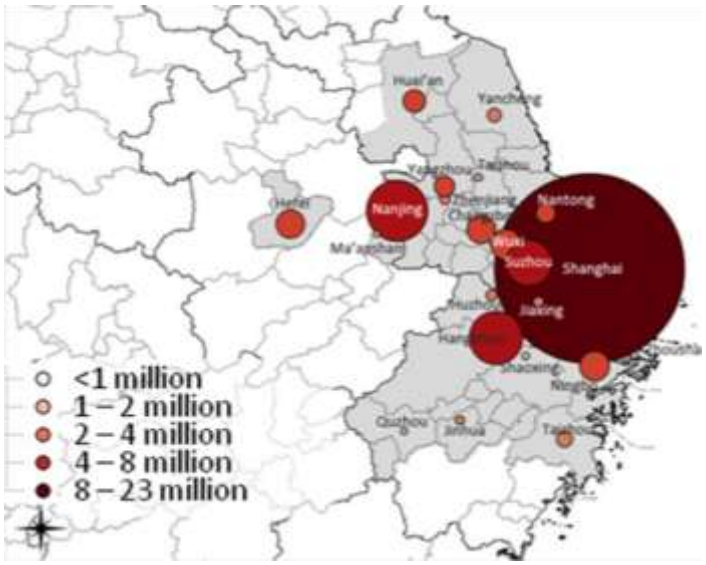


Figure 4- 8 Distribution of Residential Population within YRD 2010

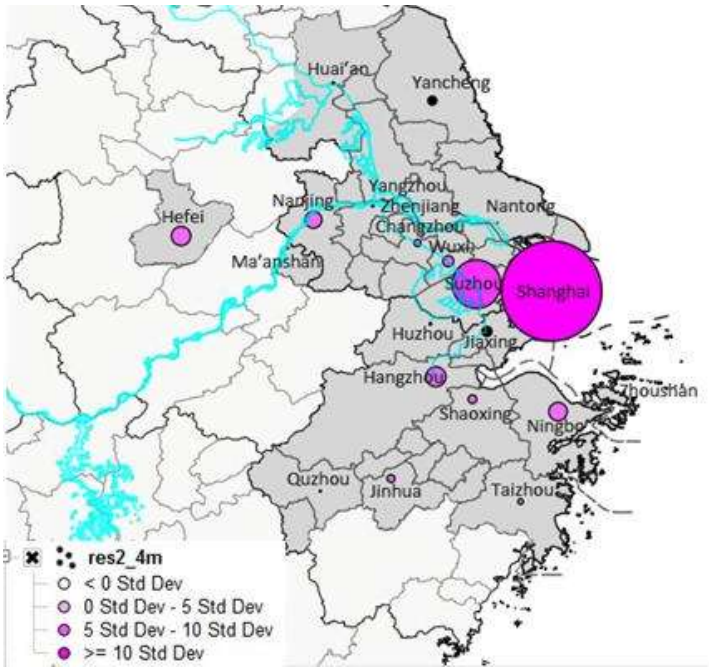


Figure 4- 9 Absolute Increment of Population 2006-2010

Source of 4-8, 4-9: national censuses 2006 and 2010, draw by the author

Shanghai consolidated the biggest amount of population and also realized the biggest growth (4.88 million) and second highest ratio (26.9%) during these five years, following after Suzhou whose increase ratio arrive to 29.7% with absolute growth of 2.37millions. The other three cities (Hangzhou, Nanjing, Ningbo, Hefei) whose increase ratios successfully exceeded the average one between 10%-20% each, realized the absolute growth more than 800 thousands. Unfortunately the left cities were completed below the average level and noticeably that the population of 3 cities (Nantong, Yangzhou and Taizhou) remained stable

with the variety less than 0.5% while 4 cities (Quzhou, Huai'an, Yancheng, and Jiaxing) lost the population dramatically with the decrease ratio more than 2.5%.

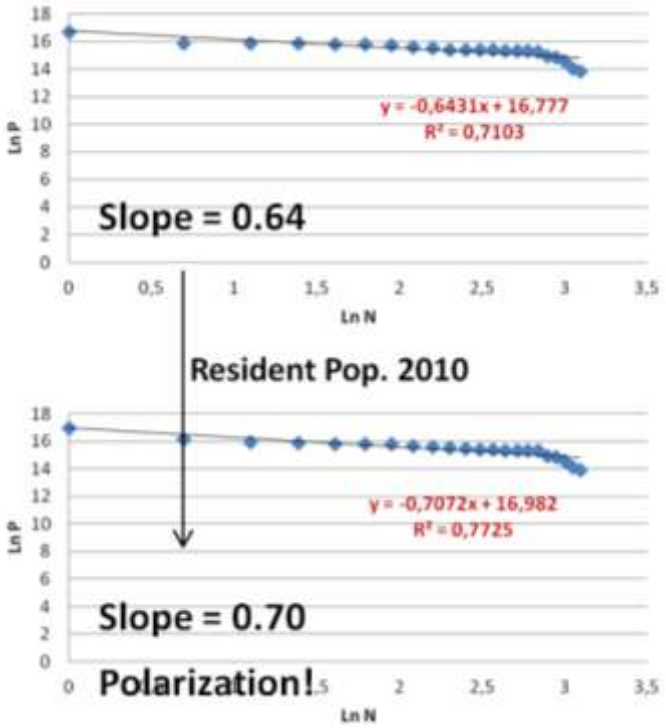


Figure 4- 10 Residence population Polarization 2006-2010

Source: draw by the author

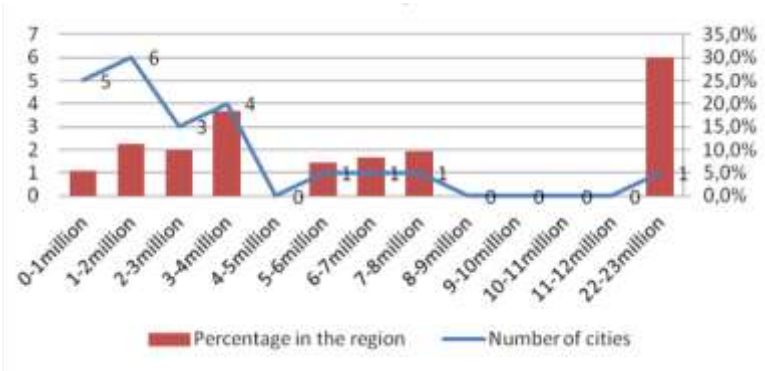


Figure 4- 11 Residence population shares by cities

Source: draw by the author

Ranked by Pop. 2006	Resident Pop. 2006 whole city	Absolute Increase	Rate of change	
Shanghai	18 150 800	4 875 800	26,9%	Expansion of megacity behemoth
Suzhou	8 098 600	2 367 400	29,2%	
Hangzhou	7 731 000	969 400	12,5%	
Yancheng	7 687 300	-427 100	-5,6%	Shrinking Medium-class cities
Nantong	7 249 300	33 500	0,5%	
Nanjing	7 190 600	814 100	11,3%	Enhancement of Mediu-class cities
Ningbo	6 716 000	889 689	13,2%	
Wuxi	5 841 700	530 900	9,1%	
Taizhou(Z)	5 705 000	263 800	4,6%	
Jiaxing	4 986 000	-484 300	-9,7%	
Jinhua	4 986 000	375 600	7,5%	
Huai'an	4 924 300	-124 400	-2,5%	
Hefei	4 770 000	932 466	19,5%	
Taizhou(J)	4 634 500	-15 900	-0,3%	
Shaoxing	4 498 000	414 200	9,2%	
Yangzhou	4 459 100	700	0,0%	
Changzhou	4 256 900	335 100	7,9%	
Zhenjiang	2 995 600	117 800	3,9%	
Huzhou	2 767 000	126 542	4,6%	
Quzhou	2 211 000	-88 300	-4,0%	
Ma'anshan	1 282 469	83 833	6,5%	
Zhoushan	1 028 000	93 300	9,1%	

Figure 4- 12 Changes of residence populations in cities of Yangtze River Delta Region

Source: draw by the author

Till 2010 concerning the Urban Central Districts Resident Population in 22 Yangtze River Delta cities, it also presented the unbalanced distribution scene that 30% of them resides in Shanghai and 50% of them resides in 18 cities with population less than 4 million while the left 20% resides in 3 cities (Hangzhou, Suzhou and Nanjing) with the population between 4-8 million. Shanghai is functioning as the greatest magnetic pole of population.

4.4.2 Employment

During 2006-2010 the regional employment amount increased 17.9% from 67.86 million to 80.07 million, but it also showed more evidently the phenomenon of employment polarization and concentrations to the principle linked cities.

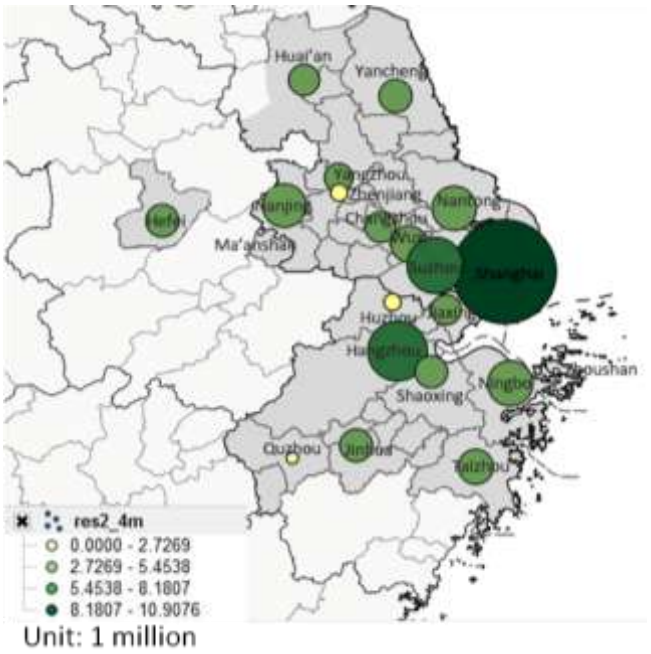


Figure 4- 13 Distribution of Employment 2010

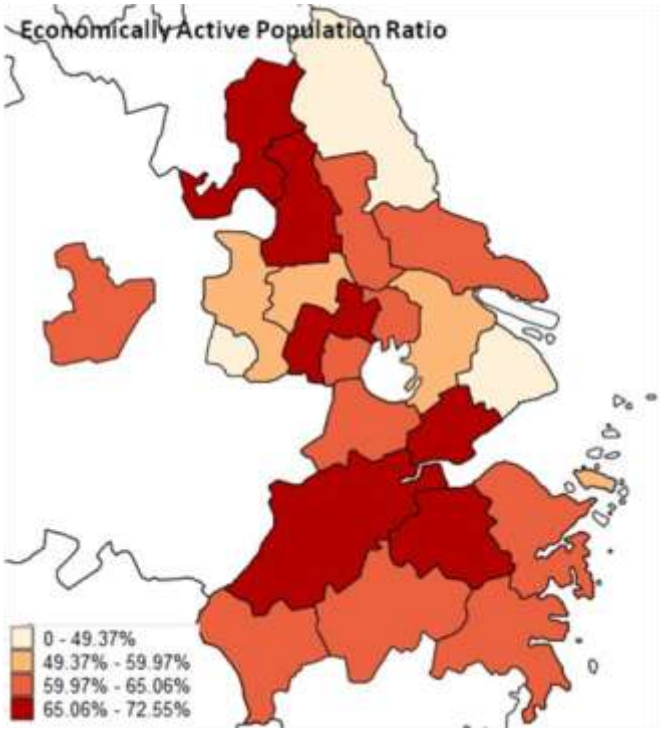


Figure 4- 14 Ratio of economically active population in cities of YRD in 2010

Source 4-13, 4-14: national censuses 2010, draw by the author

4.4.3 Correlations between Population and Employments

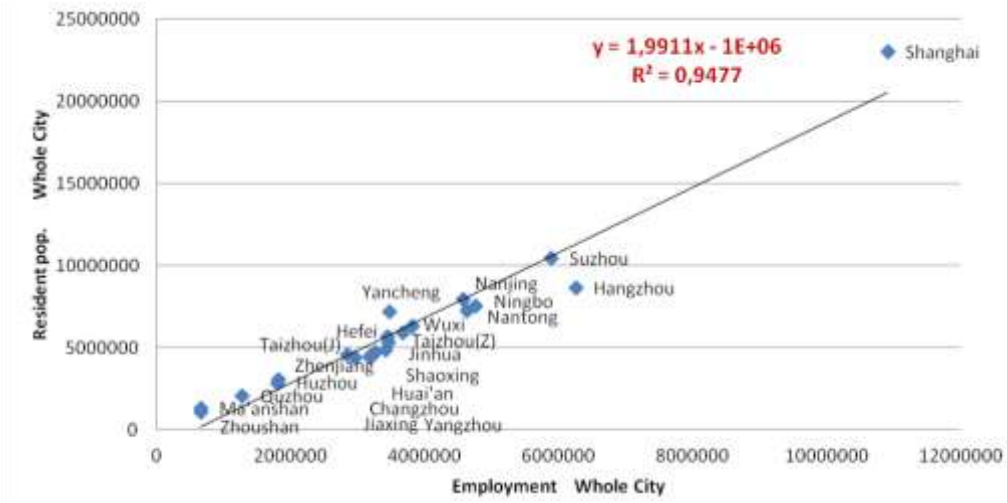


Figure 4- 15 Correlations between Population and Employment 2010 – the whole city

Source: draw by the author

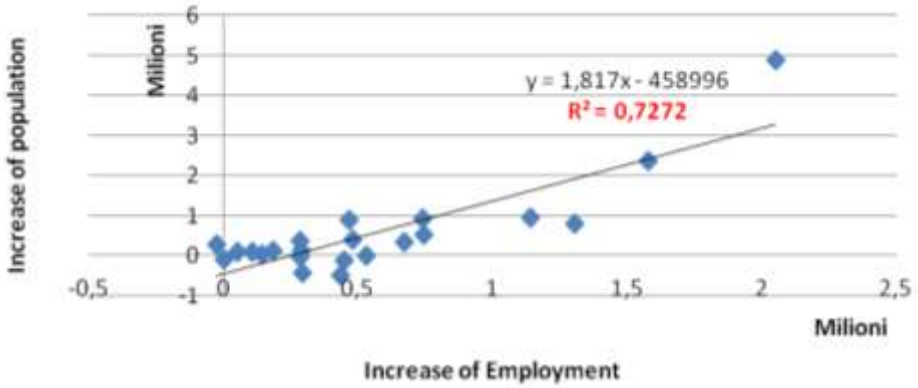


Figure 4- 16 Correlations between Increase of Population and Increase of Employment 2006-2010 – the whole city

Source: draw by the author

High Correlation was presented between Population and Employment (R^2 = 0,947). Also it proved to have correlation between Increase of Population and Increase of Employment (R^2 = 0,727). It means **people coming for jobs,** but it seems:

_ **small increase of jobs** used to lead relatively **big increase of population** in this region;

_ **large increase of jobs** leaded to **large increase of population**;

_ **Medium increase of jobs** implied a stable job pool, which leaded to stable increase of pop.

4.5 The economy trend and clusters in the region

4.5.1 The general trend: both Industrialization and Post-industrialization processes

The output value of industries in 14 prefectural level cities accounted more than 51.7% of their GDP, which reflected the economic development of this region still mainly relied on the industrial growth and these cities are still undergoing the process of industrialization. And it is performing the low industrialization of outer-ring and quite strong industrializations in the cities surrounding Taihu Lake and in south of Zhejiang Province. However if we retrospect the industrial development in territory, the phenomenon of territorial de-industrialization is also observed in recent 6 years that the industrial output values in 12 prefectural cities (more than half) has decreased in the proportion of GDP.

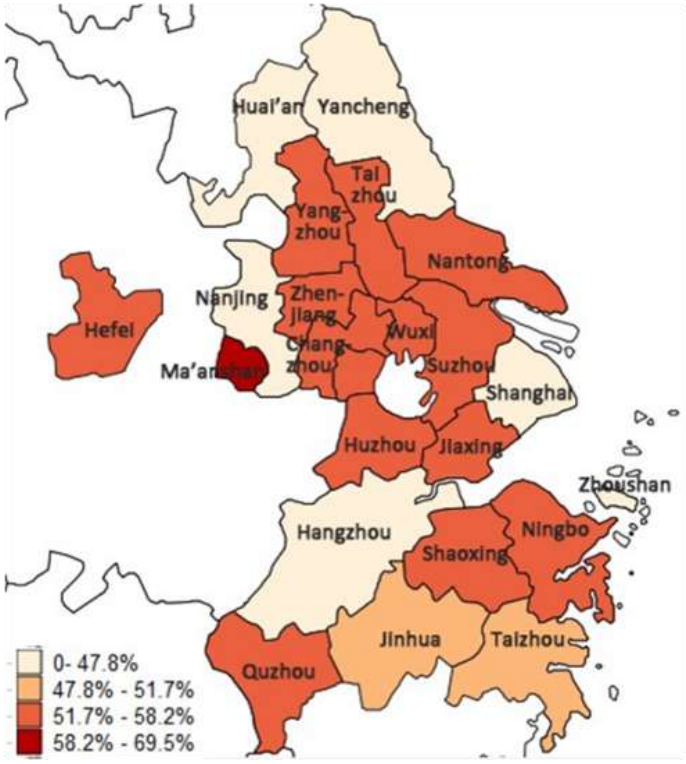


Figure 4- 17 GDP in Industry / GDP of whole city 2010

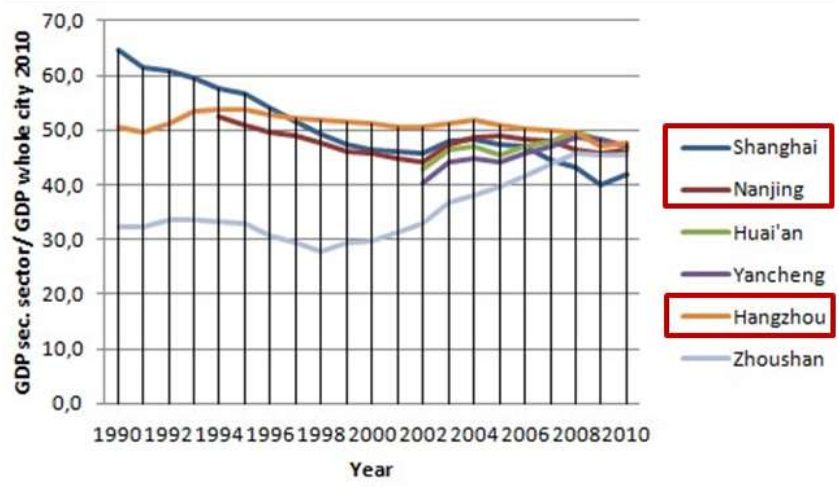
Source: draw by the author

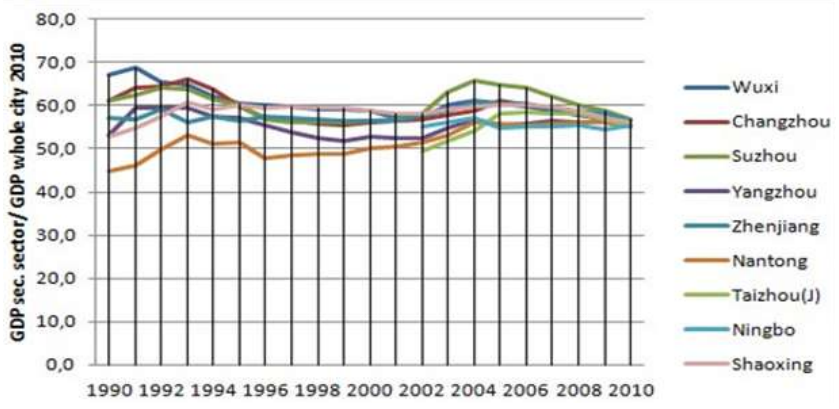
The cities with low industrialization rates locate on the outer-ring of the region, and they manifested two situations:

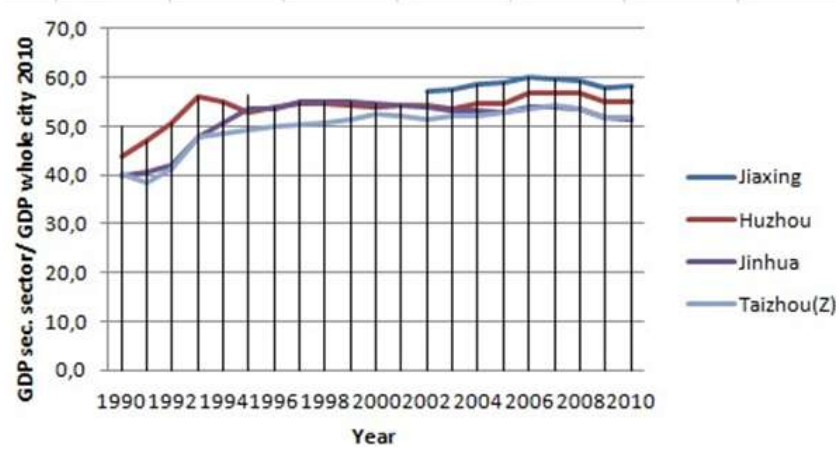
- the de-industrializations in Shanghai of the economic development particularity and the provincial capitals of Nanjing and Hangzhou;
- and the continuous industrializations in some cities of week industrial basis, like Huai'an, Yancheng, Zhoushan.

The cities with quite high industrialization rate lie surrounding Taihu Lake forming an obvious core, and others locate in southern Zhejiang province. They unfolded three situations:

- firstly, for the cities with the high industrial proportion in GDP, their industrial growth experienced a curve that was weakening around 1999, then going through a period of revival, and then de-industrialization since 2004-2006, much possibly caused by the economic crisis and the up-down of the global economic situation;
- Secondly, the industrial performances in some cities like Jiaxing, Huzhou, Jinghua and Taizhou, almost did not change during the last 10 years;
- Finally the industrialization was kept to increase strongly and steadily since 2004, and those cities are Quzhou and Hefei.







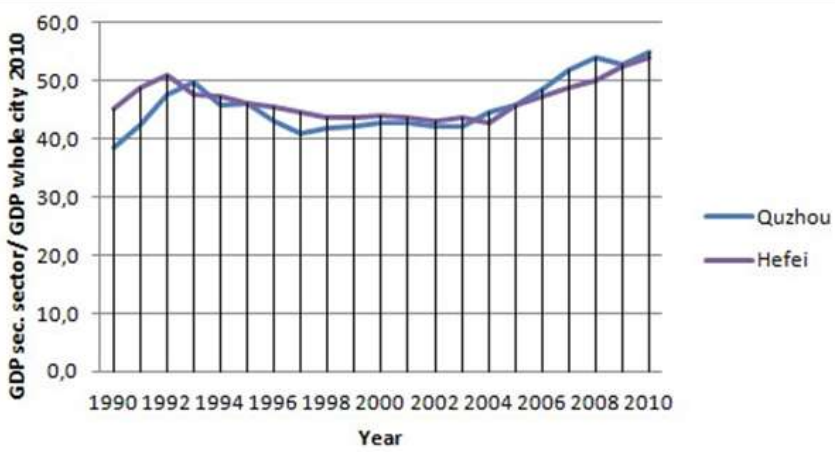


Figure 4- 18 GDP changes of 22 cities in Yangtze River Delta Region

Source: draw by the author

4.5.2 The industrial districts and specialized services

Zhejiang province has biggest number of industrial clusters in China. According to the investigation on clusters in Zhejiang Province conducted by the provincial government in 2001, it figured out that 800 industrial clusters were distributed in 85 of 88 counties or county level cities in 175 industrial sectors, including the industry of textiles, the industry of leathers, garments and feather products, the industry of pen-making， the industry of the electric apparatus and equipments, the industry of general and specific purposes machineries, and the industry of pharmaceuticals, accounting 237,000 enterprises and attracting around 3,8 million workers. And according to the investigation of provincial economic and trade committee of Zhejiang in 2003, there are **6 clusters** that surpassed **20 billion RMB** annual out-put value (or sale incomes), **26 clusters** surpassed **10 billion RMB**, **35 clusters** surpassed **5 billion RMB** and **149 clusters** surpassed **1 billion RMB**. We could say that in Zhejiang Provinces, every prefectural cities have their important clusters (although it is a little weak in Zhoushan and Lishui), the clusters of which are mainly categorized in the sector of the light industry.

Although the quantities of clusters in Jiangsu Province were smaller than that of Zhejiang Province, the economic scale of its clusters were huger and also accounted high importance in national industrial sectors. In Jiangsu Province, the industries of telecommunications equipment, computer and other electronic products are concentrating in Suzhou and Nanjing and these two cities are surrounded by the cities specialized in the traditional manufacturing sectors, like machineries productions, while the part to the north of Yangtze River, no important industrial clusters are concentrated.

In Shanghai the clusters generally concerns to the industries of the machinery and automobile manufacturing, the metal and plastic products manufacturing, and the producer services.

Table 4- 3 Typical clusters of Yangtze River Delta

Province	City (Prefectural level city)	Typical Cluster	No. of Establishments	Output value 2007 (RMB) (% of national market)
Shanghai	Shanghai	Automation equipment	81	
		Auto parts	563	
		Finance	787	
		Information, communication and software	1,500	
		Lease and producer services	31,148	
		Medical equipment	117	
		Metal products	1,388	
		Plastic and rubber	1,335	
Jiangsu	Suzhou	Electronic products (including computer manufacturing)	663	
		Information, communication and software	550	
		Wearing, apparel, footwear and headgear		
	Kunshan city (Suzhou)	Electronic products		
	Wujiang city (Suzhou)	Electronic products		
	Nanjing	Information, communication and software	801	
	Changzhou	Auto parts	148	
	Wuxi	Bicycles	68	
Zhejiang	Xiaoshan city (Hangzhou)	Chemical fibers		
	Ningbo	Wearing, apparel, footwear and headgear		50 Billion (12%)
	Yinxian county (Ningbo)	Wearing, apparel, footwear and headgear		
	Yuyao city (Ningbo)	(Plastic) mould		
	Wenzhou	Footwear and leather		43,95Billion (25%)
	Yongjia county (Wenzhou)	Buttons		2 Billion (85%)
	Pingyang county (Wenzhou)	Plastic and plaiting products		
	Cangnan county (Wenzhou)	(Traffic) signs and number plate		
	Rui'an city (Wenzhou)	Motorbike parts		
	Leqing city (Wenzhou)	Electric apparatus and equipments		
	Haining city (Jiaxing)	Leather, garment and feather products		13,5 Billion (25%)
	Pinghu city (Jiaxing)	bags and suitcases		
	Tongxiang city (Jiaxing)	Sweater		
	Huzhou	Children's wear		
	Anji county (Huzhou)	Wood, articles of straw and plaiting materials		
	Shaoxing	Textile		73,78 Billion

				(33%)
	Shengxian county (Shaoxing)	Ties		10 Billion (90%)
	Zhuji city (Shaoxing)	Socks		23,6 Billion (65%)
	Yiwu city (Jinhua)	Small commodities		28,9 Billion (70%)
	Yongkang city (Jinhua)	Metal Products		25 Billion (25%+)
	Quzhou	Badminton		
	Taizhou	Motorbike		31,2 Billion (10,5%)

Note: 1 euro = around 8 RMB (2010-2013)

Source: (Wu et al., 2009), (Bathelt and Li, 2013)

4.6 The policies and institutions

4.6.1 The national and local open-up policies and the preemptive role of Shanghai

Besides the spontaneous economic activities, the national and local policies, especially the open-up policies which have close relation with economic development, shape the regional structure. The Open-up Policy of China initiated in 1978 was primarily experimented in five economic specific zones: Shenzhen, Zhuhai, Shantou, Xiamen and Hainan Island, which excluded Shanghai in this first list of opening up to the world. Until 1984, Shanghai, Nantong and Ningbo in YRD Region were placed the 14 National Coastal Open-up Cities and then in the next year, the deltas of Yangtze River, Pearl River and Southeast of Fujian Province became the Coastal Economy Development Zones. In 1988, Nantong, Ningbo and three districts of Shanghai (Minhang, Hongqiao, and Caohejing) became the State Economy and Technology Development Zones. In the same year, Hangzhou and Nanjing became Open-up Cities.

The real critical opportunity for YRD Region came in 1990 by the Development and Open-up Policy for Pudong, Shanghai. At that moment although Pudong locating on the east side of Huangpu River has large area and faces to the Pacific Ocean with long coast line, it was much under developed and in worse connection conditions by ferry boats with the traditional and developed urban center of Shanghai on the opposite side of Huangpu River. By the supports from Central Government, Shanghai Municipality orientated three key interventions: construction of ports and infrastructures, development of finance, and development of neo-high technologies.

The further operations continued successively:

1- The construction of ports served as the basic infrastructures for the goods and human flows coming from outside, and the bridges and metro served as the infrastructures for those coming into the old city center. In 1993 the first ocean Port Waigaoqiao was

put into service with 900m piers and 4 berths of 10thousand tons; in 1999 the International Air Port of Pudong was operating and now becomes the third airport in China ranked by the annual passenger volume; in 2005 Yangshan Port was completed as the largest port for the equivalent unit transportation;

2- The finance industry development set the foundation for Shanghai to achieve the status of Chinese finance center. In 1990 Shanghai Stock Exchange (first stock exchange market in China after 1949) was opened in Pudong; in 1996 Shanghai National Grain Oil Exchange was established and merged with other institutions as Shanghai Futures Exchange in 1999; and also at the same time the constructions of Lujiazui Finance Zone and Waigaoqiao Free Trade Zone in Pudong since 1990 have became the symbol of finance Shanghai;

3- The neo-high technology development also offered the preemptive role for Shanghai. In 1992, Zhangjing High Tech Park was build in Pudong, which predominantly clustered the industries of integrated circuit, software, and biological and medical industries and in 2001 the Jinqiao Export Processing Zone was established and brought the rich practices and experiences of modern manufacturing industries.

Compared with the Open-up Policies before 1990, three significances could be observed as below. And **these policies successfully helped the city of Shanghai reaching the top of urban functional hierarchy and their status is hardly to be shaken**.

1- Port and Free Trade Zone of Waigaoqiao are more practical and operational than the Coastal Open-up City in 1984;

2- The three functional zones in Pudong are actually quite analogous to the three Economy and Technology Development Zone of Shanghai established in 1988, that Zhangjiang High-Tech Park and Caohejing Development Zone are predominant in the same Micro-Electronic industries, Jinqiao Export Processing Zone and Minhang Development Zone are engaged in the industries of Daily Consuming Goods, Material and Small Machinery Processing, Lujiazui Finance Zone and Hongqiao Development Zone are designated as the business and trade centers. However without exceptions, the dimensions of three functional zones in Pudong reached about 2 times in scale as the three Economy and Technology Development Zones in 1988, with more innovations in technologies and management concepts.

3- Finally, the development of financial sectors is most significant on the national scale.

There are also national, provincial and local level “development zones” in other cities of YRD region, and with the preferential policies they provide a field for enterprises to act and create linkages among cities (it would be explicated in Chapter 6).

4.6.2 The regional governance platform - "YRD economic coordination meeting"

Apart from the policies of state and single cities, "YRD Economic Coordination Meeting" turned into the regional governance platform. It was evolved from "YRD 14-City Cooperation Meeting" in 1992, and Shanghai is the standing president of the meeting and in every year the executive president is turning among the each city member. Since 1997, the Mayor Meeting was being held every 2 years and then once a year since 2004. In the same year of which it established a permanent office and became the first regional organization with independent affairs operation, research center and expert committees. The conventions and working missions are listed in below:

Table 4- 4 Conventions and working missions of all previous Mayors' meeting

Time		**Contents of Conventions and Missions**
1997	Fist Meeting	Two **breakthroughs for the regional economic cooperation** were primarily promoted in the **tourist sector** initiated by Hangzhou and the **business and trade sectors** initiated by Shanghai.
1999	Second Meeting	Cooperation of regional scientific research Promotion of the reform of state owned enterprises and the restructure of their properties and assets Promotion of tourist sector and business and trading
2001	Third Meeting	Reinforce the communications and coordination and perfection of operational mechanism Seminar on tourist
2003	Four Meeting	Expo economy and linkages' development of YRD
2004	Fifth Meeting	Define specific funds and permanent structure for the meeting Communication and coordination Regional planning Science Property rights Tourism
2005	Sixth Meeting	Unification of regional logistics
2006	Seventh Meeting	Regional development planning
2007	Eighth Meeting	Coordination of Policies for Zhejiang Province, Jiangsu Province and Shanghai
2009	Ninth Meeting	Seminar about the state policies Common confrontation to the financial crisis

2010	Tenth Meeting	Exploitation of the opportunity and magnifying the effects of Expo Shanghai 2010 Regional cooperation of medical insurances Off-site pensions Financial and developing cooperation Collaboration of industrial parks and zones Integration and improvement of regional modern logistic
2011	Eleventh Meeting	Collaboration of industrial parks and zones Agricultural cooperation Development of high business tourist products Frontier technology development of application programs for internet terminals Competitions and development of ports Construction of regional life circle Management of traffic conjunctions in regional central cities Easy pass and entrance for the express bus to Shanghai Cooperation mechanism of intellectual property rights Construction of the interests sharing mechanism in the process of industry Transferring and taking-over in the region Restructure of the regional economic space during the high-way development
2012	Twelfth Meeting	Patent application Customs clearance procedures Transformations of small-middle private owned enterprises Immigrates and social governance Integration of legal institutions Collaboration of cultural industries Cooperation of neo-high tech enterprises Communication and cooperation of innovation and pioneering enterprises Unification of public medical system Industrial upgrading Coordination development management Low-carbon illustrating zones
2013	Thirteenth Meeting	Innovation, green development and integration

Source: (Xinhuanet, 2013), organized by the author

By the historic evolution of the Mayors' Meeting, coordination started from the common interests of **the sectors of tourism and business-trading** and this two sectors are always the principle topics in the Meetings, although the discussing topics were gradually extended, from

the issues on **the cooperation of the public services and government activities**, including science-technology, reform of state owned enterprises, information and communication, development planning, property rights, medical treatments and insurance, off-site pensions, constructions of functional zones and parks, agricultures, ports and transportations, intellectual property rights, immigrates and social governance, legal institutions, public sanitary, low-carbon illustrating zones, to the issues for **the cooperation of social-economic activities**, like logistics, exhibitions, private owned enterprises, cultural industries, and human resources. As more fields involved, the difficulties also increased and in fact **it really reduced the transaction cost of good flow, traffic flow and knowledge spillover as the same time to create new opportunities**, to enhance the city network.

4.7 Conclusions about current conditions and city ranks

Reviewing the current conditions of the studied region, it presented that it is a metropolis-based region, with the city hierarchy:

- Shanghai as the provincial municipality, while Nanjing, Hangzhou and Hefei as the provincial capital, lied on the 1st and 2nd levels in the sense of volume of resources, capabilities in political negotiations.
- The orography goes beyond the administration boundary, and groups the cities in the alluvial plain and cities along Yangtze River with Shanghai. While the mountain area in the south of the region presents a different approach of development.
- The infrastructure conditions (airports, ports, highways, railway, especially the high-speed railway) correspond to the political and economic hierarchy.
- It presented the polarization in the distribution of population and employment 2006-2010.
- The post-industrialization appeared in YRD cities, especially the dominating sector of Shanghai, Nanjing and Hangzhou has been tertiary sector, and the specialized industrial districts could be still observed.
- The open-up polices provided the coastal cities the preemptive position in the economic development, especially Shanghai's top position on the urban functional hierarchy is hardly to be shaken. The regional platform - "YRD economic coordination meeting" provided another stage for regional cooperation.

Abstract

This chapter presented the current conditions and city ranks of Yangtze River Delta:

- Different administration levels of cities implied the political hierarchy.
- The orography determined the 3 sub-territories.
- The infrastructure conditions and distance were introduced.
- The population and employment transformations 2006-2010 also implied a hierarchical rank.
- The economic conditions and industrial districts were expressed.
- The general policies and regional governance platform – "YRD economic coordination meeting" were reviewed.

CHAPTER 5

THE CITY NETWORK OF YRD RESULTING FROM THE MULTINATIONAL FIRMS NETWORK

5.1 The network basing on the traffic flow[4]: A diachronic picture

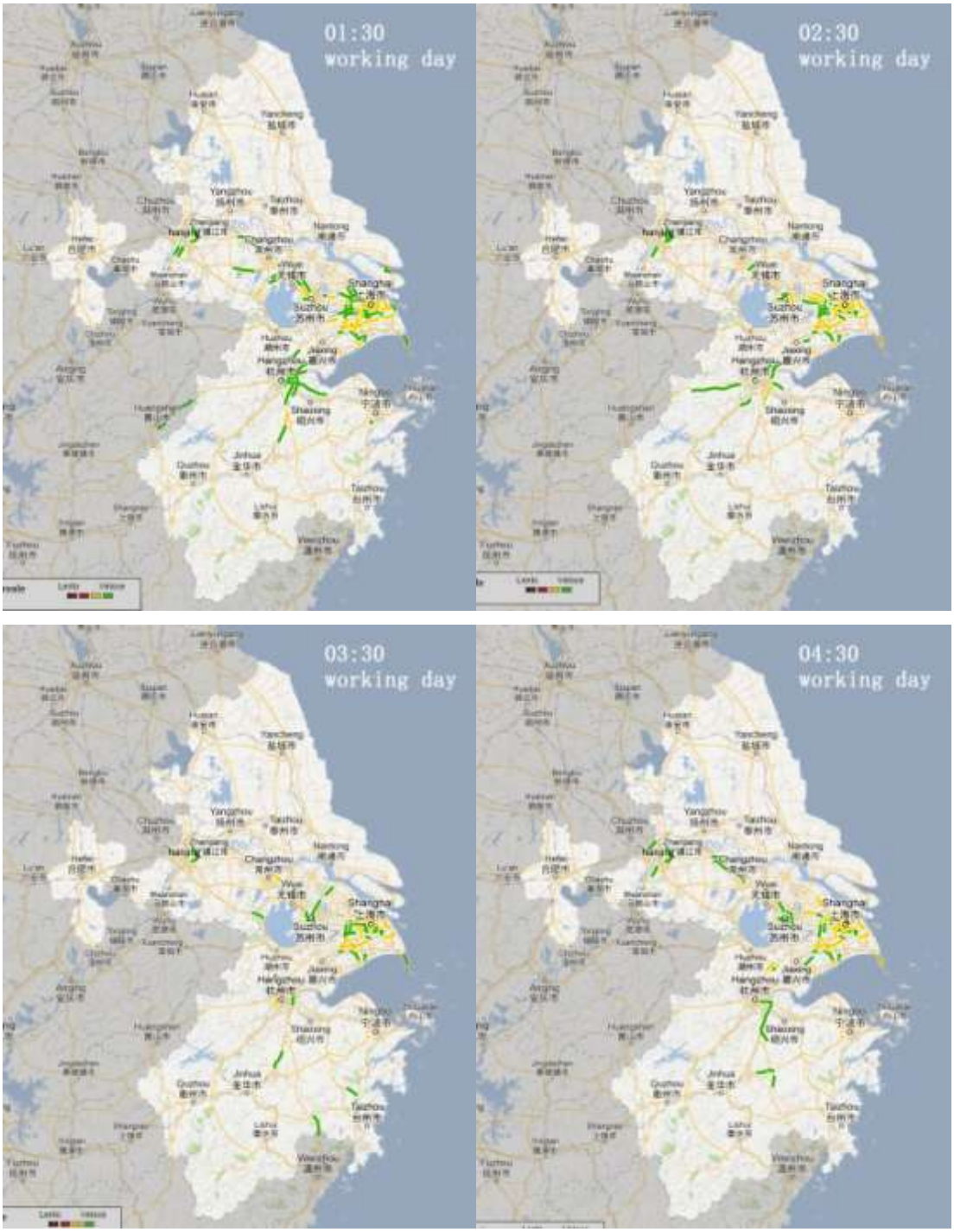
At 3:30 am, it was the moment when the flow is smallest in one day, and it revealed the **"engine" or "core" of the region**. They are: Shanghai, Suzhou, Wuxi, (Changzhou), Nanjing and Suzhou (6 cities). Meanwhile, 5 of those locate on the same traffic line Highway G42, thus the "city network" still presented as one traffic line.

The sequence that cities presented on the map revealed the "rank" or "importance" of the cities. If we say the 6 cities above are **"core cities"**, city of Ningbo could be **"quasi core cities"** because it presented late, but the flow of Ningbo emerged itself, but not the one which was spread from "core cities". The ones connected by the flow spread from core city are the **"elementary level cities"**, while the ones never be connected are the **"peripheral cities"**.

From the **most-busy-hour** image, we have a general view the city network of the south part of the region (Zhejiang Province) is more robust than the north part (Jiangsu Province), especially the north of Yangtze river presented no link with the system.

The links between Jiangsu Province and Zhejiang Province are weak, and Shanghai seemed to be the only link. There was merely link between Suzhou – Jiaxing/ Ningbo/ Huzhou. "City in between" is easily to be a "core city", but could also be a "passing by city" – city of Jiaxing.

[4] local time; Images were taken from Google map which reports the real time traffic basing on the speeds of movement of mobile phone with GPS installed. Thus the flows also depended on the number of mobiles with GPS.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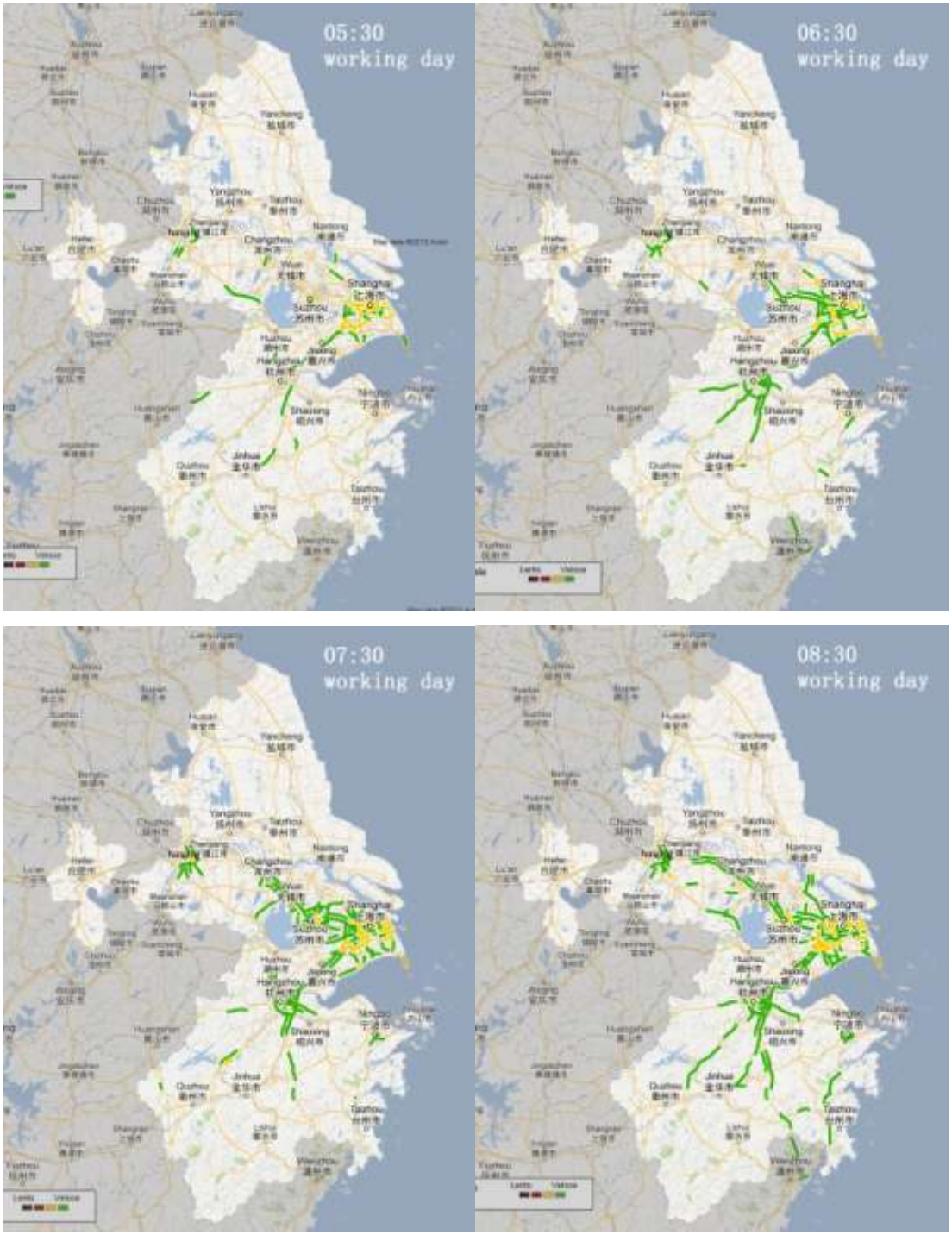
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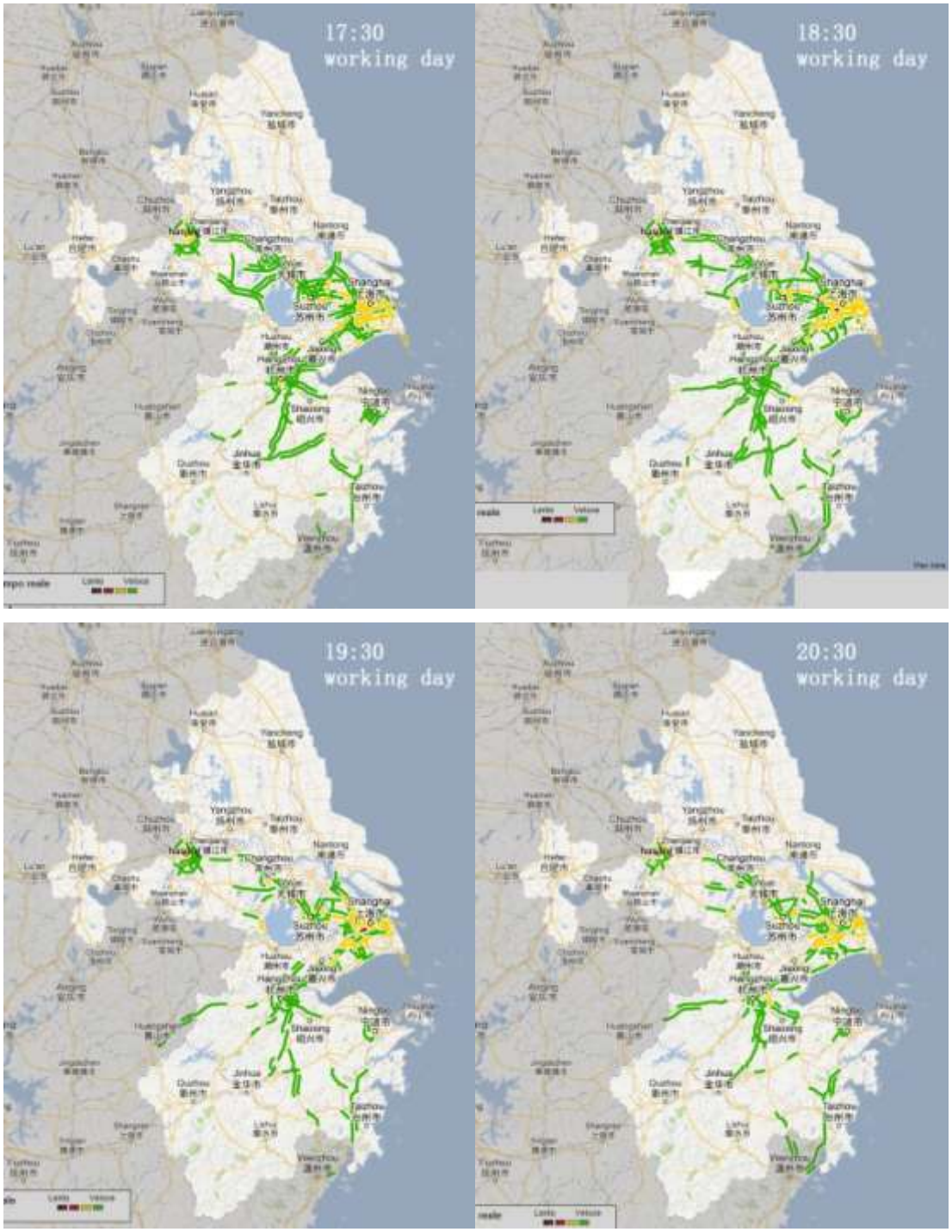
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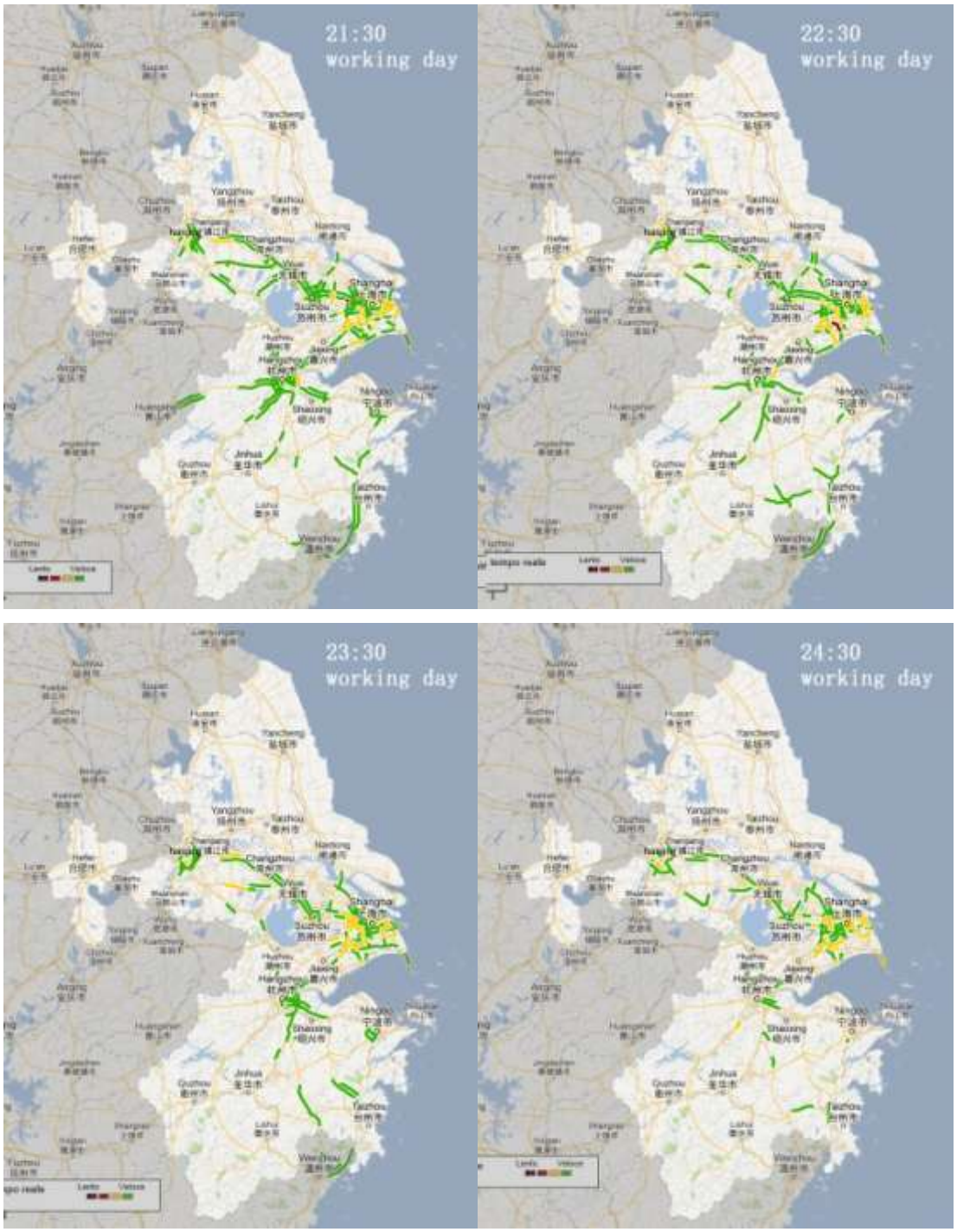


Figure 5- 1 Traffic diachronic flows in Yangtze River Delta Region

Source: Google map, organized by the author

5.2 The network basing on firm ownerships

5.2.1 The Database

The study extent is Macro level – cities system, more specifically, it is Yangtze River Delta in China, and the subjects are intra-firm linkage. Firstly, the author classified the

previous 52 categories firms (Fortune 500 2012) into 19 categories by sector. Then one global firm was chosen as sample from each category (the 19th category – Others were ignored), thus in total 18 firms have been chosen (table below).The criteria for choosing samples are: the company with more than two subsidiaries/ representative offices within the study territory, and the company with subsidiaries concerning more than 2 functions within the study territory.

Table 5- 1 The Classification of Fortune 500 (2012) by Sectors and the Chosen Samples

Pervious code	**Sectors**	**Number of firms**	**The chosen case**
1 Mining, Crude-oil, gas production and treatment			
9	Mining, Crude-Oil Production	17	**R. 101 CHINA NATIONAL OFFSHORE OIL** (1 shell; 14 Glencore)
2	Petroleum Refining	44	
15	Energy	11	
2 Food, beverage, tabacco products			
28	Food Production	5	
30	Food Consumer Products	5	**R. 71 NESTLÉ**
34	Tobacco	4	
35	Beverages	3	
3 Chemical products and pharmaceuticals			
18	Chemicals	10	**R. 62 BASF**
19	Pharmaceuticals	10	
50	Household and Personal Products	2	
4 Non-metallic mineral			
29	Building Materials, Glass	5	**R. 161 SAINT-GOBAIN**
5 Metals			
8	Metals	18	**R. 122 THYSSENKRUPP**
6 Machinery			
24	Industrial Machinery	6	
41	Construction and Farm Machinery	3	**R. 155 CATERPILLAR**
7 Transport equipment			
3	Motor Vehicles and Parts	33	**R. 10 TOYOTA MOTOR**
14	Aerospace and Defense	12	
16	Miscellaneous	11	
8 Electric apparatus and equipments, computer and office equip			
10	Electronics, Electrical Equipment	14	**R. 20 SAMSUNG ELECTRONICS**
12	Computers, Office Equipment	12	(Hewlett-Packard,HP)
31	Network and Other Communications Equipment	5	(Nokia)
37	Semiconductors and Other Electronic Components	3	(Intel Corporation)
9 Provision of electricity, gas and water			
5	Utilities	22	**R. 7 China State Grid**
45	Pipelines	2	
10 Information transmission, computer service, software industry			

7	Telecommunications	20	
49	Computer Software	2	**R. 300 Oracle** (R. 119 Microsoft)
11 Construction industry			
17	Engineering, Construction	10	**R. 100 CHINA STATE CONSTRUCTION ENGINEERING CORPORATION**
12 Transport, storage and post			
22	Mail, Package and Freight Delivery	7	(R. 98 DEUTSCHE POST DHL)
27	Airlines	6	(R. 248 LUFTHANSA GROUP)
36	Railroads	3	(R. 179 DEUTSCHE BAHN)
40	Shipping	3	**R. 154 A.P. MØLLER-MÆ RSK GROUP**
13 Wholesale and retail trade			
4	Food and Drug Stores	24	
13	Trading	12	(R. 91 Nobel)
20	Specialty Retailers	9	
21	Wholesalers: Health Care	8	
26	General Merchandisers	6	**R. 3 WAL-MART STORES**
38	Wholesalers: Food and Grocery	3	
39	Wholesalers: Electronics and Office Equipment	3	
44	Wholesalers: Diversified	2	
47	Internet Services and Retailing	2	(R. 206 Amazon)
14 Catering services			
42	Food Services	3	**R. 410 MCDONALD'S** (R. 432 COMPASS GROUP, R. 495 SODEXO)
15 Financining and insurance			
1	Banks: Commercial and Savings	54	**R. 17 ING GROUP** (R. 26 BNP PARIBAS)
6	Insurance: Life, Health (stock)	20	
11	Insurance: Property and Casualty (stock)	14	
23	Insurance: Life, Health (mutual)	7	
33	Health Care: Insurance and Managed Care	4	
25	Diversified Financials	6	
53	Insurance: Property and Casualty (mutual)	1	
16 Information, Management, Human Resource service			
43	Temporary Help	2	(R. 489 RANDSTAD HOLDING)
46	Information Technology Services	2	**R. 57 IBM** (R.405 ACCENTURE)
52	Oil and Gas Equipment, Services	1	(R. 444 Halliburton)
17 Health care			
48	Health Care: Medical Facilities	2	**R. 479 Fresenius** (R. 343 HCA Holdings)
51	Health Care: Pharmacy and Other Services	2	(R. 118 Medco Health Solution; R. 213 Express Scripts)
18 cultural, athletic and entertainment industry			

32	Entertainment	5	**R. 249 Walt Disney** (R. 332 News Corporation)
19 Others			
16	Miscellaneous	11	(R. 322 Dior)

Note: the company in parentheses are those examined by not chosen.

Source: Fortune 500 2012, organized by the author

5.2.2 The Analysis and Visualization Process

After defining the samples, this study would figure out the structures[5] of the firms through their Annual Reports (all these global firms are quoted companies), then would locate the subsidiaries which are within in the Yangtze River Delta. If in one branch, subsidiaries with different divisions of tasks locate in different cities, the paper considered there are complementary networks among those cities; if in one branch, subsidiaries with similar tasks locate in different cities, the paper consider it existed the synergic network. The complementary and synergic relations among cities basing on 1 firm would be recorded, and finally all the results of 18 samples would be overlapped, so as to form an overview of city network of this region.

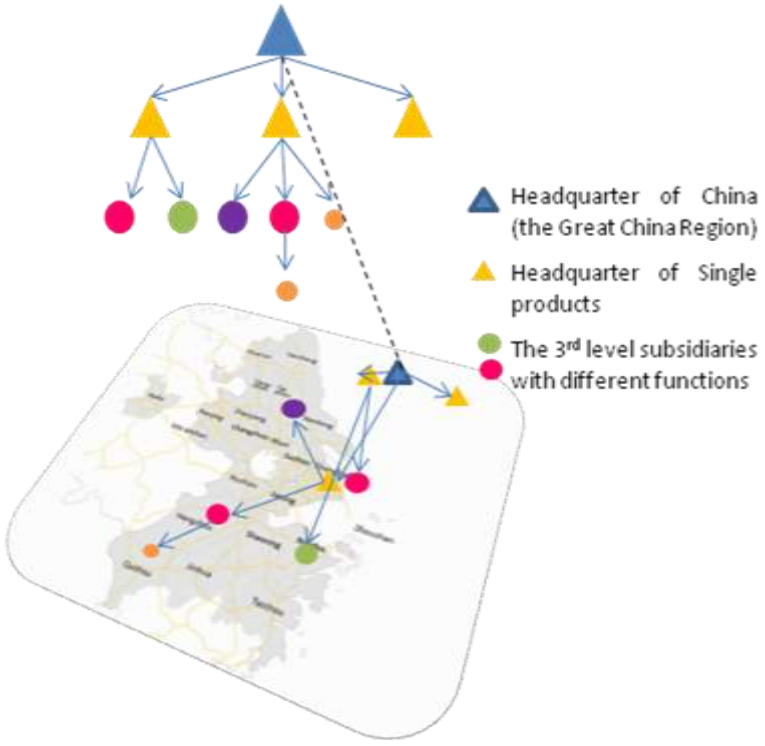


Figure 5- 2 Locate the subsidiaries of firms within the study territory

Source: draw by the author

[5] The subsidiaries include the wholly owned ones and the joint venture ones. And in most cases, the study includes only the 3rd level subsidiaries, because the 4th level ones are mostly sale offices, which do not illustrate the division of tasks.

5.2.3 The Sample Of The China National Offshore Oil

There are 3 Chinese firms in the sample list, and the locations of Chinese company in Chinese territory would be the most complex case, thus the study would unfold these extreme cases. The China National Offshore Oil with its headquarter in Beijing, China ranked 101 in the Fortune 500, and ranked 3 in the Mining, Crude-Oil Production sector. It has nine 2nd level subsidiaries, two of which locate in Shanghai, and other 2nd level subsidiaries have a few 3rd and 4th level subsidiaries within Yangtze River Delta (the ones which are outside of study territory are not listed below).

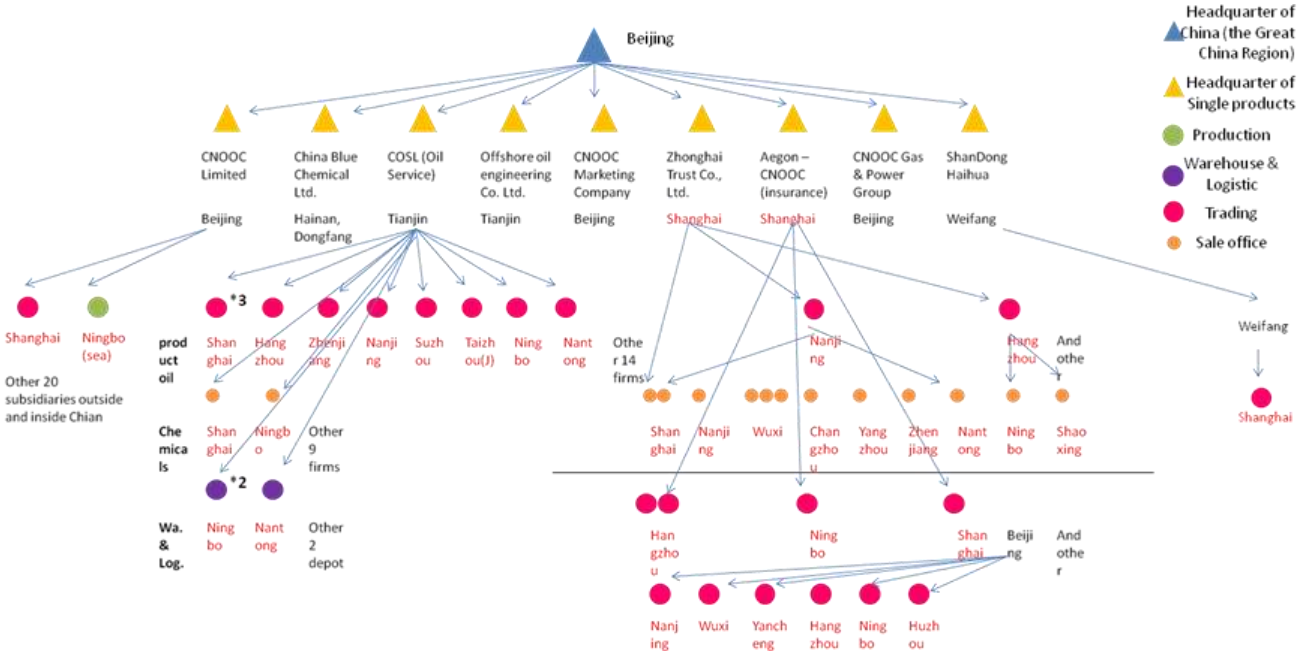


Figure 5- 3 Structure of The China National Offshore Oil

Source: draw by the author

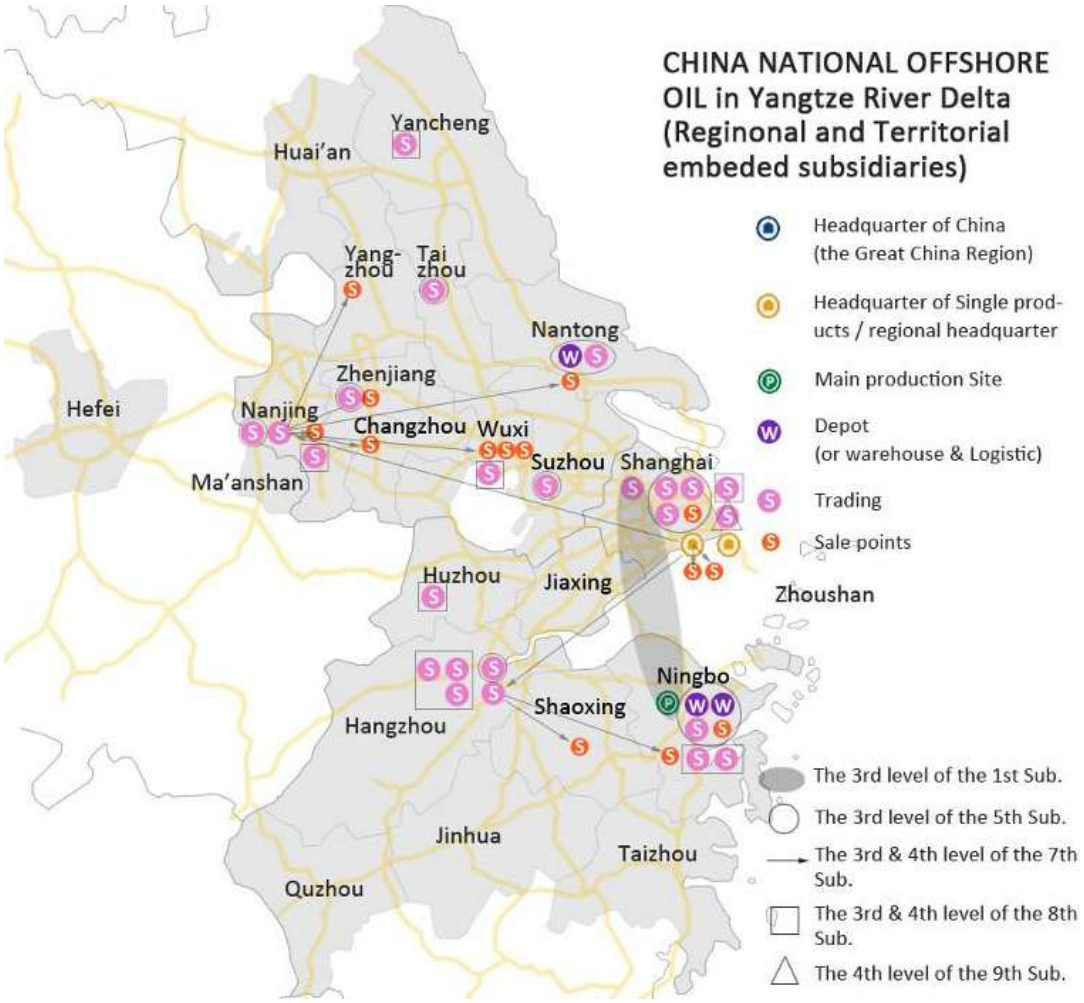
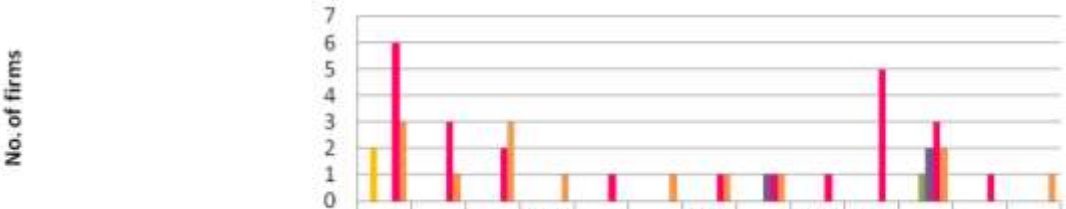


Figure 5- 4 Subsidiaries of China National Offshore Oil's within YRD

Source: draw by the author



	Shanghai	Nanjing	Wuxi	Changzhou	Suzhou	Yangzhou	Zhenjiang	Nantong	Taizhou(J)	Hangzhou	Ningbo	Huzhou	Shaoxing
Headquarter of China (the Great China Region)	0	0	0	0	0	0	0	0	0	0	0	0	0
Headquarter of Single products / regional headquarter	2	0	0	0	0	0	0	0	0	0	0	0	0
Production	0	0	0	0	0	0	0	0	0	0	1	0	0
Warehouse & Logistic (Depot)	0	0	0	0	0	0	0	1	0	0	2	0	0
Trading	6	3	2	0	1	0	1	1	1	5	3	1	0
sale points	3	1	3	1	0	1	1	1	0	0	2	0	1

Figure 5- 5 Statistics of the Subsidiaries of the China National Offshore Oil within YRD

Source: organized by the author

From Figure 5-6 and Figure 5-7, we could realize the complementarity between Shanghai and Ningbo in the sense that in the 1st subsidiary, Shanghai has trading function while Ningbo has production function. Also the complementarity existed between Shanghai and Nantong, between Shanghai and Ningbo in the sense that 5th subsidiary; Shanghai has trading functions while Nantong and Ningbo have its Depots. The synegy could be observed among these cities: Shanghai – Nantong – Taizhou – Zhenjiang - Nanjing – Suzhou – Hangzhou – Ningbo, in the sense that in the 5th subsidiary, all those cities have trading functions. The synergy existed between Nantong and Ningbo in the sense that in the 5th subsidiary, both cities have Depots. It also could be observed among Shanghai – Hangzhou – Shaoxing – Ningbo – Nanjing – Changzhou – Wuxi – Zhengjiang – Nantong – Yangzhou in the sense that in the 7th subsidy, all those cities have trading or sale functions. Lastly, synergy existed among Shanghai – Huzhou – Hangzhou – Ningbo – Wuxi – Nanjing – Yancheng in the sense that in the 8th subsidiary, all those cities have trading functions.

Figure 5- 6 Complementary Relations among Cities Basing on the China National Offshore Oil

Source: draw by the author

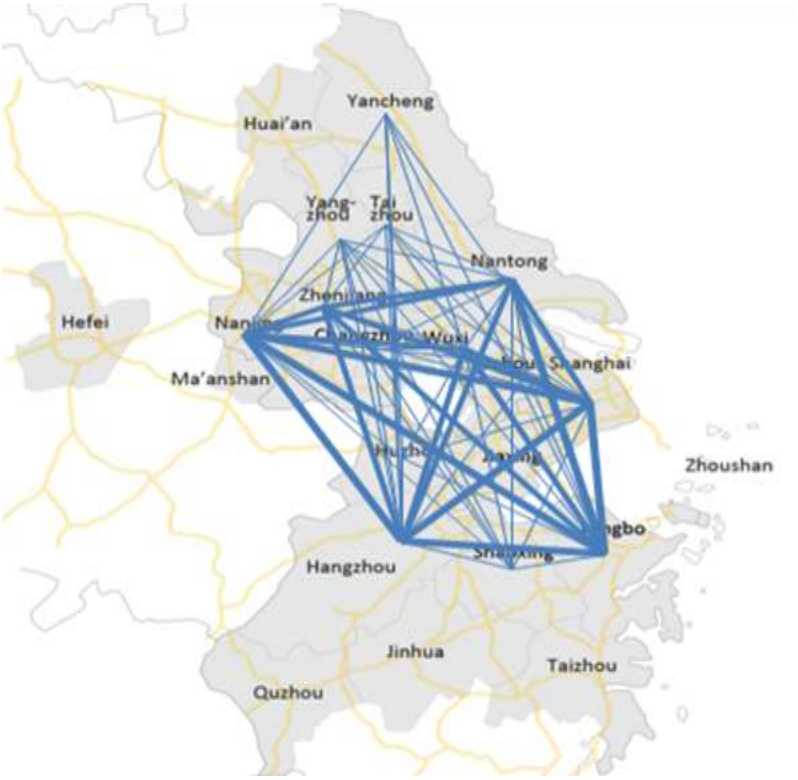


Figure 5- 7 Synergic Relations among Cities Basing on the China National Offshore Oil

Source: draw by the author

5.2.4 The Overlapping results

Figure 5- 8 The Complementary Relations among Cities Basing on the 18 global firms

Source: draw by the author

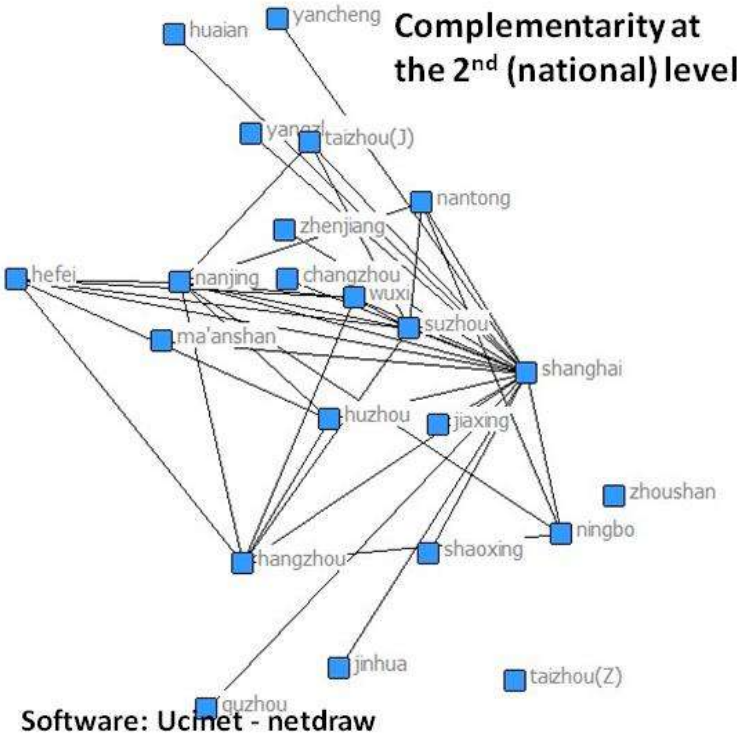


Figure 5- 9 The Synergic Relations among Cities Basing on the 18 global firms

Source: draw by the author

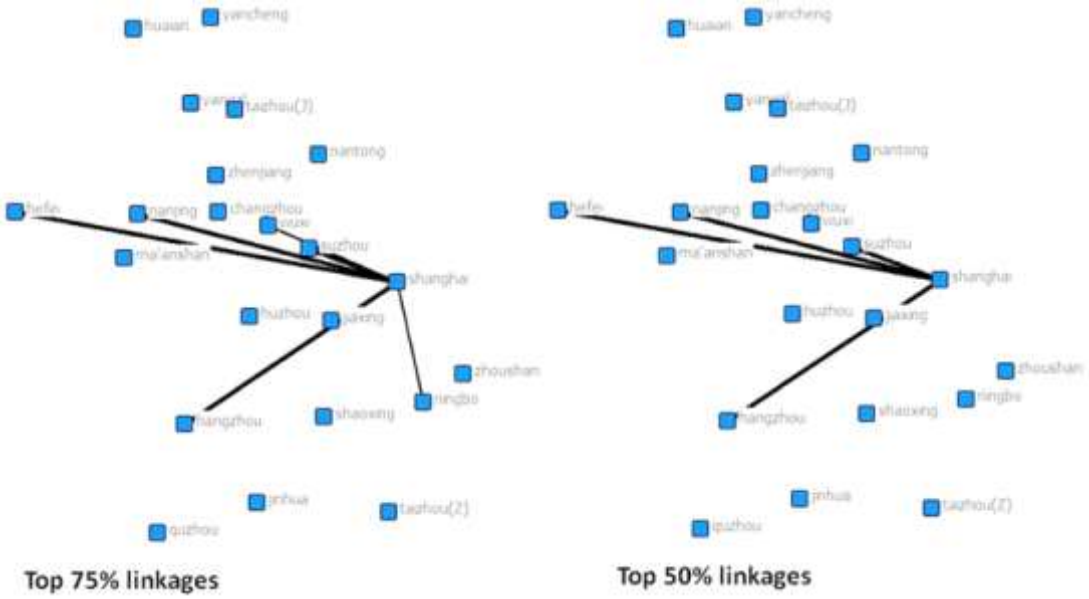


Figure 5- 10 City Links in Yangtze River Delta Region

Source: draw by the author

5.2.5 Main findings

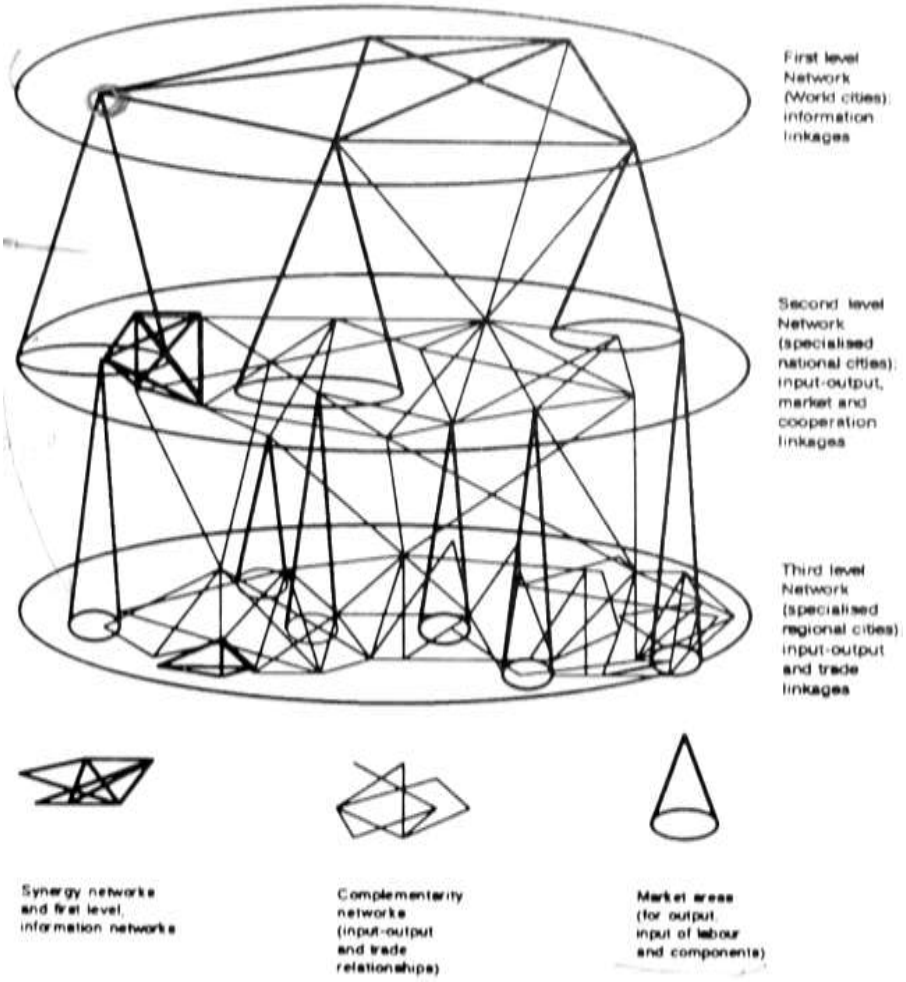
By considering the linkages between cities, two principle linkage passages were existent in the region starting from Shanghai towards Hefei and towards Hangzhou (the line to Hefei was more strong than to Hangzhou) and a more connected triangle area composed by Shanghai, Hefei and Hangzhou in which the linkages between cities were more rich, while the other cities (in northern Jiangsu and southern Zhejiang) connected directly preferentially with Shanghai in the form of mono-line compared with any other cities.

Firstly, the survey of Multinational firm ownership verified the emergence of city-network, but with Center – periphery structure: not all Yangtze River Delta cities are involved in the city network in the sense of subsidiaries of leading global firms.

Secondly, the most involving cities are Metropolis, province capital, specialized cities.

Thirdly, the network is not balanced, in the sense that most of the links of city network (representing the top 75% of the linkages) converge on the single center of Shanghai.

Lastly, it verified the Hierarchy of city-networks model proposed by Camagni (1993).



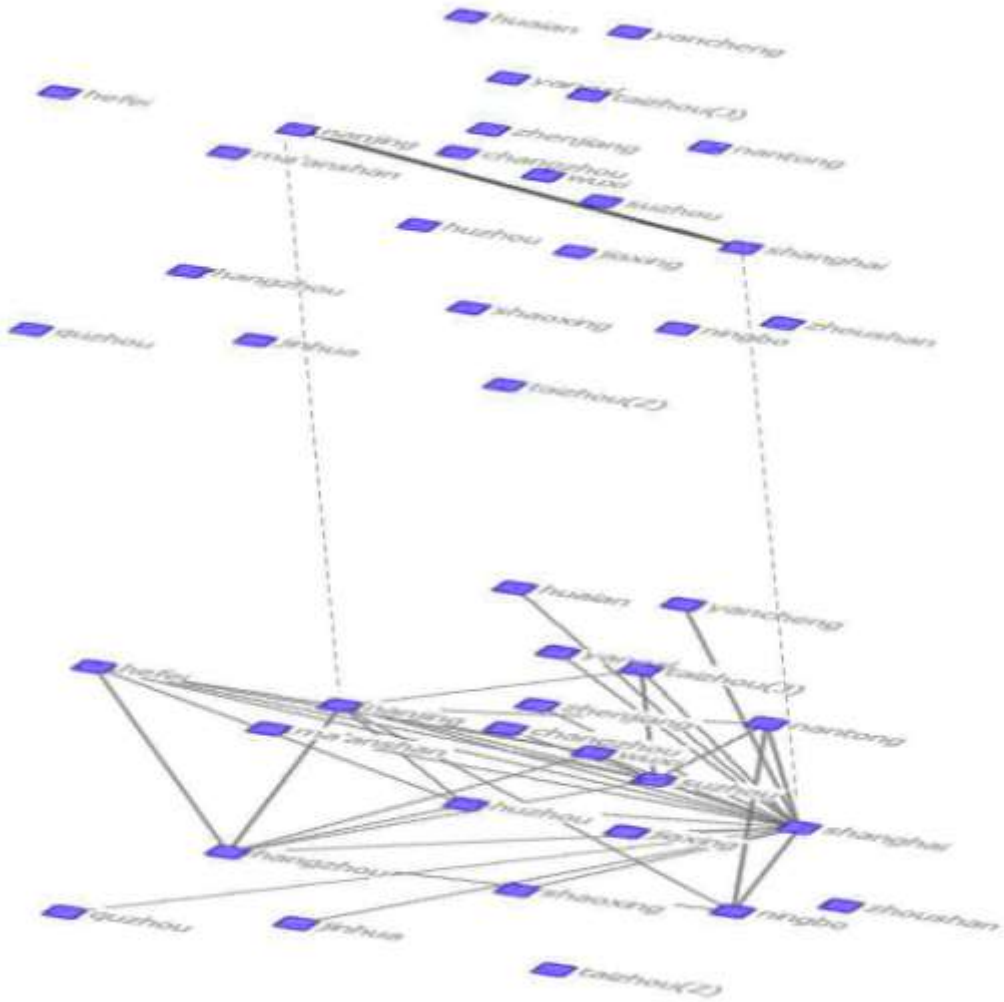


Figure 5- 11 Hierarchy of city network in Yangtze River Delta Region

Source: draw by the author

Abstract

This chapter revealed the city network in Yangtze River Delta basing on the multinational firms network:

- The traffic flow on diachronic change provided a general picture of city network in YRD: the maximal links, the core cities, the rank of cities and some basic judgments about the relations among cities.
- Basing on the information of Chinese headquarters and subsidies of 18 multinational enterprises of Fortune 500 (2012), the international and national level complementary networks in YRD were sketched. Especially on the national level, the most connected cities and area were illustrated.

CHAPTER 6

THE REASONING OF CITY NETWORK IN YRD: TOPOGRAPHY, ECONOMY, COGNITION AND GOVERNANCE

6.1 Topography-related economy and culture as a first factor

From the experience of the matured city-networks, for instance Randstad and Rhine-Main, it could not be denied that the city-network was more easily formed in the homogeneous topography and economic base. Basing on the interpretations of topography in Chapter Four, **the most robust city-network appeared in the alluvial plain sub-territory, especially among the cities along Yangtze River, and it is certainly relating with the topography.** Firstly Yangtze River was and is the principle axis expanding westward the hinterland of this region, while the most important communication infrastructures in the region along Yangtze River – the Express way, Railway, High speed railway from Shanghai to Nanjing - have enhanced the competitions and collaborations among cities. Thirdly, in the alluvial plain, the Beijing-Hangzhou canal, the Taihu Lake and their connecting hydrographic net traditionally comprise a homogeneous economic area (Ningbo, Hangzhou, Jiaxing, Huzhou, Suzhou, Wuxi, Changzhou and Shanghai). And not only the economic base, but also the dialects and customs of those cities are approximate, which make the knowledge and policies easily to spread, and it is especially important in the post-modernization world. Those explain why the cities in the alluvial plain and along Yangtze River are especially closely connected.

Hence, the homogeneous topography and the topography-related economic bases are one of the factors fostering the city network, especially in the initial period of its formulation. However accompanying with the development and expansion of the city network, it would supersede the topographic confinements and the specificity-based city networks would be developed.

6.2 City-network basing on specializations

6.2.1 The economic traditions around 1990s and path dependence on sectors

The Open-up policy of China in 1978, which transformed the planned economy into the market economy, could be considered as the starting point of the common development of Chinese economy. And the development and open-up policy for Pudong, Shanghai in 1990 would be an actual starting point of current achievements of this region. Therefore the predominating industries in 1990s could hint the economic traditions. By the image below, the predominant industries among the 22 cities of YRD Region in 1990s were **highly overlapped and analogous** in five industrial categories: Machinery (16 prefectural cities), Textile (15 prefectural cities), Light-industry (14 prefectural cities), Chemical (13 prefectural cities and Shanghai with a little differences of fine chemical industry) and Building materials. Comparing with the total number of prefectural cities in their hosting provinces, the intensity of industrial overlapping in Zhejiang was much higher than the other two provinces (table below). By the industry categories, except these high analogous industries which were widely spread, **the electronic industry** was more clustered in the cities from Suzhou to Hefei along the Yangtze River, while in Zhejiang, it was only distributed in three cities of Hangzhou, Ningbo and Jinhua. And **the pharmaceutical industry** showed the tendency of clustering in the margins of the YRD Region, especially in the middle-southern part of Zhejiang Province, like Taizhou, Jinhua, Shaoxing, Hangzhou and Yancheng. Meanwhile the predominant industries of **Shanghai and Nanjing have similarities** in the sense that both of them have the heavy industry such as Petrochemical industry, Vehicle industry, and the light industries. But generally speaking, the industrial categories of Shanghai were with higher added values.

The economic traditions lead to the path dependency of development in several cities, including the electronic industry along Yangtze River, the textile industries in the alluvial plain, and later these sectors especially contribute to the specializations and city network.

Figure 6- 1 Leading sectors of each city in 1990's

Source: Yearbook of each city during 1991-2000, organized by the author

Table 6- 1 Principle industrial categories in prefectural cities of Yangtze River Delta Region in 1990's

Industrial Category	Number of Prefectural City			Shanghai
	Jiangsu (8 cities in total)	Zhejiang (9 cities in total)	Anhui (2 cities in total)	
Machinery	6	9	1	NON
Textile	6	8	1	NON
Light-industry	6	6	2	Household appliances manufacturing
Chemical industry	5	7	2	Fine chemical industry
Building materials (cement and etc.)	3	2	1	NON

Source: organized by the author

6.2.2 Specializations on primary, manufacturing and tertiary sectors in 2010

6.2.2.1 The location quotients of the primary and tertiary sectors

The data chosen for Location Quotient Analysis are the employment in 9 primary and tertiary sectors in 2010 of the central districts of the 22 prefectural cities, and the formula is below. Basing on possible reasons that may lead to high location quotient, the results are presented:

$$\mathbf{L.Q._{ij} = (E_{i.j}/E_{total.j}) / (E_{i.n}/E_{total.n}) >< = 1}$$

$L.Q._{ij}$: Location quotient of sector i of city j in a region

$E_{i.j}$: Employment of sector i of city j

$E_{total.j}$: Employment of all sectors of city j

$E_{i.n}$: Employment of sector i of all cities

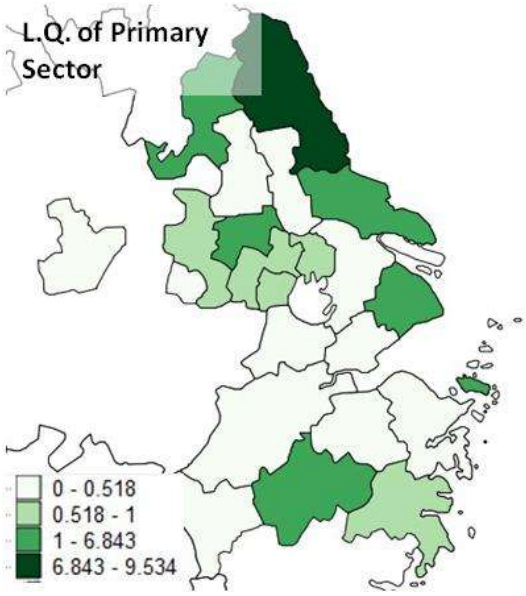
$E_{total\ n}$: Employment of all sectors of all cities

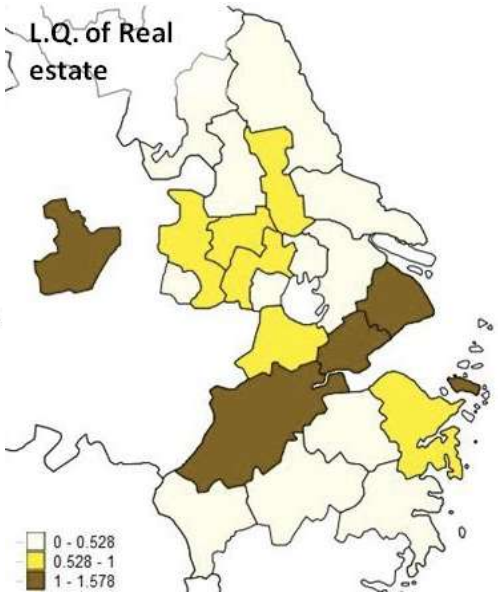
1. The highest LQ of agricultural sectors in northern part of Jiangsu Province, and the high LQs of real estate industry and leasing & business service sectors in the areas along the line between Shanghai and Hangzhou and of the northern part of Zhejiang Province may be related with **the economic traditions**. Because basing on the light industries, the financial activities between agents to agents are used to be more flexible and active, and the real estate and leasing industries are more easy to happen.

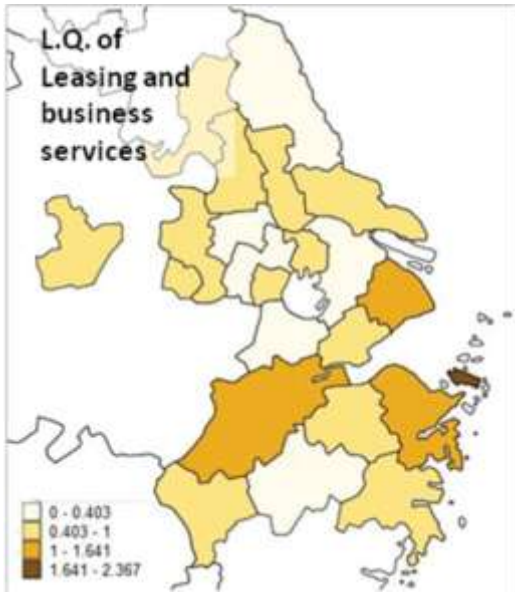
2. The highest LQ of transportations and storage of Shanghai, the high LQ of research of Shanghai, Nanjing, Hangzhou and Hefei, and the high LQ of cultural industries of Nanjing, Quzhou and Hefei may be related with **the high city level (municipality of Shanghai, and 3 capitals of respective provinces) and its corresponding high level functions or the geographical positions** (the second line).

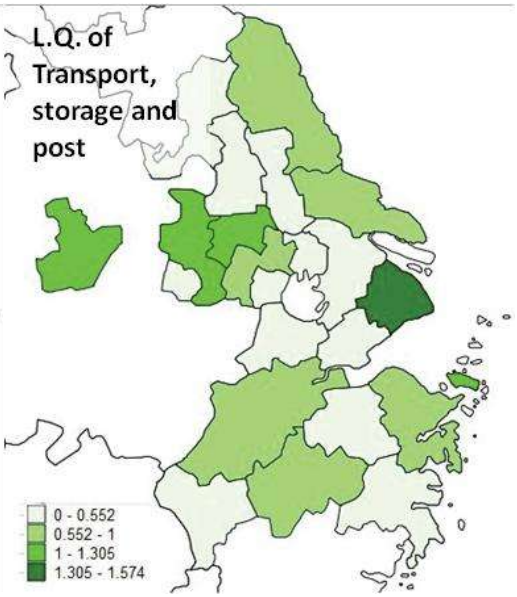
3. The highest LQ of the information & software industries of Hangzhou may be related with **the city strategy**.

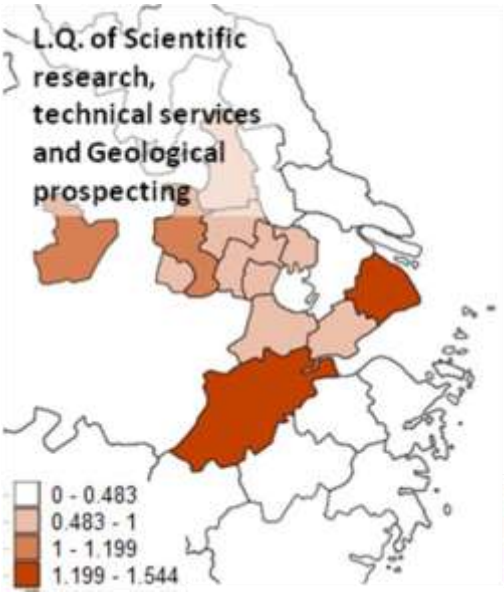
4. The high LQ of financial industries of Yangzhou and Quzhou, and the high LQ of education sectors in the northern part of Jiangsu Province are difficult to be explained. Maybe the mix of high level financing (stock, banking and etc.) with low level financing (bank agents), and the mix of the universities with the elementary, middle, professional schools blurred the implication of these functions.

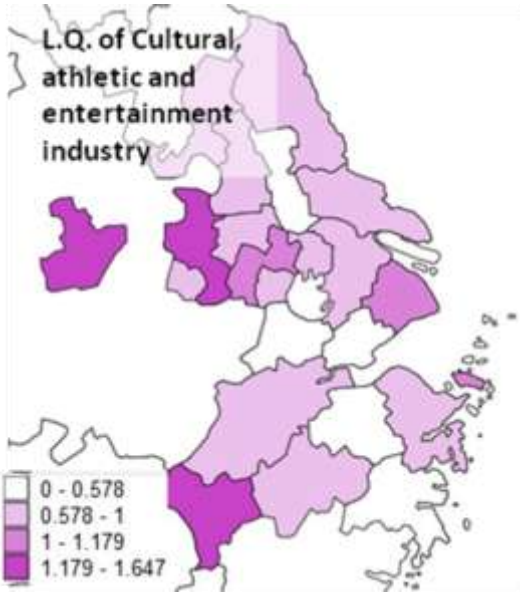

L.Q. of Primary Sector
0 - 0.518
0.518 - 1
1 - 6.843
6.843 - 9.534


L.Q. of Real estate
0 - 0.528
0.528 - 1
1 - 1.578


L.Q. of Leasing and business services
0 - 0.403
0.403 - 1
1 - 1.641
1.641 - 2.367


L.Q. of Transport, storage and post
0 - 0.552
0.552 - 1
1 - 1.305
1.305 - 1.574


L.Q. of Scientific research, technical services and Geological prospecting
0 - 0.483
0.483 - 1
1 - 1.199
1.199 - 1.544


L.Q. of Cultural, athletic and entertainment industry
0 - 0.578
0.578 - 1
1 - 1.179
1.179 - 1.647

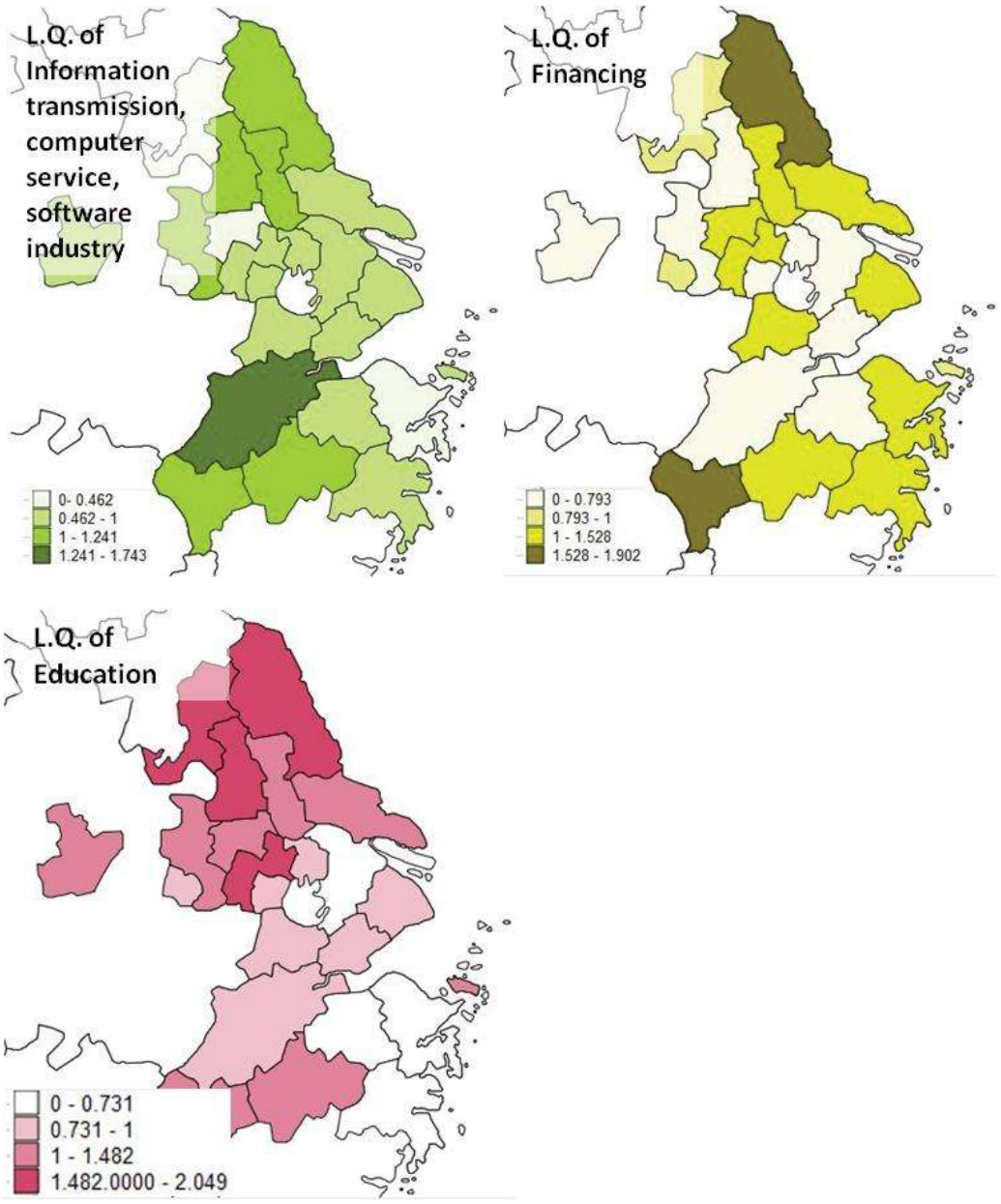


Figure 6- 2 Distributions of Location quotient of different industries in Yangtze River Delta

Source: draw by the author

6.2.2.1 The urban specializations that are sensitive to City sizes

The study firstly plotted the number of cities which presented specificity by the city sizes (resident population in central districts on 2010): 0-1 million, 1-2 million…...22-23 million; then it made the diagrams about the value of specificity and the city sizes (the author classified city sizes as 5 categories: < 1 million - 5 cities, 1-2 million - 6 cities, 2-4 million - 7 cities, 4-8 million - 3 cities and > 8 million - 1 city). Figures below represented some correlations between specializations and city sizes in the senses of frequency and highest value.

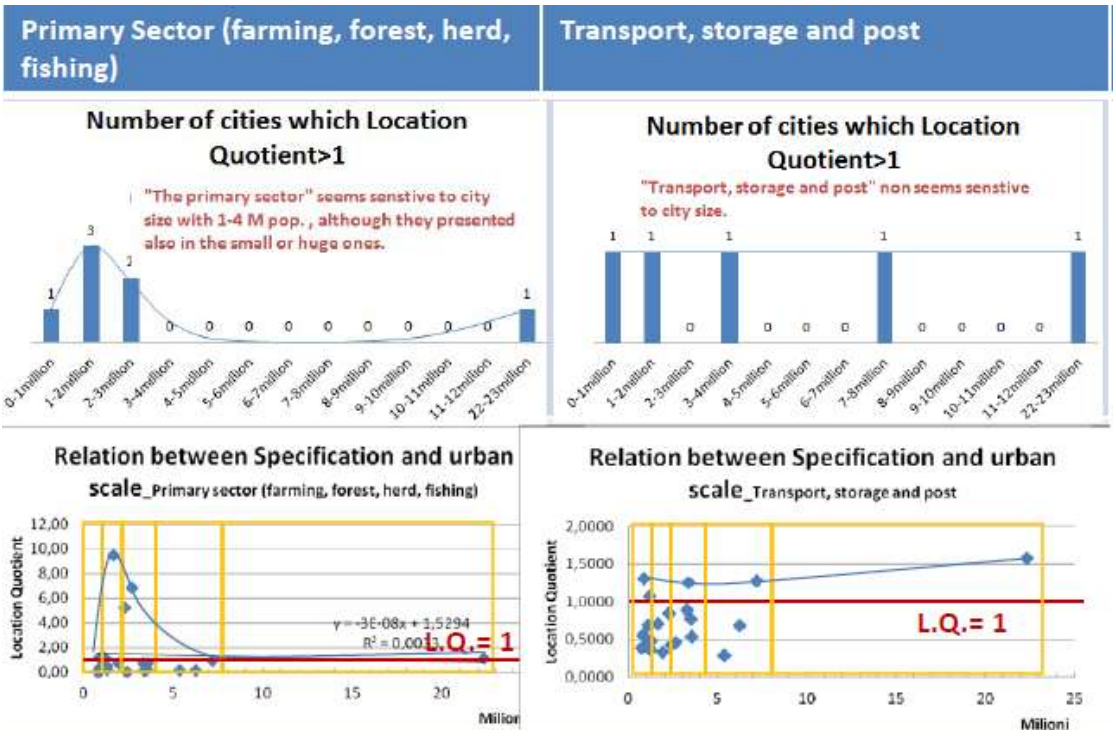
The specializations of Primary sector and Education were more frequently found in cities with 0-4 Million population (small-medium scale), and the highest value also presented in these categories.

The specializations of the Information & software industries seem to concentrate in cities with population less than 8 Million, especially highest value presented in cities with 4-8 M population (medium).

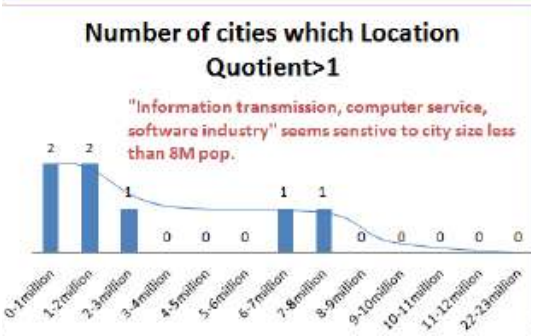
The specializations of Scientific research preferred cities with population more than 2 M (medium-large), and the value of specializations increased as city size increased.

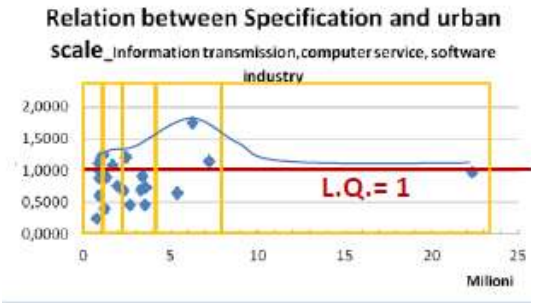
The specializations of Transportation & storage, Financing, Real estate, Leasing & business service and Culture industry do not seem sensitive with the city size, because cities of all sizes presented those specializations.

Therefore the city size is useful for understanding the specificities of Primary, Education, Information & software industries and Scientific research.

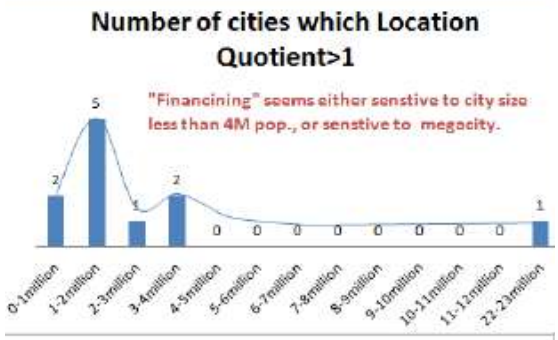


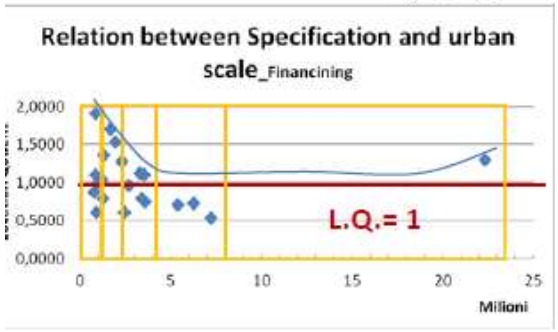
Information transmission, computer service, software industry



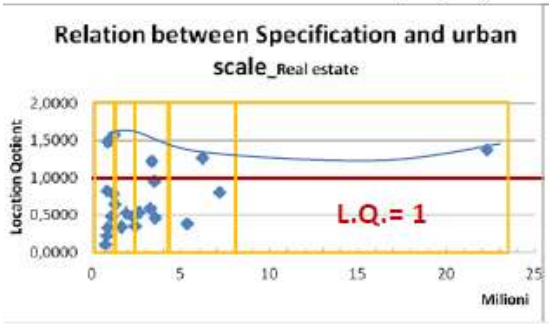


Financing

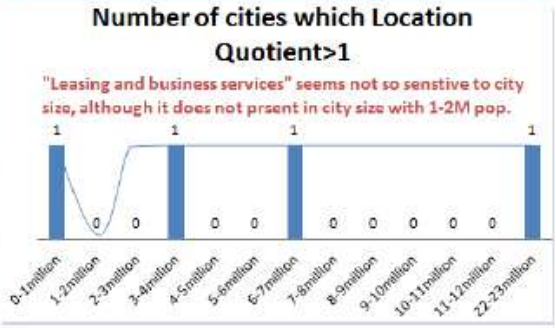


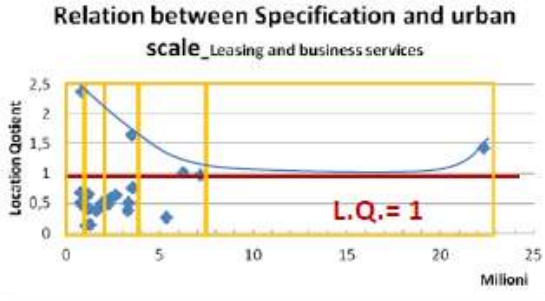


Real estate



Leasing and business services





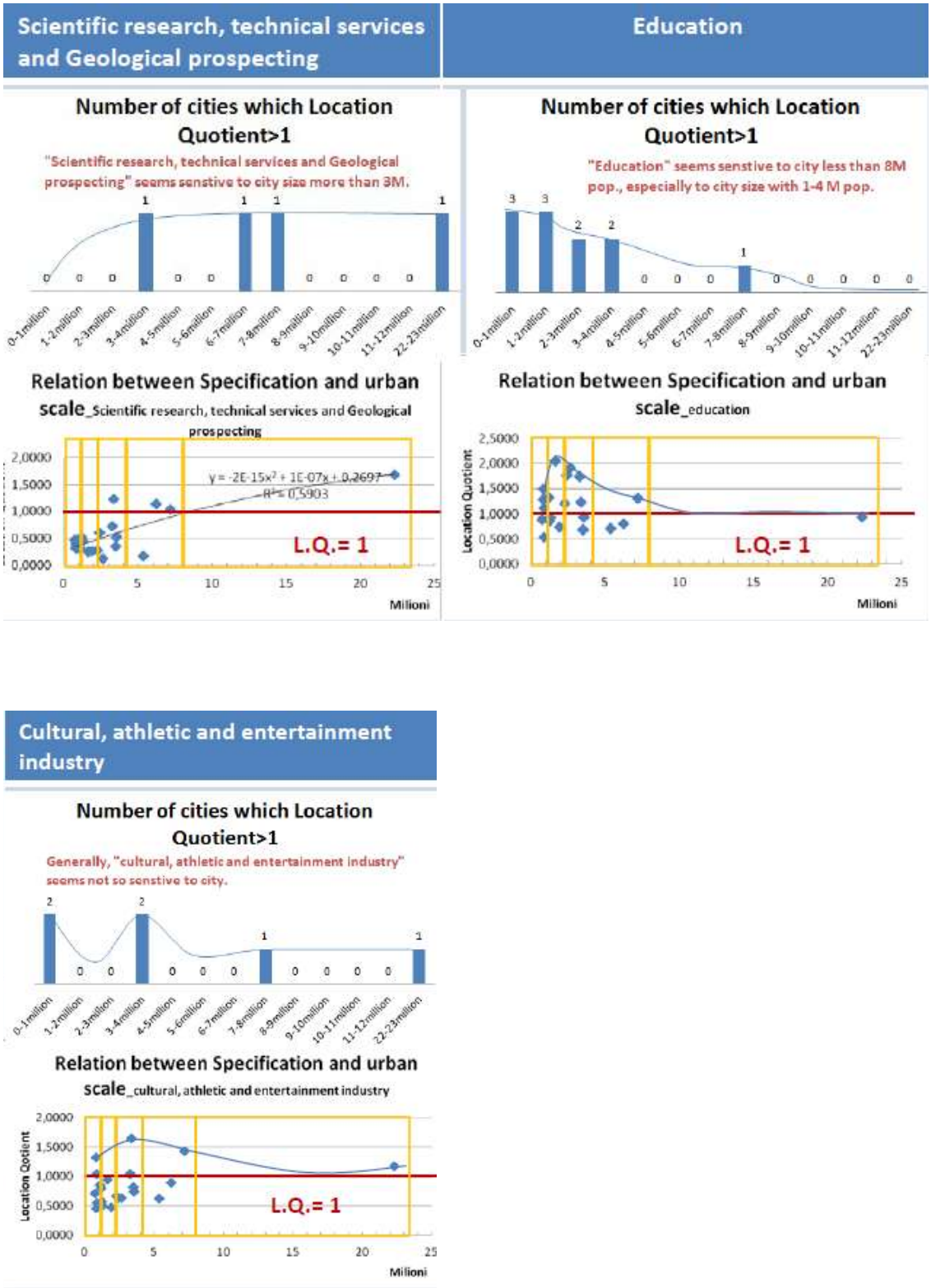


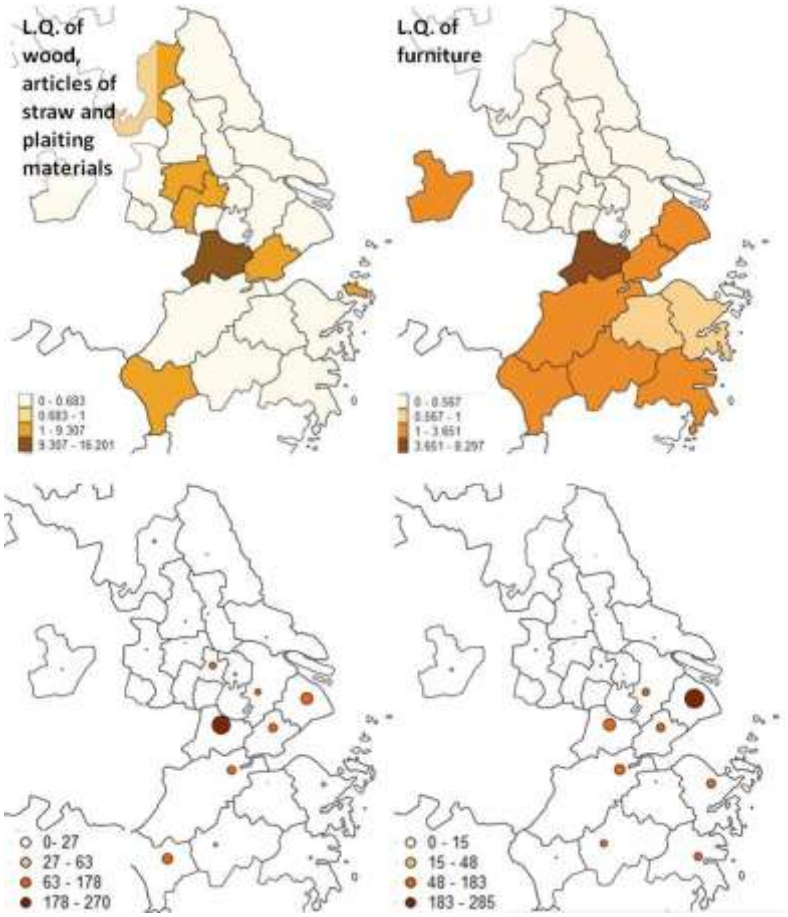
Figure 6- 3 Correlation between specializations and city sizes

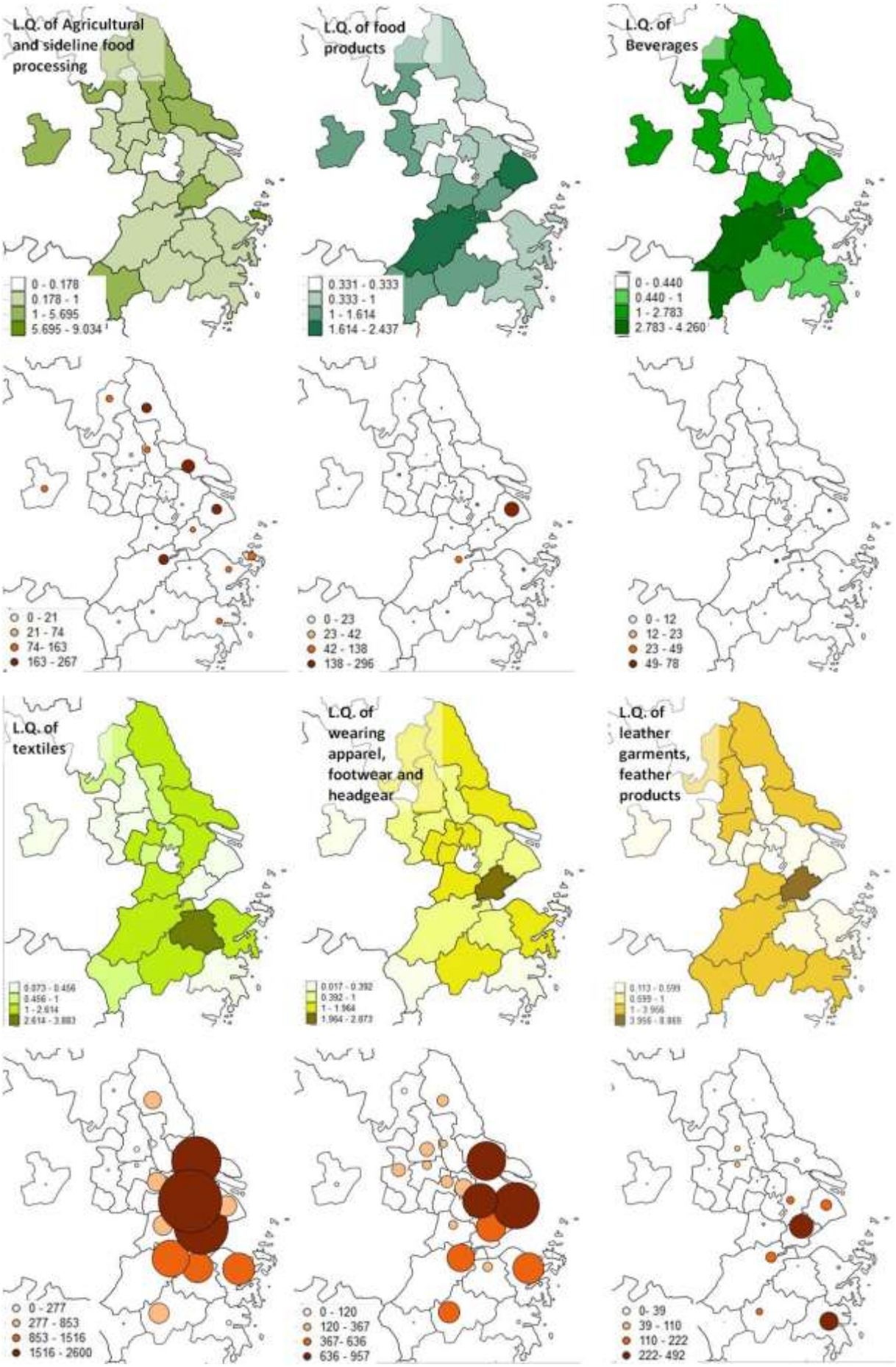
Source: draw by the author

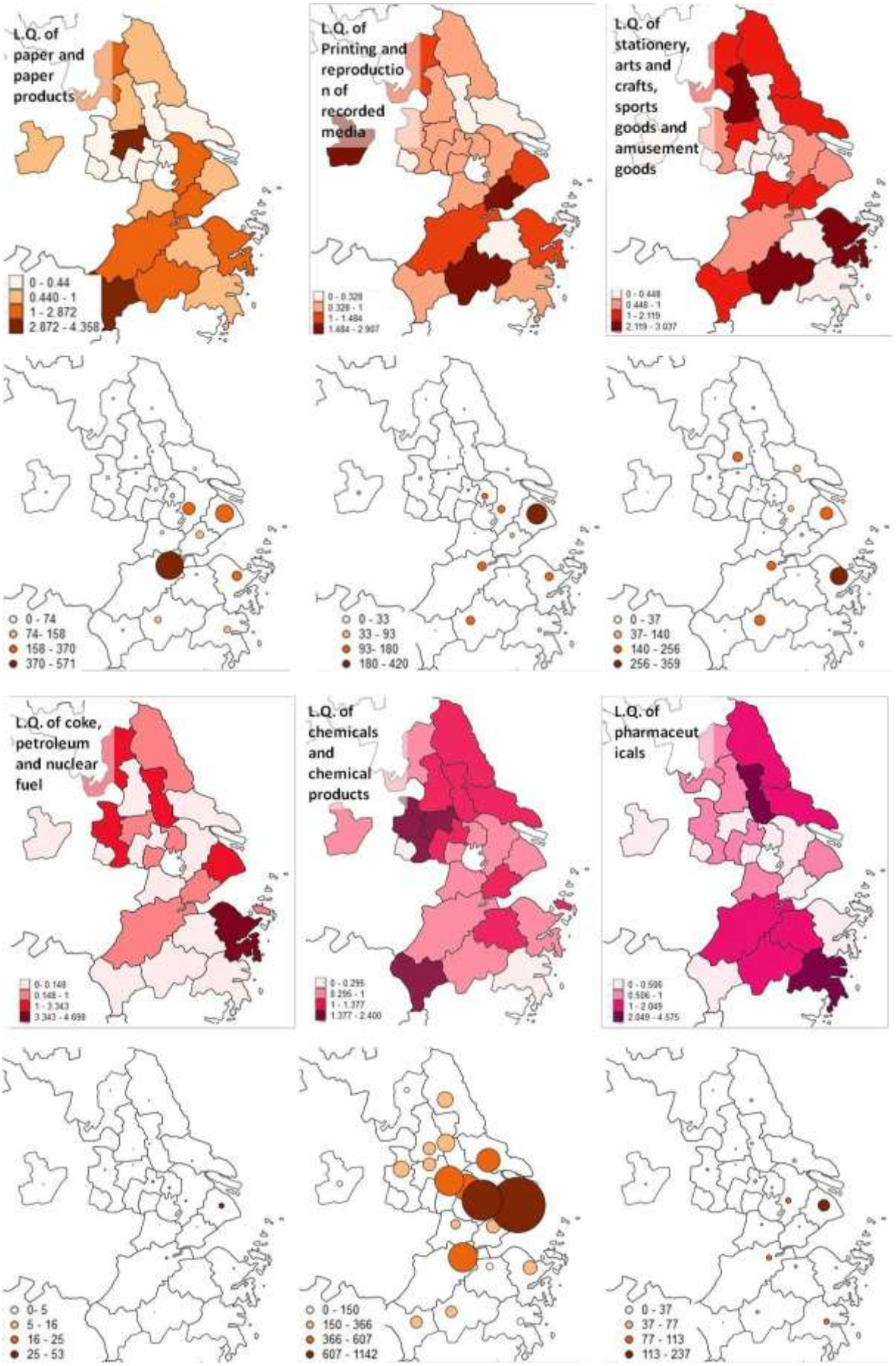
6.2.2.2 The location quotients of manufacturing and the clusters in the region

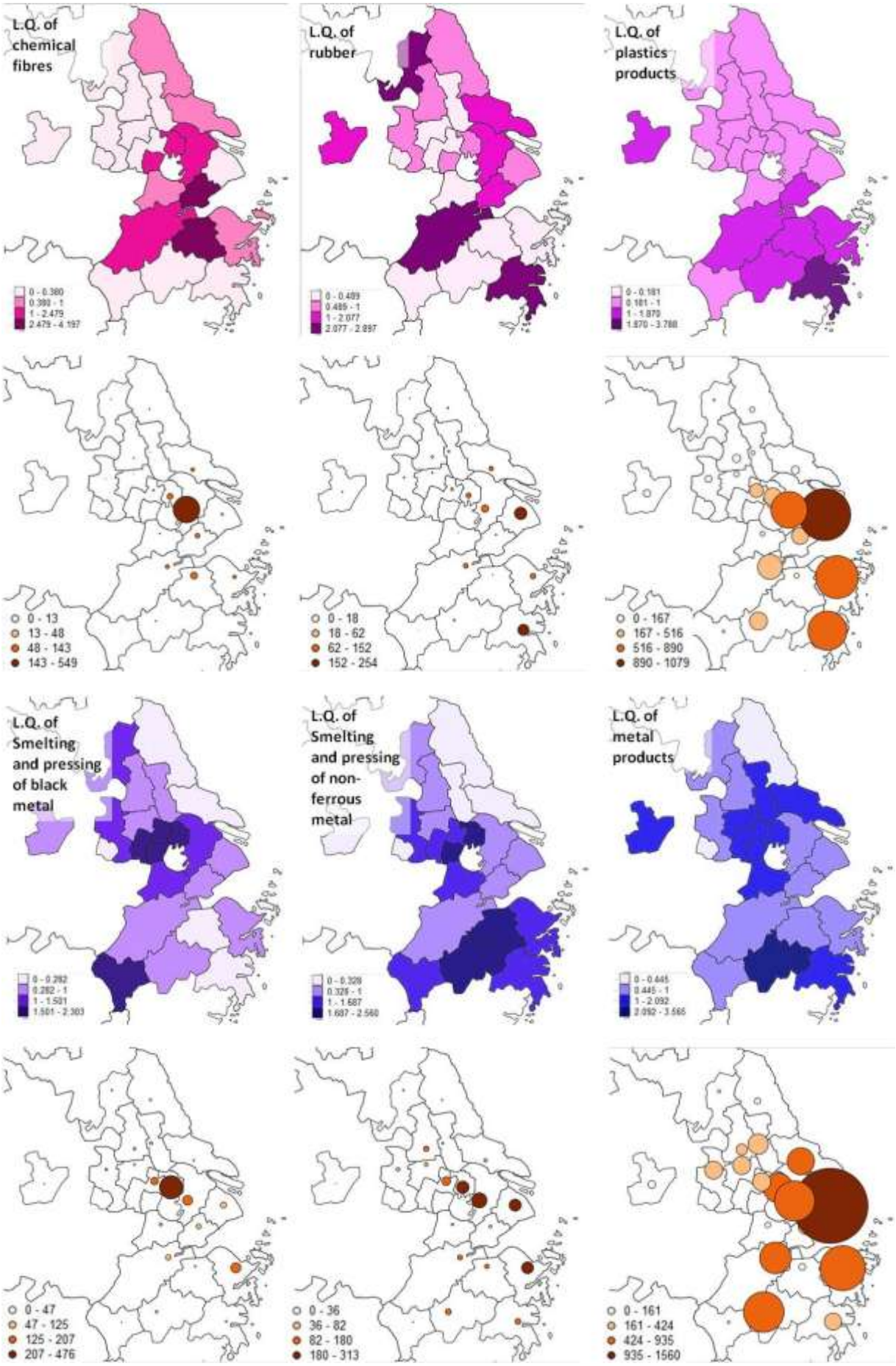
The analysis for the location quotients of manufacturing sectors adopted the data of the output value and the numbers of enterprises of 28 sector of 22 prefectural level cities in 2010.

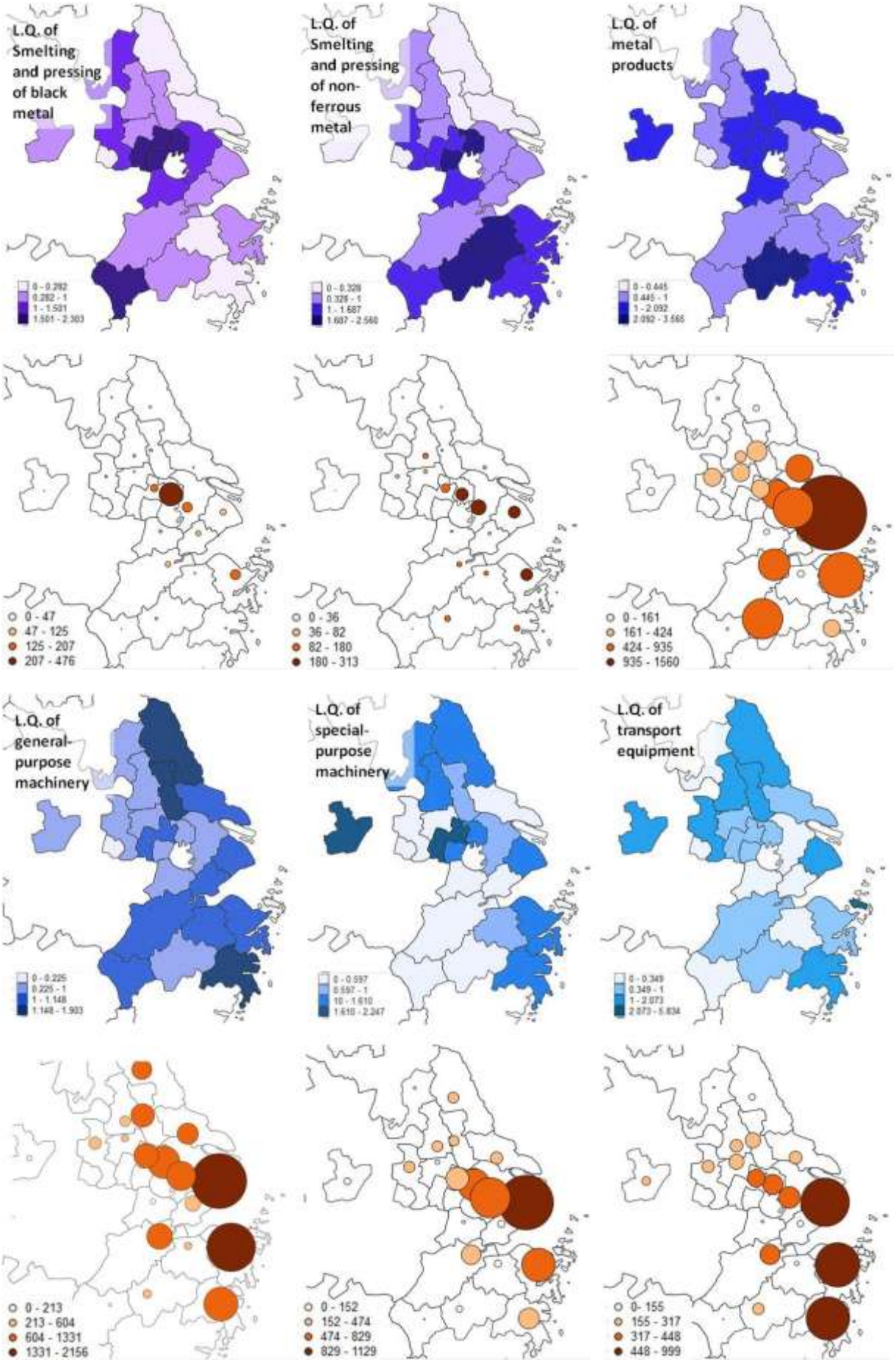
These specializations with clusters represented the path dependency of the specializations basing on the economic traditions and the economic developing models.




L.Q. of Agricultural and sideline food processing
0 - 0.178
0.178 - 1
1 - 5.695
5.695 - 9.034
L.Q. of food products
0.331 - 0.333
0.333 - 1
1 - 1.614
1.614 - 2.437
L.Q. of Beverages
0 - 0.440
0.440 - 1
1 - 2.783
2.783 - 4.260
0 - 21
21 - 74
74- 163
163 - 267
0 - 23
23 - 42
42 - 138
138 - 296
0 - 12
12 - 23
23 - 49
49- 78
L.Q. of textiles
L.Q. of wearing apparel, footwear and headgear
L.Q. of leather garments, feather products
0 - 277
277 - 853
853 - 1516
1516 - 2600
0 - 120
120 - 367
367- 636
636 - 957
0- 39
39 - 110
110 - 222
222- 492


L.Q. of paper and paper products
0 - 0.44
0.440 - 1
1 - 2.872
2.872 - 4.358
L.Q. of Printing and reproductio n of recorded media
0 - 0.328
0.328 - 1
1 - 1.484
1.484 - 2.997
L.Q. of stationery, arts and crafts, sports goods and amusement goods
0 - 0.448
0.448 - 1
1 - 2.119
2.119 - 3.037
0 - 74
74- 158
158 - 370
370 - 571
0 - 33
33 - 93
93- 180
180 - 420
0 - 37
37- 140
140 - 256
256 - 359
L.Q. of coke, petroleum and nuclear fuel
0- 0.148
0.148 - 1
1 - 3.343
3.343 - 4.698
L.Q. of chemicals and chemical products
0 - 0.295
0.295 - 1
1 - 1.377
1.377 - 2.400
L.Q. of pharmaceut icals
0 - 0.506
0.506 - 1
1 - 2.049
2.049 - 4.575
0- 5
5 - 16
16 - 25
25 - 53
0 - 150
150 - 366
366 - 607
607 - 1142
0 - 37
37 - 77
77 - 113
113 - 237


L.Q. of chemical fibres
0 - 0.380
0.380 - 1
1 - 2.479
2.479 - 4.197
L.Q. of rubber
0 - 0.489
0.489 - 1
1 - 2.077
2.077 - 2.897
L.Q. of plastics products
0 - 0.181
0.181 - 1
1 - 1.870
1.870 - 3.788
0 - 13
13 - 48
48 - 143
143 - 549
0 - 18
18 - 62
62 - 152
152 - 254
0 - 167
167 - 516
516 - 890
890 - 1079
L.Q. of Smelting and pressing of black metal
0 - 0.282
0.282 - 1
1 - 1.501
1.501 - 2.303
L.Q. of Smelting and pressing of non-ferrous metal
0 - 0.328
0.328 - 1
1 - 1.687
1.687 - 2.560
L.Q. of metal products
0 - 0.445
0.445 - 1
1 - 2.092
2.092 - 3.565
0 - 47
47 - 125
125 - 207
207 - 476
0 - 36
36 - 82
82 - 180
180 - 313
0 - 161
161 - 424
424 - 935
935 - 1560


L.Q. of Smelting and pressing of black metal
0 - 0.282
0.282 - 1
1 - 1.501
1.501 - 2.303
L.Q. of Smelting and pressing of non-ferrous metal
0 - 0.328
0.328 - 1
1 - 1.687
1.687 - 2.560
L.Q. of metal products
0 - 0.445
0.445 - 1
1 - 2.092
2.092 - 3.565
0 - 47
47 - 125
125 - 207
207 - 476
0 - 36
36 - 82
82 - 180
180 - 313
0 - 161
161 - 424
424 - 935
935 - 1560
L.Q. of general-purpose machinery
0 - 0.225
0.225 - 1
1 - 1.148
1.148 - 1.903
L.Q. of special-purpose machinery
0 - 0.597
0.597 - 1
1 - 1.610
1.610 - 2.247
L.Q. of transport equipment
0 - 0.349
0.349 - 1
1 - 2.073
2.073 - 5.834
0 - 213
213 - 604
604 - 1331
1331 - 2156
0 - 152
152 - 474
474 - 829
829 - 1129
0 - 155
155 - 317
317 - 448
448 - 999

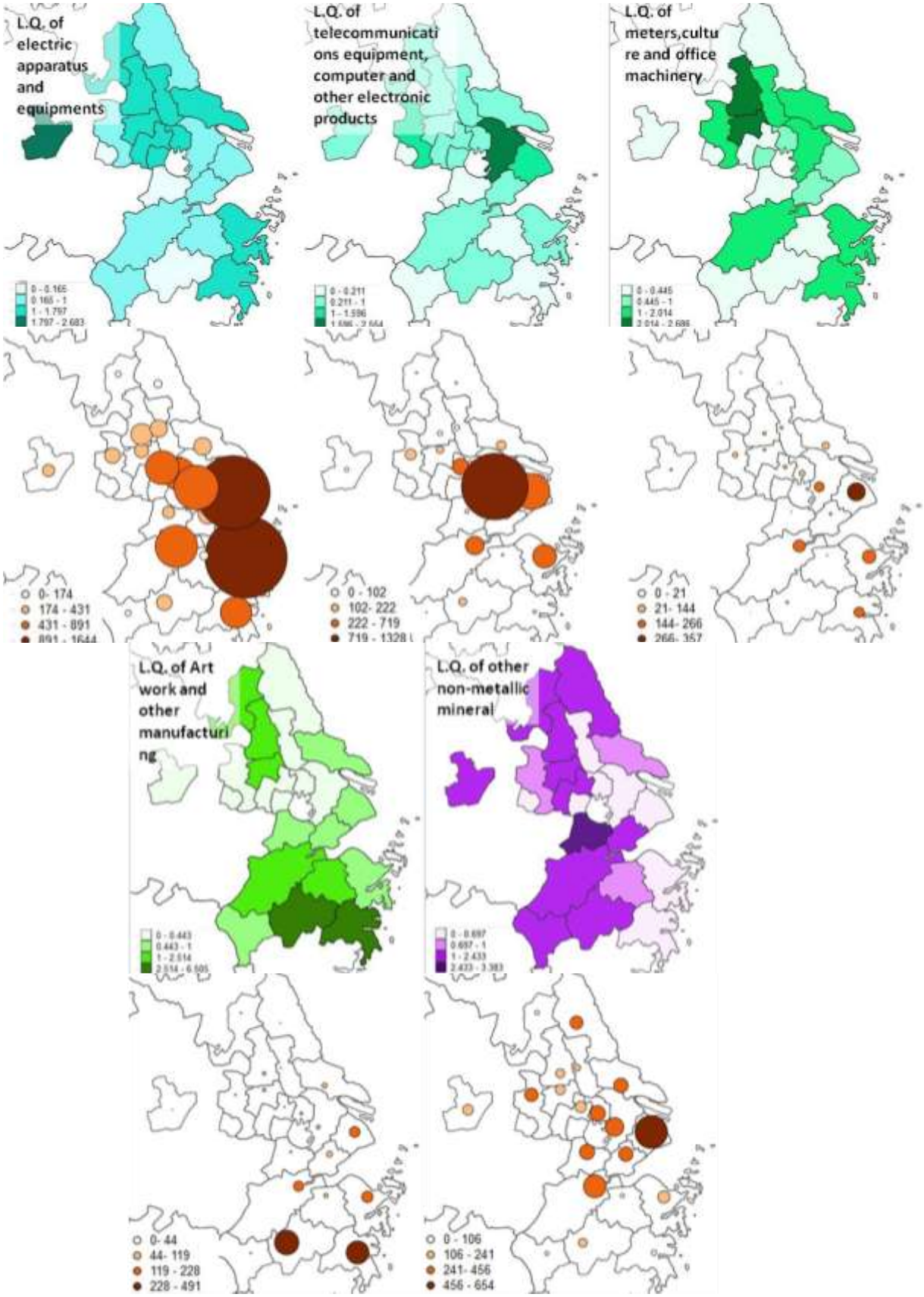


Figure 6- 4 Location quotients of 28 manufacturing sectors in YRD cities in output value and the numbers of enterprises 2010

Source: draw by the author

6.2.3 The evolution of the City Specializations 2000-2010: the transferring attention to the cities with small specializations

The two maps of "leading location quotient" in 2000 and 2010 reveal the geographical industrial transformations. In general, the distribution of urban **leading specializations is going to be more widespread** in 2010, because more cities acquired their own specializations and the process of sector specialization was extending towards the north wing of Jiangsu Province (north of Yangtz Rivery except Huai'an) and towards the south wing of Zhejiang Province which are peripheries. Especially more **rapidly intensified and diversified** in Zhejiang Province. However some cities along the Yangtze River **lost their specializations** during the ten years, like Zhenjiang, Nanjing and Hefei, because they were transforming towards more compound cities. While some **never created their own specificity**, like Nantong, Ma'anshan. It is interesting to see an unique phenomenon that in the cities between Taihu Lake and Yangtze River **didn't showed the process of intensifying, diversifying and extending their own sector specializations**, including Suhou, Wuxi and Changzhou, but instead they **upgraded their specializations** from low added-value industries (light industries: paper production, cultural and office machinery) towards high added-value industries (heavy industries: machinery, equipment manufacturing and smelting and metal productions), while Shanghai was more functioned as the service provider in the sector of research, technical and logistics after 10 years. However the upgrading of industrial sectors didn't happen to other cities, which were more specified in light industrial sectors, even those cities in northern Zhejiang like Ningbo which had the possibility to so.

One correspondence between the leading specificity and the city network we got in last chapter was that the cities along the most frequent direction of the linkages showed quite low sector specializations, including Suzhou, Wuxi, Changzhou, Nanjing and Hefei. This process seem to tell a fact that, **in the "central place era" (agriculture era), there were several compound cities in the hierarchical top with their dependent surroundings**; **in the industrial era, city network emerged basing on the urban specializations with incomplete presence of the entire mix of functions**, just what we saw the increase of specializations in Zhejiang province; while **in the post-industrial era, city network would evolve into cities with specializations on manufacturing or services, but also with complete presence of urban functions**, in other words, the location quotients of the most connected cities trend are decreasing, just as we saw the shrinkage and upgrading the specializations of Nanjing, Hefei, Suzhou, Wuxi, Changzhou and Shanghai.

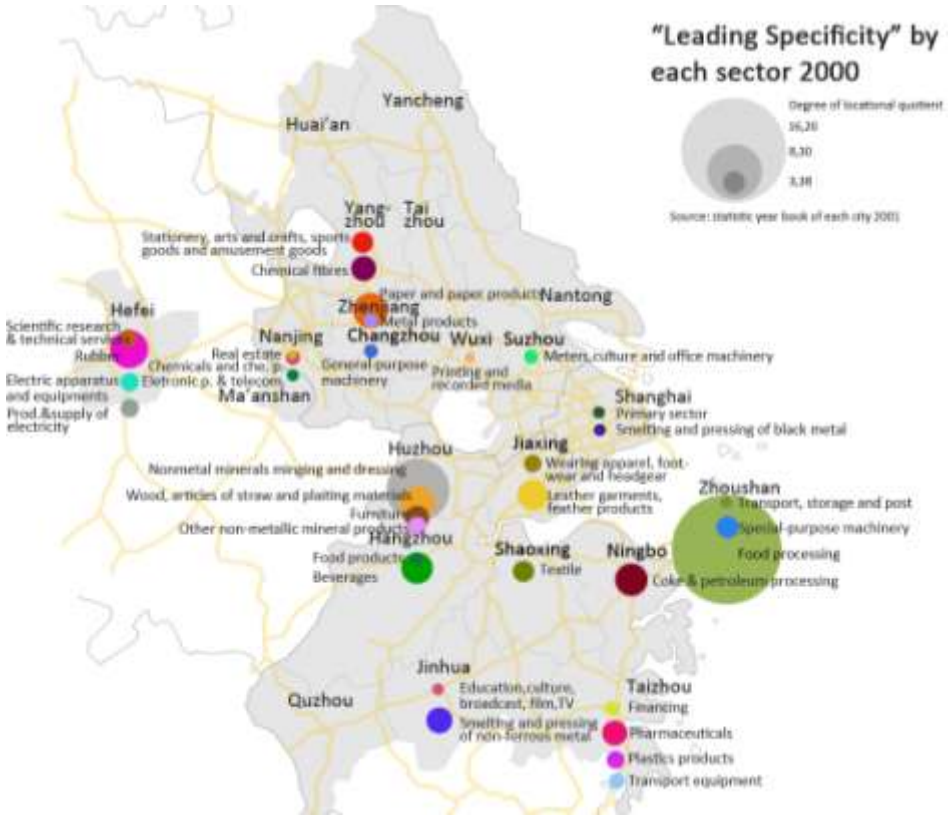


Figure 6- 5 Leading specializations by each sector in year of 2000

Source: draw by the author

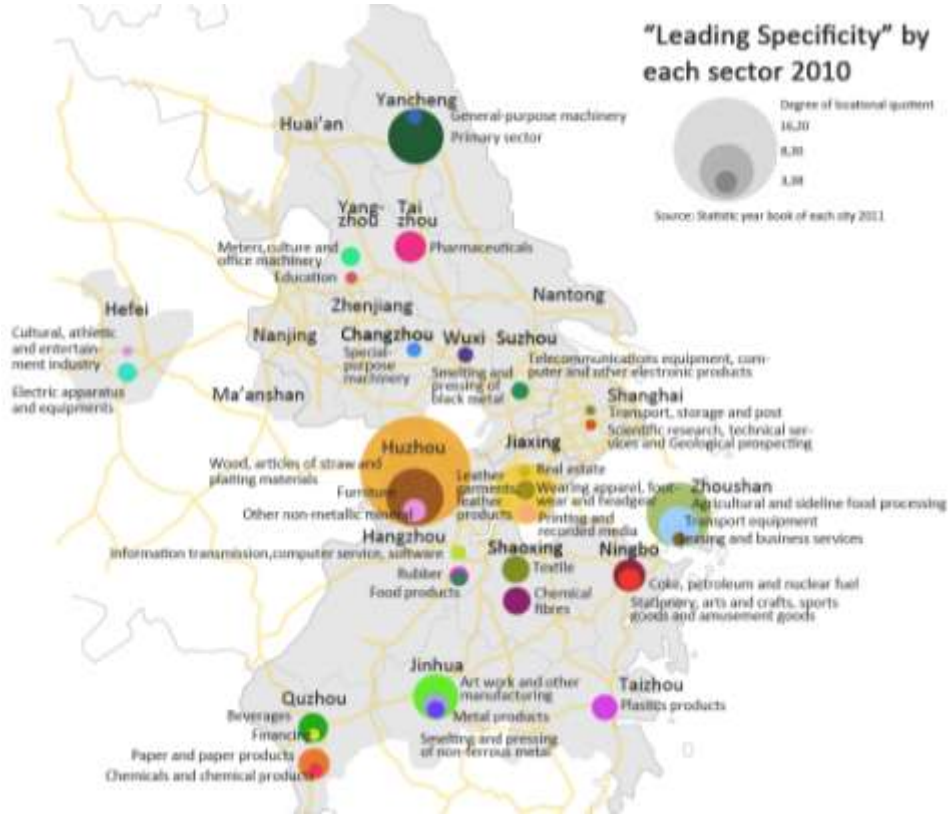


Figure 6- 6 Leading specializations by each sector in year of 2010

Source: draw by the author

Table 6- 2 The change of specializations of YRD cities during 2000-2010

		Specializations Changes	
		Specializations 2000	***Specializations 2010***
Acquired specializations (periphery)	Yancheng	no specificity	"general purpose machinery and primary sector"
	Taizhou(J)	no specificity	"pharmaceuticals"
	Quzhou	no specificity	"beverage", "financing", "paper and paper products", "chemical and chemical products"
Remained specializations (core area, alluvial plain and some periphery)	Huzhou	"wood, articles of straw and painting materials", "furniture" and "other non metallic mineral products"	Remained the specializations, but lost "nonmetal minerals mining" and "dressing"
	Shaoxing	"textile"	Remained the specializations, and added by "chemical fibers"
	Jiaxing	"wearing apparel, foot wear and headgear", "leather garments and leather products"	Remained the specializations, and added by "real estate" and "printing and recorded media"
	Ningbo	"coke, petroleum and nuclear fuel"	Remained the specializations, and added by "stationary, arts and crafts, sports goods and amusement goods"
	Jinhua	"smelting and pressing of non ferrous metal"	Remained the specializations, and added by "artwork and other manufacturing", "metal products"
	Zhoushan	"agriculture and sideline food processing", "transport equipment"	Remained the specializations, and added by "leasing and business services"
	Hefei	"electronic apparatus and equipments"	Remained the specializations, but lost "scientific research & technical service", "rubber", "production and supply of electricity" , and added by "Culture, athletic and entertainment industry"
Lost specializations (city around Nanjing, south Zhejiang Province)	Zhenjiang	"paper and paper product", "metal products"	no specificity
	Nanjing	"real estate", "chemical and chemical products", "electronic p.& telecom"	no specificity
	Hefei	"scientific research & technical service", "rubber", "electronic apparatus", "production and	no specificity

		supply of electricity" to specificity	
	Taizhou (Z)	"financing", "pharmaceuticals" , "transport equipment", "plastic products"	"plastic products"
Never created specializations (periphery)	Huai'an, Ma'anshan, Nantong		
Upgraded their specializations (core area, alluvial plain)	Changzhou	"general purpose machinery"	"special purpose machinery"
	Wuxi	"print and recorded media "	"smelting and pressing of black metal"
	Shanghai	"primary sector", "smelting and processing of black metal"	"transport, storage and post", "scientific research, technical service, geological prospecting"
	Suzhou	"meters", "culture and office machinery"	"telecommunication equipments, computer and other electronic products"
Altered specializations	Yangzhou	"stationary, arts and crafts, sports goods and amusement goods", "chemical fibers"	"meters, culture and office machinery", "education"

Source: organized by the author

6.2.4 Clusters and Spatial structures of Specializations 2000-2010: from central places to a network structure

The functional structure in YRD Region is defined by conducting the analysis of "Employment location quotient of all sectors", "Factor Analysis" and "Cluster" on the previous one. These two analyses are based on the data of 15 sectors of 2001 and 19 sectors of 2010 covering the central districts of 22 cities. The sources comes from China City Statistical Yearbook 2002 & 2011.

Five steps are simultaneously carried to the data of 2001 and 2010 (Figure below). Take the year 2001 for example:

Firstly the author calculated of location quotient of employment of all sectors (results over "1" have been marked in red).

Secondly the factors analysis resulted in the extraction of 6 factors which could represent 84.3% of the total factors.

Thirdly the interpretation of 6 factors: 1, Advanced Service (including education, finance, public administration and welfare), 2, Common Service (including residential service, real estate, whole and retail sales), 3, Research and Knowledge, 4, Resources-Based Productions (like geological explorations, mining), 5, constructions, Transportation and Logistics, and 6, Non-Agricultural Resources Based Industries.

Fourthly the Cluster of cities by their scores of 6 factors: 7 categories has got. First category city mixed the sectors of manufacture, transportation, advanced and common services; Second category city mixed constructions and advanced and common services; Third category city mixed the provisions of water, electricity, and gas, transportations and advanced and common services; Fourth category city mixed the provisions of water, electricity and gas, construction and trade; Fifth category city mixed the geological explorations and advanced and common services; Sixth category city was mining and Seventh category city mixed trade and services.

CITIES(all data are Municipality charged districts)	primary sector (farming, forest, herd, fishing)	Mining	manufacturing	Production and provision of electricity, gas and water	construction industry	Geological prospecting & irrigation management	Transport, storage and post	Wholesale and retail trade	financing	real estate	Residential services and other services	Sanitation, sport and welfare	education, culture, broadcast, film,TV	Scientific research, technical services	public administration and social organizations
Shanghai	1,69	0,02	0,97	0,56	0,88	0,34	0,82	1,21	0,71	1,04	1,32	0,87	0,77	0,86	0,64
Nanjing	0,15	1,23	0,98	1,04	1,30	2,16	1,56	0,69	0,91	1,23	0,66	0,99	1,48	2,03	1,15
Wuxi	0,14	0,04	1,35	1,20	0,48	0,59	0,78	0,88	1,07	0,96	0,65	0,96	0,92	0,96	1,00
Changzhou	0,02	0,00	1,38	1,65	0,49	1,73	0,86	0,70	1,23	0,86	0,41	1,18	1,08	0,75	1,10
Suzhou	0,13	0,77	1,31	1,38	0,44	0,63	0,99	0,65	0,83	1,26	0,62	1,15	1,17	0,75	1,27
Nantong	0,12	0,00	1,27	2,07	0,60	0,67	1,55	0,69	1,24	0,81	0,41	1,20	0,92	0,56	1,29
Huai'an	0,05	0,00	1,03	1,63	1,06	0,81	1,52	0,96	1,93	0,45	0,36	1,14	1,13	0,66	2,06
Yancheng	0,21	2,71	0,80	4,21	1,69	1,71	1,31	1,13	1,60	0,94	0,42	0,81	1,29	0,49	1,53
Yangzhou	0,05	22,35	0,95	1,90	0,90	0,31	1,16	0,63	0,88	0,76	0,46	1,02	1,09	0,94	1,23
Zhenjiang	0,13	3,14	1,03	1,96	1,29	3,89	1,61	0,73	1,24	0,73	0,49	1,15	1,14	0,42	1,36
Taizhou	0,52	0,00	1,23	1,49	0,97	3,66	1,10	0,74	1,17	0,50	0,31	1,11	1,05	0,25	1,69
Hangzhou	0,10	0,00	0,87	1,08	1,19	0,67	1,17	0,82	1,73	1,07	1,05	1,43	1,47	1,88	1,37
Ningbo	0,24	0,09	1,00	1,67	1,39	1,05	1,43	0,88	1,45	1,46	0,72	1,08	1,02	0,46	1,41
Jiaxing	0,25	0,00	1,07	1,82	0,71	0,77	1,01	0,81	2,19	0,77	0,42	1,56	1,46	0,88	1,58
Huzhou	0,12	0,00	0,77	1,90	1,26	2,96	0,91	0,90	1,98	0,98	0,19	1,87	2,16	0,74	3,08
Shaoxing	0,02	3,44	0,88	1,62	2,29	0,57	0,90	0,79	2,80	0,94	0,49	1,44	1,29	0,54	1,42
Jinhua	0,29	0,00	0,79	2,63	1,11	4,42	2,53	0,47	1,97	0,61	0,60	1,42	1,77	0,51	1,39
Quzhou	0,53	0,97	1,36	2,21	1,54	0,84	0,94	0,35	1,61	0,35	0,28	0,87	0,77	0,16	1,41
Zhoushan	0,37	0,00	0,77	1,49	1,42	0,00	1,70	0,85	1,57	0,99	0,64	1,48	1,54	0,40	2,58
Taizhou	0,27	0,37	0,72	2,55	2,69	1,29	0,79	0,68	3,48	0,65	0,34	1,43	1,59	0,29	2,63
Hefei	0,12	0,00	0,88	1,46	1,37	6,13	1,15	0,69	1,17	0,58	0,62	1,37	1,60	2,45	1,95
Ma'anshan	0,04	24,18	1,18	1,57	1,48	3,63	0,52	0,44	1,00	0,32	0,29	0,51	0,63	0,35	1,18

Figure 6- 7 Location quotient of employment of all sectors 2001

Source: organized by the author

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,232	28,210	28,210	4,232	28,210	28,210
2	3,060	20,400	48,610	3,060	20,400	48,610
3	1,820	12,133	60,743	1,820	12,133	60,743
4	1,313	8,752	69,494	1,313	8,752	69,494
5	1,217	8,115	77,609	1,217	8,115	77,609
6	1,009	6,726	84,335	1,009	6,726	84,335
7	,720	4,802	89,137			
8	,585	3,900	93,037			
9	,372	2,480	95,517			
10	,289	1,928	97,445			
11	,232	1,546	98,991			
12	,081	,538	99,529			
13	,049	,326	99,856			
14	,022	,144	100,000			
15	4,403E-5	,000	100,000			

Extraction Method: Principal Component Analysis.

Figure 6- 8 The extraction of 6 factors

Source: organized by the author

Finally the 7 categories of cities were illustrated on the map. By this categorization for **2001**, except Shanghai and the Mining cities, other cities all embraced the advanced and common services with other sectors, and this kind of phenomenon was **coincident to the central place theory** - the hierarchical characteristics of the cities and the functional compounds in the central districts, which indicated the central districts were the "central place" for their attached counties and county level cities. This could be also verified on the map of these categorized cities, that at least until 2001 YRD Region was not so specialized territory which almost presented its geographic face of central place theory.

Education& culture, Pub Admin., Financing, welfare
1 Advanced Service & common service

Residential service, Real estate, whole sale & retail
2 Common service, trade city

Research, Geo. Prospecting
3 Knowledge city

Construction, Geo., Mining, Primary sector
4 Resource-based city

Transport, Provision E.G.W.
5 Provision city

Real estate, mining
6 Resource-based

Component Matrix[a]

	Component					
	1	2	3	4	5	6
PrimarySector	-,347	,408	-,436	,334	,159	-,549
Mining	-,276	-,567	,034	,394	-,308	,400
Manufacturing	-,728	-,346	,100	-,524	,015	-,169
ProvisionofElectricityGas Water	,471	-,429	-,236	,097	,496	,282
Construction	,605	-,190	-,409	,463	-,227	,053
GeologicalProspecting IrrigationManagement	,239	-,266	,631	,419	,099	-,335
TransportStoragePost	,292	,176	,345	,108	,767	,129
WholesaleRetailTrade	,000	,673	-,420	,038	,057	,062
Financining	,792	-,093	-,394	-,083	-,140	-,059
RealEstate	-,090	,739	-,067	-,194	-,002	,488
ResidentialServicesOther	-,394	,793	-,041	,336	,010	-,006
SanitationSportWelfare	,748	,375	,182	-,358	-,123	-,148
EduCulBroadcastFilmTV	,845	,336	,216	-,026	-,037	,024
ResearchTechnical Services	-,050	,489	,636	,222	-,362	,103
Publicadministration SocialOrganizations	,842	-,029	-,052	-,149	-,171	-,168

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a. 6 components extracted.

Figure 6- 9 Componet Matrix

Source: organized by the author

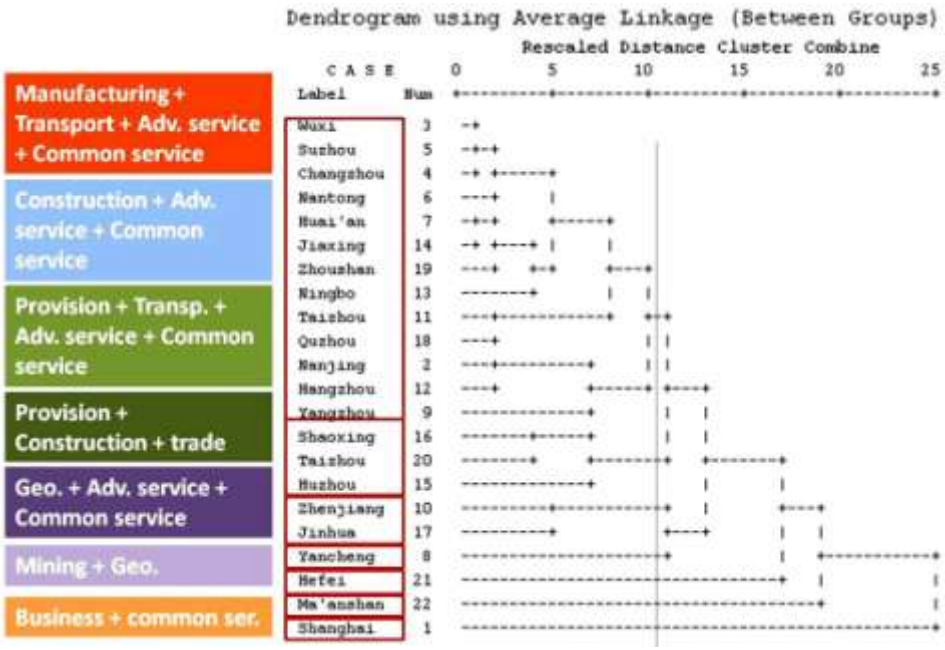


Figure 6- 10 Cluster of cities by their scores of 6 factors 2001

Source: organized by the author

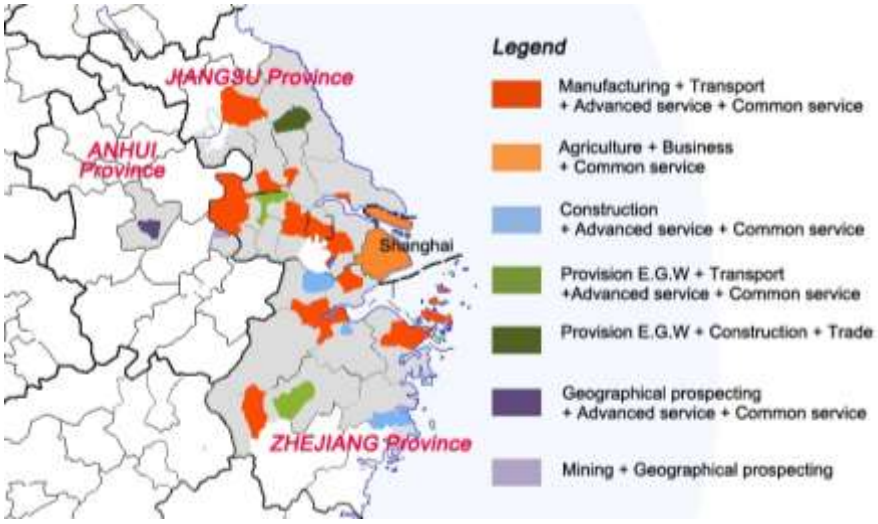


Figure 6- 11 Locations of the 7 clusters 2001

Source: draw by the author

However after the same analysis applied to the situation of 2010, the result represents obviously a functional structure of network that four non-industrial centers of Shanghai, Nanjing, Hangzhou, and Hefei have emerged, synthetic functional cities composed by industries and advanced and common services have distributed surrounding Taihu Lake and in southern part of Zhejiang Province, and finally the agricultural cities in northern part of Jiangsu Province and the mono-functional cities specialized in constructions and resources exploitation industries displayed among them. Comparing the two results in 2001 and 2010, the transformation process for YRD Region was going towards a region composed by Cities with specialized functions (advanced services, service + manufacturing) from the previously functional mixed cities.

L Qin	primary sector (farming, forest, herd, fishing)	Mining	manufacturing	Production and provision of electricity, gas and water	construction industry	Transport, storage and post	information transmission, computer service, software industry	Wholesale and retail trade	Accommodation, catering services	financing	real estate	Leasing and business services	Scientific research, technical services and Geological prospecting	irrigation, environment and communal facilities management	Residential services and other services	education	Sanitation, social security and public welfare	cultural, athletic and entertainment industry	public administration and social organizations
Shanghai	1,16	0,06	0,91	0,98	0,30	1,57	0,97	1,22	1,22	1,29	1,37	1,43	1,68	1,04	2,00	0,93	1,07	1,18	0,82
Nanjing	0,95	0,71	0,94	1,05	0,76	1,27	1,15	1,30	1,33	0,58	0,80	0,98	1,04	1,01	0,67	1,30	0,95	1,44	1,09
Wuxi	0,71	0,00	1,41	1,20	0,47	0,54	0,74	0,77	0,84	0,75	0,46	0,76	0,53	0,84	0,68	0,93	0,96	0,75	0,99
Changzhou	0,75	0,00	1,08	1,52	0,28	0,88	0,70	0,67	0,52	1,13	0,58	0,38	0,73	1,30	0,17	1,74	1,66	1,04	1,51
Suzhou	0,13	0,00	1,80	0,56	0,17	0,28	0,64	0,42	0,63	0,70	0,38	0,26	0,18	0,53	0,11	0,71	0,67	0,62	0,86
Yangzhou	0,00	29,75	0,83	1,19	0,53	0,42	1,21	0,58	0,93	0,61	0,35	0,59	0,61	1,25	0,77	1,77	1,30	0,64	1,92
zhenjiang	1,11	2,39	1,01	2,40	0,58	1,07	0,39	1,10	0,61	1,08	0,78	0,40	0,53	1,22	0,38	1,32	1,39	0,80	1,48
Nantong	5,25	0,00	1,19	1,38	0,88	0,85	0,68	0,54	0,27	1,28	0,47	0,49	0,28	0,81	0,15	1,20	1,36	0,67	1,11
Huai'an	6,84	1,90	0,93	1,66	0,72	0,46	0,45	0,60	0,23	0,96	0,53	0,64	0,13	2,81	0,00	1,91	1,33	0,64	2,26
Yancheng	9,53	7,19	0,76	3,00	0,62	0,70	1,08	0,92	0,42	1,71	0,34	0,38	0,25	0,96	0,30	2,05	1,46	0,95	1,60
Taizhou	0,32	0,00	1,11	1,98	0,69	0,55	1,13	1,09	0,38	1,10	0,82	0,53	0,39	0,55	0,37	1,28	1,18	0,46	1,66
Hangzhou	0,14	0,12	0,78	0,51	2,30	0,68	1,74	1,06	1,54	0,72	1,26	1,01	1,15	1,27	0,91	0,80	0,81	0,90	0,76
Ningbo	0,19	0,06	1,38	0,81	0,50	0,77	0,46	0,79	0,63	1,10	0,95	1,64	0,36	0,67	0,67	0,67	0,78	0,82	0,74
Jiaxing	0,52	0,00	1,46	0,83	0,34	0,36	0,89	1,00	0,58	0,79	1,58	0,65	0,50	0,33	0,69	0,85	0,94	0,58	0,88
Huzhou	0,24	1,04	1,08	1,09	1,81	0,48	0,90	0,66	0,35	1,36	0,64	0,14	0,45	0,73	0,14	0,91	1,05	0,51	1,26
Shaoxing	0,15	1,94	0,68	0,84	4,86	0,40	0,60	0,59	0,48	0,61	0,32	0,46	0,32	0,40	0,09	0,53	0,62	0,55	0,60
Jinhua	1,27	0,00	0,66	1,21	2,65	0,68	1,24	1,13	0,45	1,06	0,48	0,13	0,31	0,92	0,15	1,31	1,25	0,85	1,61
Quzhou	0,00	1,17	1,05	1,68	0,42	0,55	1,00	0,47	0,18	1,90	0,22	0,50	0,31	0,68	0,26	1,48	1,24	1,32	2,42
Zhoushan	1,17	0,37	0,72	1,82	1,11	1,31	0,88	0,46	1,16	0,97	1,48	2,37	0,44	1,06	0,34	1,10	1,10	1,05	2,08
Taizhou	0,75	0,00	1,04	0,95	2,32	0,33	0,76	0,60	0,42	1,53	0,52	0,50	0,26	0,68	0,71	0,73	0,85	0,48	1,10
Hefei	0,14	0,00	0,67	0,92	1,84	1,25	0,91	1,38	0,87	0,79	1,21	0,51	1,24	1,05	0,61	1,22	1,12	1,65	1,26
Ma'anshan	0,00	27,87	1,21	1,90	0,65	0,38	0,24	0,42	0,12	0,88	0,10	0,67	0,49	0,61	0,17	0,88	0,93	0,71	1,28

Figure 6- 12 Location quotient of employment of all sectors 2010

Source: organized by the author

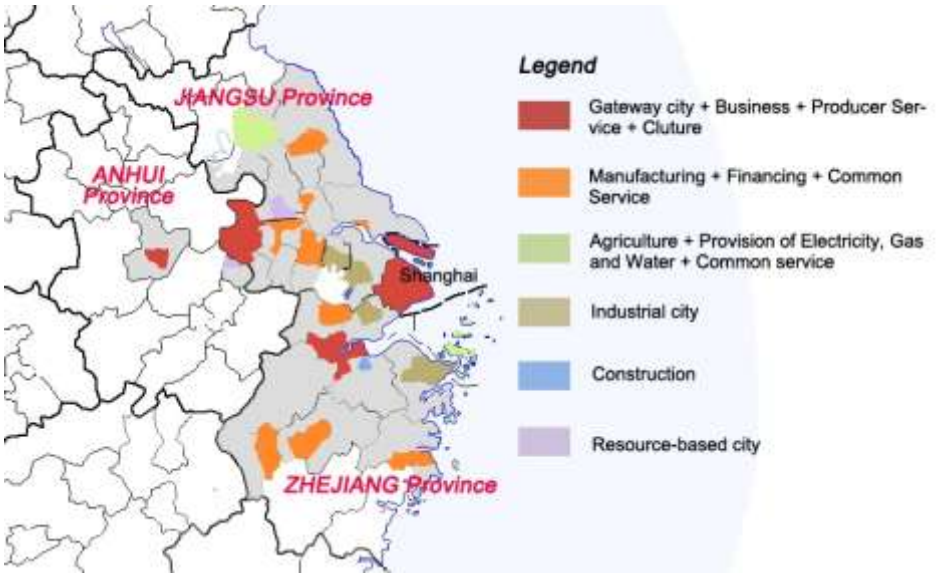


Figure 6- 13 Locations of the 6 clusters 2010

Source: draw by the author

6.2.5 The sectors that contributed more to the city network

It is also argued that the industries which has longer production chain would more easily foster a city network, for example the automobile industry, the electronic industry, while those having shorter production chain, such as the production of commodities, contribute less to the city network, although they could be very specialized.

6.3 The relational proximity: policies and cognitions

6.3.1 The policy of development zones created the institutional proximity

According to a questionnaire and interview survey of 250 foreign-direct-invest enterprises in Hangzhou, the different preferential policies of "development zones" and the efficiency of district/zone level administrations have become the key factors for them to chose the locations in the city, and 80% of the foreign-sole-ownership enterprises have located in these "development zones" (Li et al., 2006). In order to promote the clusters (especially high tech clusters) and attract the foreign investment, the design of different level of "development zones" have been a most frequently used approach by Chinese national and local governments. Generally there are 6 kinds of "development zones": the "State Economy and Technology Development Zones" (49 through China), the "State Neo-High Tech Park" (53 through China), the "State Export Processing Zone" (15 through China), the "Free Trade Zone" (14 through China), the "Border Economic Cooperation Zone" (15 through China) and "Other types of zones" (42 through China, state tourists development zones, tariff-free zones and etc.). They applied different kind of preferential policies to the national and international enterprises (such as tax discount, procedure facilitation and etc.). And these areas have become the hot land for investment, and the enterprises became more and more skilled in finding a location with least input and better environment (milieu) in this kind of zones.

Therefore the number and quality of these "development zones" of each city has actually become a factor for local development and even the city network. We could discover from image below that the number of "state level development zones" is not determined by the administration hierarchy (for example Nanjing, Hangzhou and Hefei are provincial capitals, but all of them have less development zones than Suzhou), instead it is strongly related the city network – the cities with more strong linkages have more development zones. The robustness of city network and the number of development zones boost reciprocally.

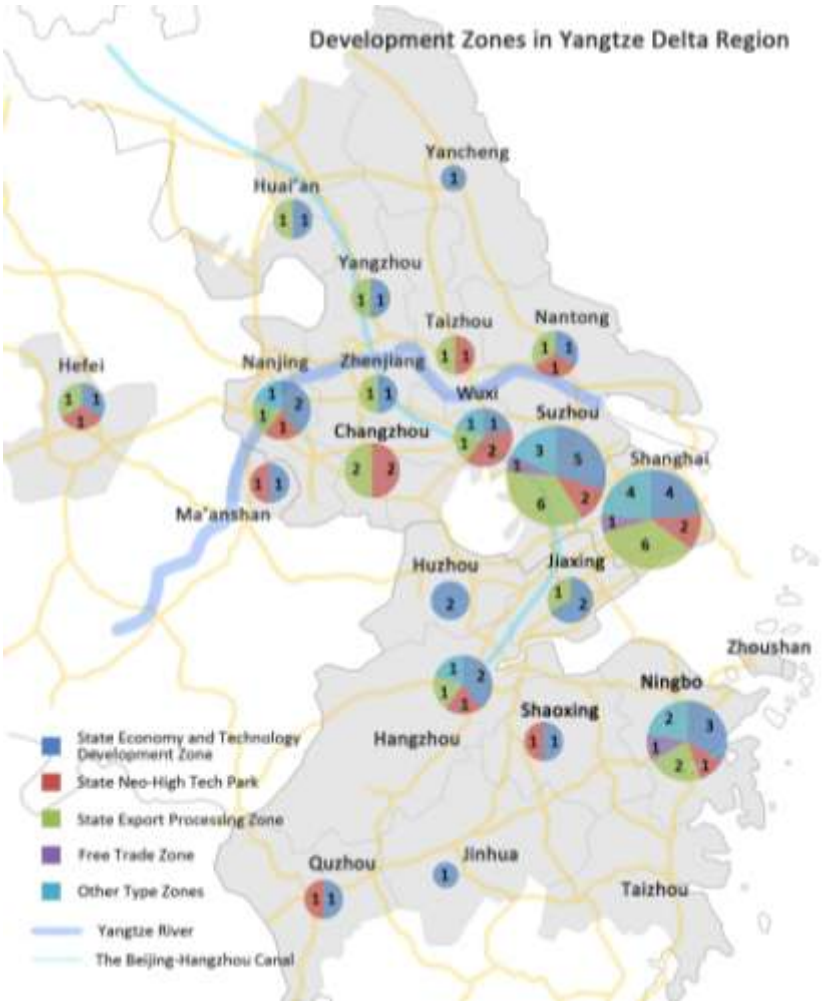


Figure 6- 14 The five kinds of National level Development Zones in YRD

Source: (Net_of_Chinese_Development_Zone, 2013), draw by the author

Noticeably, two cities of Nantong and Ningbo which caught every historical opportunities as Shanghai about the Open-up Policies, both of they were nominated as the Coast Open-up Cities at the same time in 1984 and established the Economy Development Zones simultaneously in 1985. **However under the same policy environment, the two cities haven't built the strongest and the most frequent economic connections with Shanghai**. The possible reason may be that the competition is more prevalence over cooperation among these three cities whose initiative Open-up Policy was oriented and based on the ports development. On the other side, at the time of Development and Open-up Policy for Pudong in 1990, Suzhou established Singapore Industry Park in 1994 (a national cooperation and the stock shared by the two countries), and **now Suzhou have developed much closer economic connections with Shanghai because under the similar policy environment the two cities found the cooperation fields**. Thus, the special policy is one of the elements for developing the urban networks, but it should be the policies could create synergies and complementary.

6.3.2 The cognitions of local governments: competition and integration

As mentioned above, in the 250 foreign-direct-invest enterprises survey, "the attitude and efficiency of district/zone level administrations" even surpassed "the different preferential policies", has become the most weighty factors for them to chose the locations (Li et al., 2006). That is the governance issue. **Actually the most connected cities have very similar cognitions in governance: the proactive attitudes to attract investments and the tactics to manage investments.**

The cognitions and tactics are too similar by the sophisticated governors that the fierce competitions inevitably exited among the highly connected cities. By the case of competition for the investment project by Korean LG Corporation between Suzhou and Wuxi, the governance tactics could be traced a little from the winner side of Neo-Tech Park of Wuxi:

- The competition program was: LS Machinery of LG Corp was seeking the place in YRD Region for their investment in 2003, with a selecting scheme for three rounds: picking 4 potential cities out of 13, then 2 cities out of the picked 4 cities, and finally determining the last one out of 2 cities.
- In the first process of picking 4 out of 13 cities, the Korean Corp was not specifically interested in Wuxi. However Wuxi was more proactive that governors of Neo-Tech Park of Wuxi headed off to Shanghai, waited for the Korean representatives until 11.30 pm and hold the first negotiation until 1.30 am, which deeply touched the Korean Corp and made Wuxi standing in the second round.
- Then during the second round of selection, Wuxi displayed their professions and skills that on one hand several schemes were prepared for receipting the Korean investments, including different investment host method, the corresponding expenses and possible problems and on the other side they also tried to canvass for the supports from the president of LG and partially succeeded with the answer of "no opposition to invest the project in Wuxi".
- In the final round the requirement for land price conditioned by LG was "15 US Dollar for one hectare" and LG also claimed that Wuzhong Development District of Suzhou (the other candidate in final round) could offer more benefits. The land price was too low to be accepted and the final negotiations failed for twice from 9 am to 4 am of the next day.

However Wuxi won the final round, although the differences on hardware of facilities and software of public service were little between Suzhou and Wuxi. The secret for this successful experience was concluded by Wuxi itself: "Sticking on the bottom line without compromising to the very low land price" and "Professionalism of the investment hosting program, the following tactics and the persistent negotiation".

The similar competitions for foreign investments have been numerously carried out in Yangtze River Delta Region. For example, for hosting the second phase investment by Korean Hyundai Motor Company (DYK), Wuxi proposed to build the "Hyundai Ecological Park" specifically for this investment, the county city of Zhangjiagang of Suzhou proposed to build an express way to the port, and Yancheng which is in the periphery north of the region, proposed a strategy of constructing the Modern Automobile City in 5 dimensions. Finally the Government of Jiangsu Province canvassed among the competitors and investor, on the purpose of balancing the territorial development in Northern and Southern of Jiangsu Province. Then this investment was kept continuously in Yancheng. Afterwards, the strategy was promoted and until the end of 2012, 52 billion RMB (around 6,3 billion Euro) were invested and 152 urban projects of the 5 dimensions were completed, which included:

- City for Vehicle Manufacture: serves for the factories of DYK, and develops the base of finished vehicle and components-parts manufacturing;
- City for Automobile Science and Technology: initiation the research and development center for DYK and Vehicle Academy of Yancheng, Vehicle Testing Center, Professional Training Base and Science-Technology Incubators;
- City for Vehicle Commerce and Trade: export and import in advantage of Comprehensive Tax Free Zone and Port of Yancheng for promoting the vehicles and parts trades;
- City for Automobile Culture: conduction of the urban brand marketing of Automobile by the urban project of Automobile cinema, theme park and museum;
- City for Automobile Tourism: development of tourist programs of test driving, production line tour, drift performances, photography competition by the supports of Test Driving Base and DYK factory.

However these kind of competitions in Yangtze River Delta Region unexpectedly brought about the opportunity of urban integration. For example, the attitude was expressed by the governors of Wuxi that "the advantages of Suzhou are also the advantages of Wuxi because in the only short distance of 50 km, the enterprises of Wuxi could also access to the assorting enterprises in Suzhou". Equally, the International Airport of Southern Jiangsu is located in Wuxi, and it is also consider as the advantage by Suzhou because of the short distance of 20km. More astonishing, in the two successive days in 2004, Mayor of Suzhou was transferred to be Party Secretary of Wuxi and then Party Secretary of Wuxi was transferred to be the Party Secretary of Suzhou, and this action gave a push towards the regional cooperation from the original urban competitions.

6.3.3 The spillover of relations

The spillover of relations is also observed in the making city network in this region. Take the case of neighboring cities of Shanghai and Suzhou for example, we observed the spillover of German investments and the spillover of similar sectors (automobile industry, machinery industry to textile and electronic industries) from Shanghai to Suzhou. However the time sequences which obeyed the gravitational model are also observed: the foreign companies and the sectors they working on firstly spill over from Shanghai to the central districts of Suzhou which are around 50km far away (40mins by car) in 1984, then they spread to the smaller country-level cities of Kunshan and Taicang which are around 20km far away (20mins by car) in 1988 and 1993.

Anting town of Shanghai:

- 1958, municipality of Shanghai located lots of manufactories in Anting town.
- 1984, Volkswagen founded the joint-venture enterprise, and started to produce cars.
- Later (around 1995), Shanghai Automotive Industry Company (SAIC Motor) moved to there. Then Anting town has been considered as a "Motor Town".
- 2001, the "Shanghai International Automobile Town" which includes automobile manufactures, research, test, trade & sale, F1 field, Jiading Campus of Tongji University has been build.

Figure 6- 15 Locations of Anting town, Taicang city and Kunshan city (a zoom in map)

Source: Google earth, organized by the author

Taicang city of Suzhou, Jiangsu Province (20mins by car & metro from Anting town): it has 947 thousand inhabitants (2012), 300 thousand in the central districts. GDP 96,5 Billion RMB 2012 (around 11,6 Billion Euro) – rank 4th of Chinese counties/counties level cities.

- **More than 200 German enterprises locate there** – it is said to be "the 1st town of German enterprises in China". Most of the products are related with the **mechanical industries**, but also service, consulting companies which are specialized for German customs.
- In 1993, the first German enterprise, Kern-Liebers, which mainly produce mechanical spring, stamping and components for textile machines founded their manufactory there. The second one entered in 1996.

Kunshan city of Suzhou, Jiangsu Province (20mins by car & metro from Anting town): it is very similar with Taicang case, the 2012 GDP 272,5 Billion RMB (around 32,8 billion Euro), rank 1st among Chinese counties/ counties level cities.

- It locates more than 2400 Taiwan enterprise, and it is called "little Taiwan". But its industrial range are quite wide, an important part is the manufacture of electronic components.
- The first foreign enterprise was found in 1988 by a Japanese company. And the 1st Taiwan enterprise was Shunchang Textile, which entered in 1990, and it was followed by lots of Taiwan textile companies.

6.4 Cases of a strongly connected city and a weakly connected city

The cities of Suzhou (Jiangsu province) and Jiaxing (Zhejiang province) are neighboring cities to Shanghai, both of them are correspondingly located on the principal paths from Shanghai to Nanjing (capital city of Jiangsu Province) and from Shanghai to Hangzhou (capital city of Zhejiang Province), and the distance between their central urban districts and Shanghai is equally only 1.5 hours by highway. The similarities between these two cities reflected on their geographic and orographic conditions in Taihu Lake Basin and Canal Plain, the natural resources and traditional industries (in 1990, 4 of 5 predominant industries of the two cities were the same), the similar density of highway and also the common culture and dialects with each other and also with Shanghai. However **their urban scales and their connections with Shanghai are greatly diverse** from each other. For example, in 2010 the residence population of Suzhou reached 10 million and achieved the closest connections with Shanghai, while at the same time Jiaxing had only 4 million residence population and loosely connected with Shanghai. The reasons are stressed below.

Figure 6- 16 The locations (a zoom in map) and city linkages of Suzhou and Jiaxing

Source: Google map, organized by the author

From the **economic** traditions, the only superiority of Suzhou over Jiaxing is the bigger amounts of electronic industries while Jiaxing possesses more agricultural and food industries. It manifests that Suzhou has a better industrial base which has founded a better base for networking. While from the perception of Shanghai, Suzhou happens to be located nearby the historical industrial areas of Shanghai and it is easier to receive the industrial transfers and diffusions from Shanghai, but Jiaxing is close to the vast agricultural lands and Jinshan petrochemicals on the coast which are blocking the geographical connections with Shanghai. On the economic development modes, Suzhou is the origin of Sunan Mode while Jiaxing wasn't evidently affected by Sunan Model and also wasn't touched by Wenzhou Mode because of the long distance away.

The strong and close connections between Suzhou and Shanghai also reflect on the **economic logic** of its principle electronic and communicate industries whose investors mainly come from the more advanced East Asian areas, like Hongkong, Taiwan, Singapore, Korea and Japan. Suzhou is more defined as the producing place with low cost of productive factors (the low price of land, material and labor) in their entire business circle while their capitals and markets are remained abroad. So in their perceptions it is naturally to seek a channel for smooth and effective capital importing and rapid products exporting (because the prices of electronic and communicative products fluctuated promptly in world market). Shanghai is the best choice to build this kind of double turn connections for the qualified and open-up finance service, higher effective and more reliable logistic infrastructure and service (ocean and air ports) and also the high quality life which attracts these over-sea staffs live in Shanghai (actually there is a very famous foreign community locating in western part of central Shanghai). Thus by the considerations of the capital landing-off, export toward oversea market and human communication, the strong and close connections between Suzhou and Shanghai naturally come out.

However the general situation of cities of Zhejiang province has essential differences from those of Southern Jiangsu province (e.g. Suzhou). The small micro firms and the low value-added products from their light industries of Zhejiang province actually do not have the necessity to build international connections through Shanghai and bearing its high cost of services and logistics. Those small micro local firms build directly their over-sea connections with foreign market in the advantages of local ocean ports (Zhejiang is more rich in the natural shoreline and deep harbor resources, especially the harbors are good in Ningbo, Zhoushan, Taizhou and Wenzhou).

On the aspects of **relational proximity**, they are diverse more. First on the state level, Suzhou-Singapore Industry Park (a national cooperation and the stock shared by both countries) established in 1994 as the national strategy, and has become the second symbol of Open-up of YRD Region after Pudong. However according to Memoirs of Lee Kuan Yew, the premier of Singapore, Mayor of Suzhou strived more for this project. But Jiaxing as the site of First National Congress of Communist Party of China more regarded the political performances. Second, on the provincial level, Jiangsu Province underlined the fundamental principle of "Learning from Shanghai, Relying on Shanghai, Connecting with Shanghai and Servicing for Shanghai" for policy making while Zhejiang Province was keen on conceiving Shanghai as the competitor in the establishing national development parks and zones and as the resources robber for Shanghai's exploitation of the rich shoreline conditions of Zhejiang in order to build Yangshan international ports. This perception towards Shanghai resulted in the provincial policies of Zhejiang which placed the focus points of economic development on the cities of Ningbo, Taizhou and Wenzhou. This thought of policy making also reflected on the physical infrastructure constructions of Highways that the one between Shanghai-Nanjing was completed 2 years earlier than the one between Shanghai-Hanghzou. Another consideration should be also taken into account is that the policy of low land price is always the main mean of attracting the foreign investment for Suzhou while Jiaxing is defined as the main farming area in long term in order to balance the provincial target of the total agricultural area because of the inappropriate utilization of the mountain area as agricultural production in Southern Zhejiang. This may also interpret the low competence of Jiaxing in the regional competitions.

6.5 Conclusion: Topography, Economy and Cognition and Governance

Owing to facts above, the economic traditions and policies are the two important origins in shaping the urban networks in this region. Firstly the economic traditions lead to different industrial specializations, which would result in the different degrees of network connections. Secondly, the institutional or policy proximities (relational proximity) directly affect the

intensity of connections. And further on, there are clear interactions among policy, governance and economic development: the close economic connections will conversely hasten the matching policies and governance modes for consolidating the existent connections, and conversely the new policies and governance tools aggravate the differences of the connections.

Abstract

This chapter explored the reasons leading to the city network in Yangtze River Delta:

- The topography-related economy and culture would be a base for network forming and spreading.
- The specializations of cities shaped the city network.
- The relational proximities of different actors (among governments and among investors) are important factors.
- The case of city of Suzhou (strongly connected city) and Jiaxing (weakly connected city) was investigated from the dimensions above.

CHAPTER 7

THE CORRELATION BETWEEN REGIONAL EVOLUTION AND CITY NETWORK

7.1 City network and population transformation

7.1.1 The correlation between population transformation and city link

In general, between 2006 and 2010, the population transformation showed certain correlations with the city links in the region. The cities with the rapidest growth of population are located along the strongest linking path from Shanghai to Hefei in Southern Jiangsu, and less growth were realized in the cities of Zhejiang, like Hangzhou and Ningbo which showed some less links with Shanghai compared with the previous ones. However these cities on the two sides of Northern Jiangsu and Southern Zhejiang contrarily and generally lost populations. The exceptional city is Jiaxing which is placed in the central area of YRD Region but performed the fastest lose of population in these five years with the decrease ratio of 9.7% and the absolute amount of 484 thousands.

But the distribution of the population amount to certain extent was corresponding similarly to the relationship between the growth ratio and city links, but not so obviously and concentrated manifested the relationship. The population dimensions were more directly connecting to the existent economic scales, instead of city links.

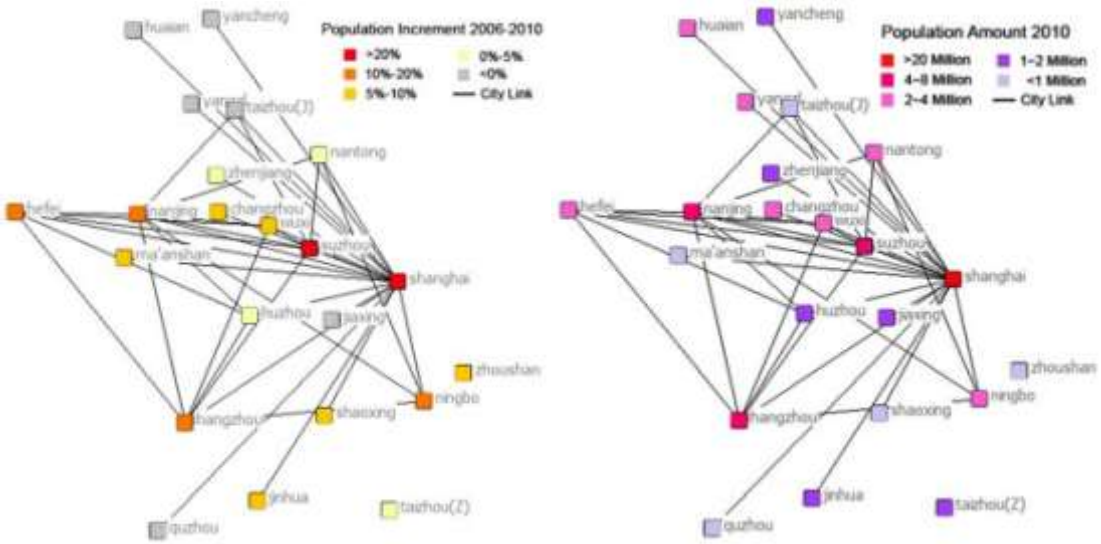


Figure 7- 1 Population changes and existent scales overlapping by city links

Source: draw by the author

7.1.2 The correlation between employment transformation and city link

The greatest growths happened in the cities again along the path from Shanghai to Nanjing, in which Nanjing, Suzhou and Hefei increased the most with the ratios of 39.8%, 36.6%, and 27.4% while Shanghai, Wuxi, Changzhou and Zhenjiang increased their employment between 1~1.5 times of the average level. Unfortunately, outside this principle linking direction, the employments of remained cities universally grew slower than the average level, except Hangzhou and Zhoushan.

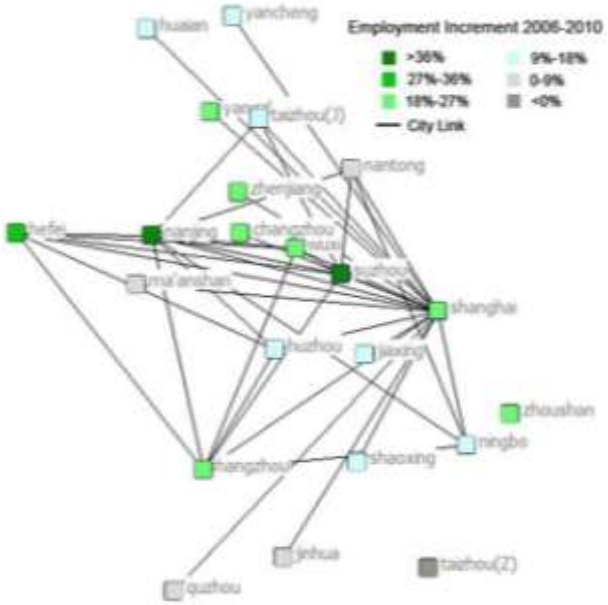


Figure 7- 2 Employment amounts overlapping by city links

Source: draw by the author

7.1.3 The presence of people with degree and above in low rank cities

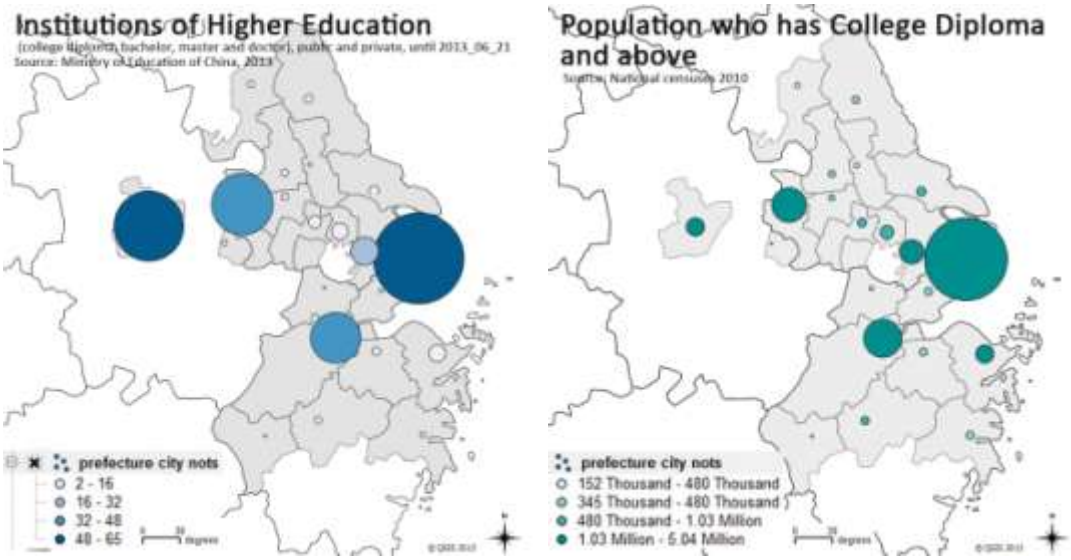


Figure 7- 3 Distributions of high education institutions and urban high-educated population amounts

Source: Ministry of Education of China, 2013, and National censuses, 2010, draw by the author

Generally, the distributions of higher education institutions and higher educated populations in 2013 were geographically corresponding. The cities on the direction along Shanghai to Hefei are the principal locations for the knowledge institutions and educated populations and Hangzhou and Ningbo were the main nodes in Zhejiang Province.

The hierarchical distribution of knowledge was still obvious that the primary knowledge node in Yangtze Delta River is Shanghai, followed by the two provincial capitals of Nanjing and Hangzhou in secondary level in considering both the institutions and populations.

But phenomenon is observed that, **the more connected cities** - Suzhou, Wuxi and Ningbo **attracted comparatively more higher-educated population** in the conditions of relatively less higher education institutions. Also the cities like Changzhou, Nantong, Zhenjiang, Yangzhou, Jiaxing, Shaoxing, Jinhua, and Taizhou(Z), which is connected with the city network, have comparatively more higher-educated population than the poorly-connected cities of Yancheng, Huai'an, Taizhou(J), Ma'anshan and Jinhua, which have the same amount of institutions as the above ones.

The most incommensurate case between the distributions of institutions and higher-educated population was Hefei, which has more higher education institutions and much less higher educated population than Suzhou and Ningbo. Correspondingly, Hefei's degree of connections in the city network is lower than those of Suzhou and Ningbo.

7.2 City network and territorial spatial transformation

7.2.1 Hypothesis and the approach

The hypothesis of this section would be "The **direction and density of City Network** determine the **direction and the speed of urban expansion**".

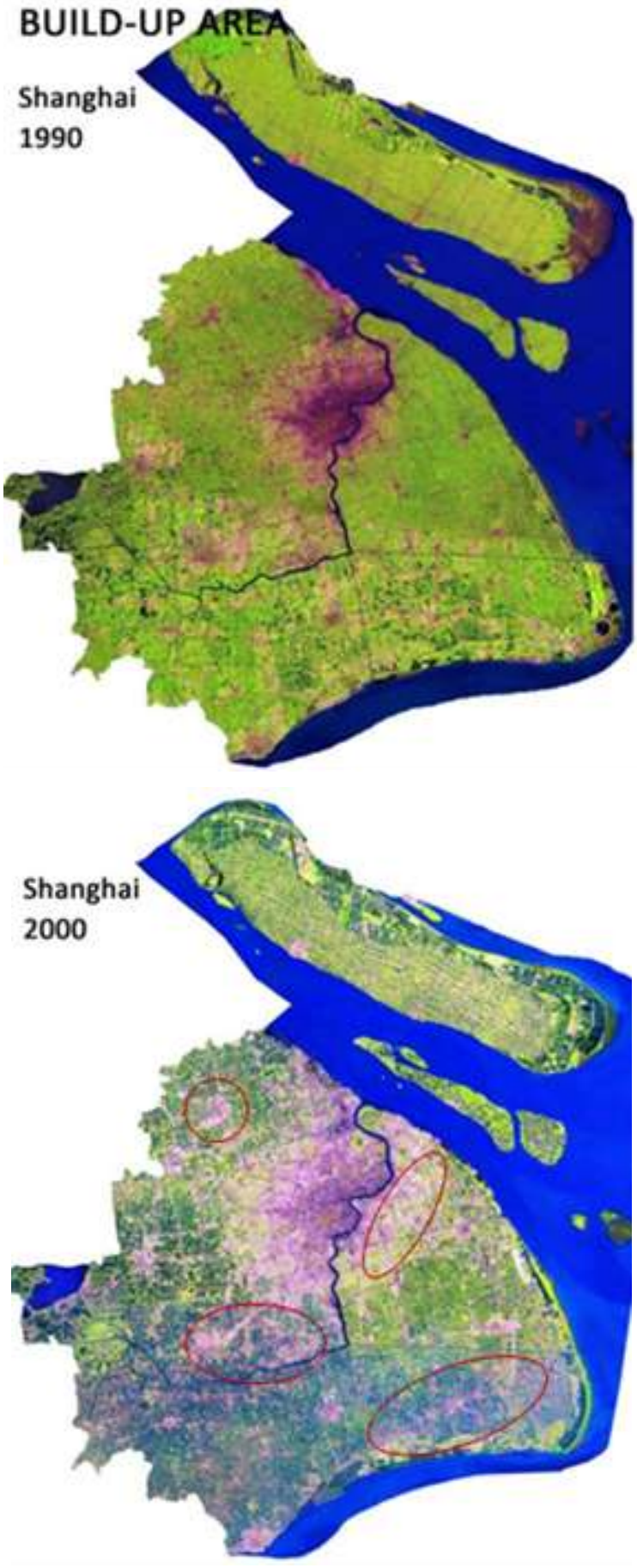
It is an survey of the correlation between the "city links" and their "territorial spatial transformations". When making territorial analysis, the relations – economic relations, some of the tel-communication relations and etc. need to be achieved through the transportation system – especially high way and ports. Therefore beside examining the "territorial spatial transformations" and "city links", this study also considered the factor of infrastructures.

7.2.2 Examination of the City links and Territorial spatial transformations

It turned out that the city links could explain the urban expansions of most of the cities, but with limits to explain all the expansion activities (Table 7-1). Also they failed to explain the transformation of some other cities (Table 7-2).

Table 7- 1 Shanghai urban expansion and city links

City	**City links success in explaining the urban expansion**	**City links has limits to explain the urban expansion**
Shanghai	Shanghai has 2 main connection directions: Suzhou, Wuxi, Nanjing, Hefei (Shanghai-Nanjing transportation corridor) north-west direction, and Hangzhou (Shanghai-Hangzhou corridor) south-west direction, Ningbo (Hangzhou Bay Bridge). During 1990-2000 and 2000-2013, **it had obvious expansion towards both directions**. Especially during 2000-2013, the great expansion towards Suzhou-Nanjing direction would be due to its especially close linkages with those cities. Also fast expansion of the southern Shanghai which is close to Hangzhou bay during 2000-2013, could be attributed to the opening of Shangzhou Bay Bridge on 2008, which connect Shanghai directly with Ningbo.	The expansion of Pudong could not be well explained by the links with those cities, instead it would be due to the "Development and Open-up Pudong" policy.


BUILD-UP AREA
Shanghai
1990
Shanghai
2000

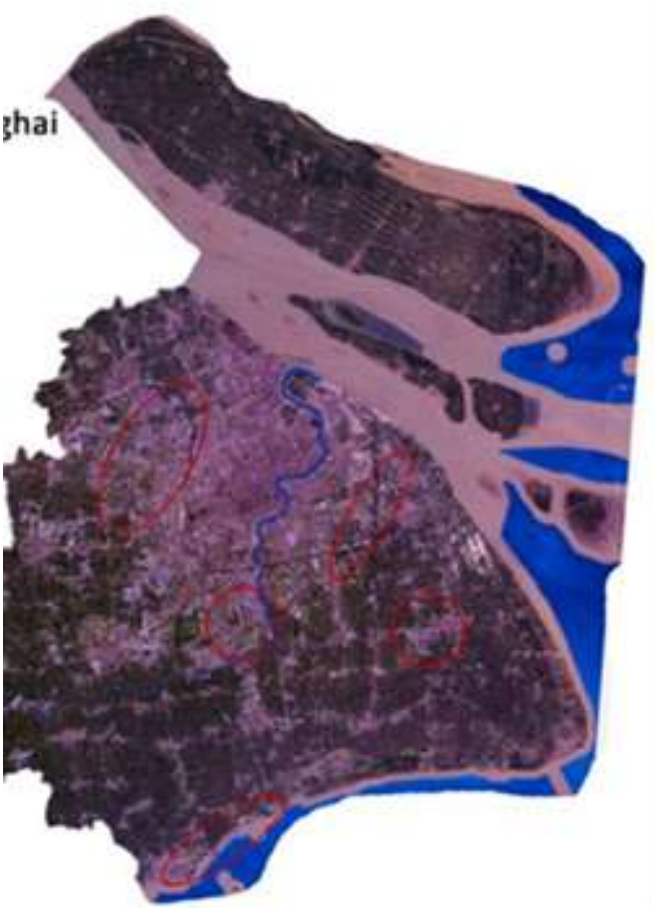


Figure 7- 4 Build-up area transformation of Shanghai, 1990, 2000 and 2013

Source: Institution of Remote Sensing and Digital Earth, 2007, and Google earth 2013; adjusted by the author

Table 7- 2 City links success in explaining the urban expansion in prefectural cities

City	**City links success in explaining the urban expansion**	**City links has limits to explain the urban expansion**
Suzhou	Suzhou is mainly connected with Shanghai, Wuxi, Changzhou, Taizhou(J), Nanjing, Hefei (Shanghai-Nanjing transportation corridor) to its east and west, Nantong (Suzhou-Nantong highway) to its north, and Hangzhou (Suzhou-Jiaxing-Hangzhou highway) to its south – 4 directions. **They explained the "pentagram" morphology of Suzhou city,** and it is more and more obvious with the passage of time (1990-2000-2013). **Also the intermediate cities/towns have got robust developments**.	Except the 4 attractive dictions, the Taihu Lake (good environment as a resource) completed the "pentagram".
Wuxi	Similar with Suzhou case, **the "south-east and north-west" growth verified the macro attractive directions**. **The county-level cities and towns** between Wuxi central district and main attractive directions have got **dramatic developments**.	They seemed not enough the expansion of the central districts. The growth towards Yangtze River port (county-level city – Jiangyin) and towards the Taihu lake would present the micro attractions.
Changzhou	Similar with Suzhou and Wuxi case, **the "south-east and north-west" growth verified**	They seemed not enough the expansion of the central districts.

	the macro attractive directions. **Robust developments happened on the county-level cities and towns** between big cities.	The growth towards Yangtze River port and toward the south (maybe because it has available land on that direction) implied other reasons.
Zhenjiang	A notable **increase happened on the county-level cities** of Danyang and Jurong which is between Changzhou and Nanjing on the Shanghai-Nanjing transportation corridor.	There was a notable increase from 2000-2013 along the **Yangtze River**.
Taizhou(J)	Taizhou has continually enlarged towards its south (the port, Wuxi direction) since 1990. And the towns which locate on the pass towards Wuxi and Shanghai have got notable development.	On the other hand, Taizhou also expanded on its east and west direction. The **traditional and administrative links** with Yangzhou and Nanjing could explain this case.
Ma'anshan	Ma'anshan has expanded basing on its previous site. It is true that it has been attracted towards Nanjing, Shanghai, because its urban development has reach its administration boundary.	Ma'anshan also got developed to its south, because through that direction, it could reach the capital of Anhui Province – Hefei. (It is the limit of my database that it did not represent the administration relations.)
Huai'an	Central district of Huai'an enlarged itself to its south and east – Shanghai direction, which confirmed the attraction direction.	Its growth to the north and west could not be explained by my firm network.
Yancheng	Central district of Yancheng enlarged itself **to the south**, and **the counties to its south** have got impressive developed. This case confirmed the attractive direction of Shanghai.	
Jiaxing	There are notable growth of the central district itself and the 4 counties around it. The growth of the county towards Shanghai verified the attractive direction of Shanghai.	But my firm network could not explain the fast expansions of the other 3 counties.
Huzhou	The central district grows itself, and also the 4 counties around it which are on the pass towards the 3 main liked cities got impressive growths. It verified the influences of the attractions.	
Hangzhou	To the Shanghai/Suzhou/Wuxi direction, the build-up area is almost connected with Jiaxing city; to the Nanjing/Hefei direction, it has enlargements, but still lands available; to the Ninbo direction, the build-up area is almost connected with Shaoxing city.	Hangzhou has got dramatically increase especially from 2000-2010, it seemed to utilized every piece of land competing with **the mountains**.
Shaoxing	Shaoxing not only enlarged the central districts itself, it also got the robust growth of 5 counties around it. Among which it truly get notable growth on the Hangzhou/Shanghai direction.	No links could explain its growth **towards Ningbo and other directions**.
Ningbo	Except the rapid enlargement of the central districts, there are growths of the county-level city which is the start point of Hangzhou bay bridge, and the county-level city which is on the way towards Hangzhou.	Ningbo has also got especially quick development on the district which has **a port** (east to the central districts).
Jinhua	On the direction of Hangzhou/Shanghai, the growth of the county and county-level cities is impressive.	But no links support the expansion of the central districts, towards Ningbo and the south.

Source: organized by the author

Table 7- 3 City links cannot explain the urban expansion in prefectural cities

City	City links failed to explain the urban expansion
Nanjing	Nanjing did not expand towards neither Shanghai direction, nor Hefei direction, because there are **mountains** on both directions. Instead, it expanded especially towards its north and south

	direction. (A notable increase of Lishui county which is on the pass of Nanjing towards Huzhou/Hangzhou.)
Yangzhou	Yangzhou did not actually presented strong motivation towards the south direction (the Yangtze River and Zhenjiang). Instead, it has continually enlarged towards its west (Taizhou) since 1990. Maybe it is because Taizhou was separated from Yangzhou in 1996, and these 2 cities **traditionally have close relations**. (It is the limit of my database that it did not represent the administration relations.)
Nantong	The expansion of central district of Nantong is **along the Yangtze River**. Rather than saying that it has been expanding towards Suzhou and Shanghai, it would be more suitable to say that Nantong is expanding around its port and along the river. There are also robust developments of the towns which are not on the main attractive directions.
Hefei	Hefei expanded towards **all directions** (8 directions). The expansion towards east could be an evidence that it is attracted by Nanjing, Shanghai and Hangzhou, but compared with the attraction from the south-west, this attraction is not strong enough.
Zhoushan	Zhoushan is not connected with any cities according to the database. The build-up area on the main Island of Zhoushan archipelago enlarged basing on its pervious sites. Because the **suitable land for development** is quite limited, it could not present obvious growth towards attractive direction.
Quzhou	Instead of saying it enlarged towards Hangzhou and Shanghai, we would rather say it sought for the development on the **valley**, and maybe towards Hangzhou and Jinhua.
Taizhou(Z)	Taizhou(Z) is not connected with any cities according to the database. It developed more towards its south, and along the **valley**.

Source: organized by the author

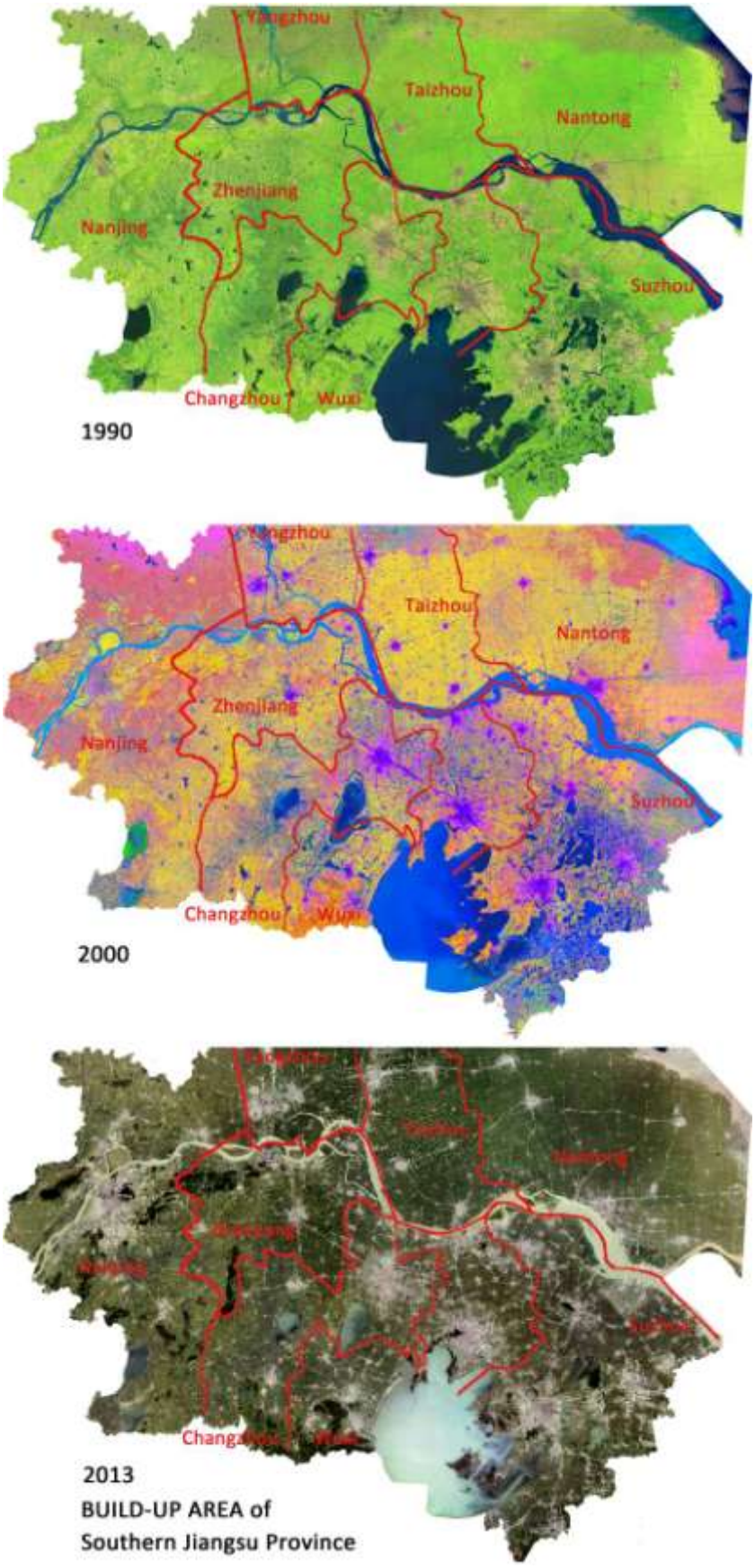


Figure 7- 5 Zoom-in of the build-up area of southern Jiangsu Province, 1990, 2000 & 2013

Source: (Institution of Remote Sensing and Digital Earth, 2007); adjusted by the author

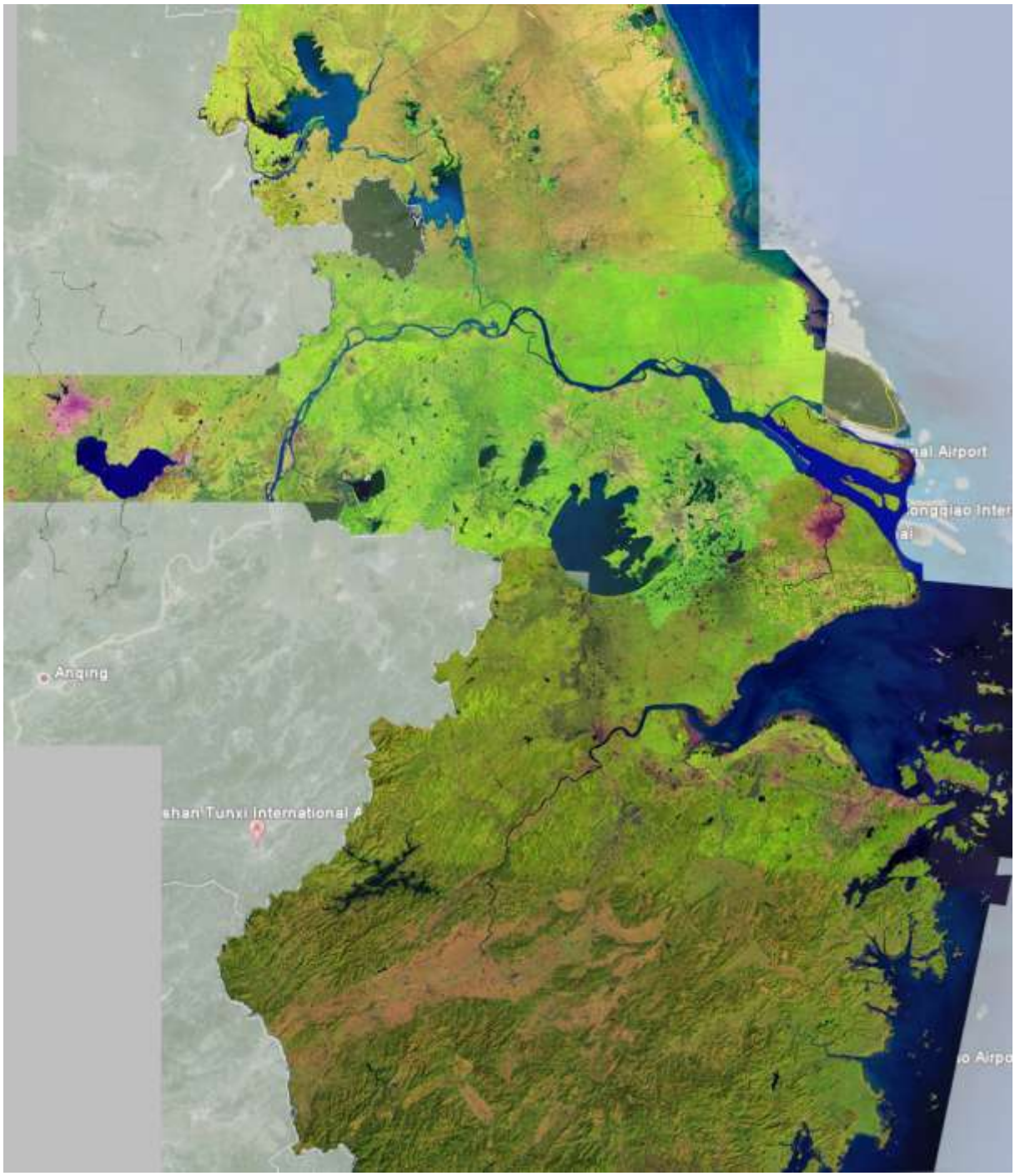


Figure 7- 6 Satellite image of YRD 1990

Source: (Institution of Remote Sensing and Digital Earth, 2007); adjusted by the author

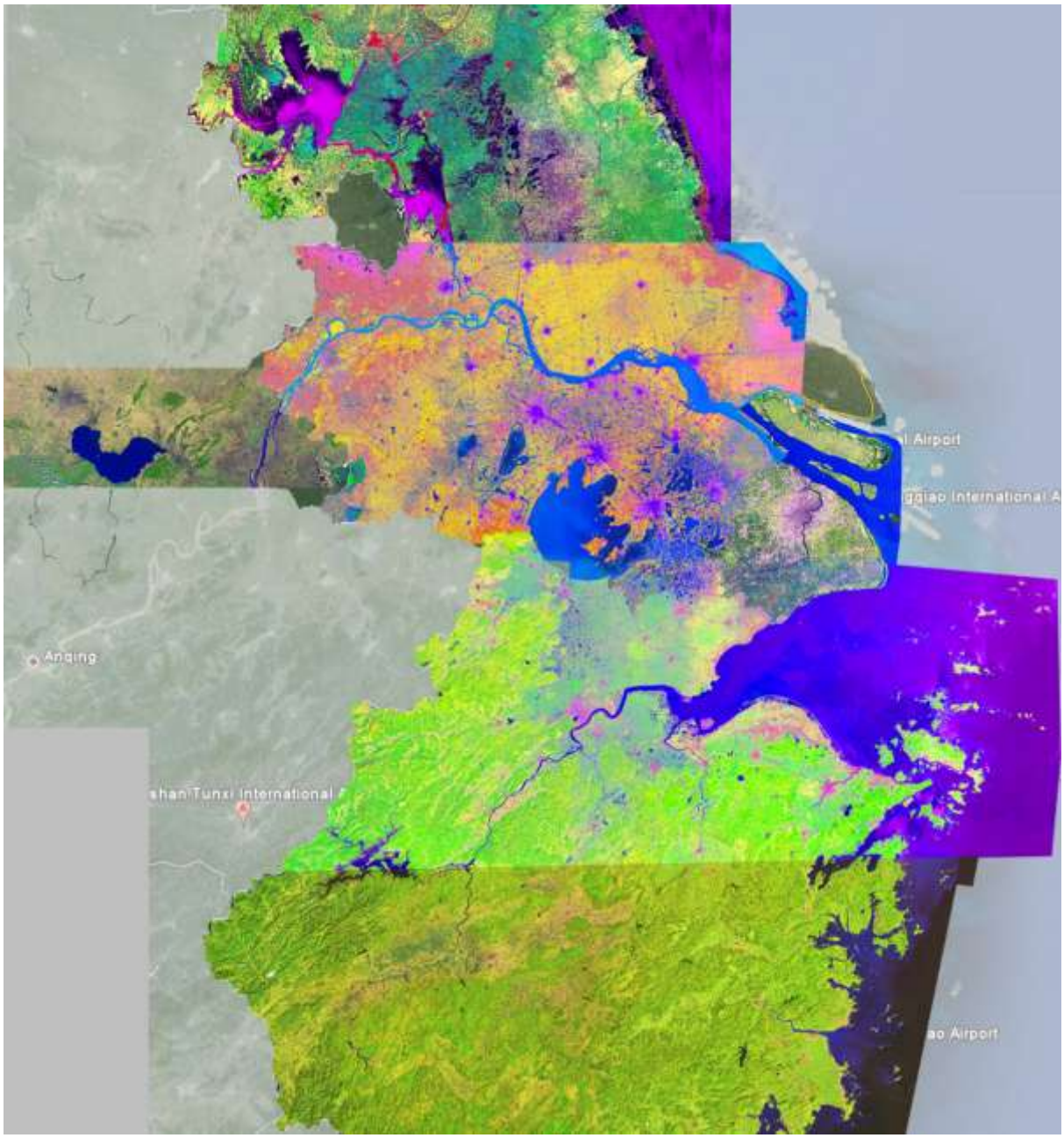


Figure 7- 7 Satellite image of YRD 2000

Source:(Institution of Remote Sensing and Digital Earth, 2007); adjusted by the author

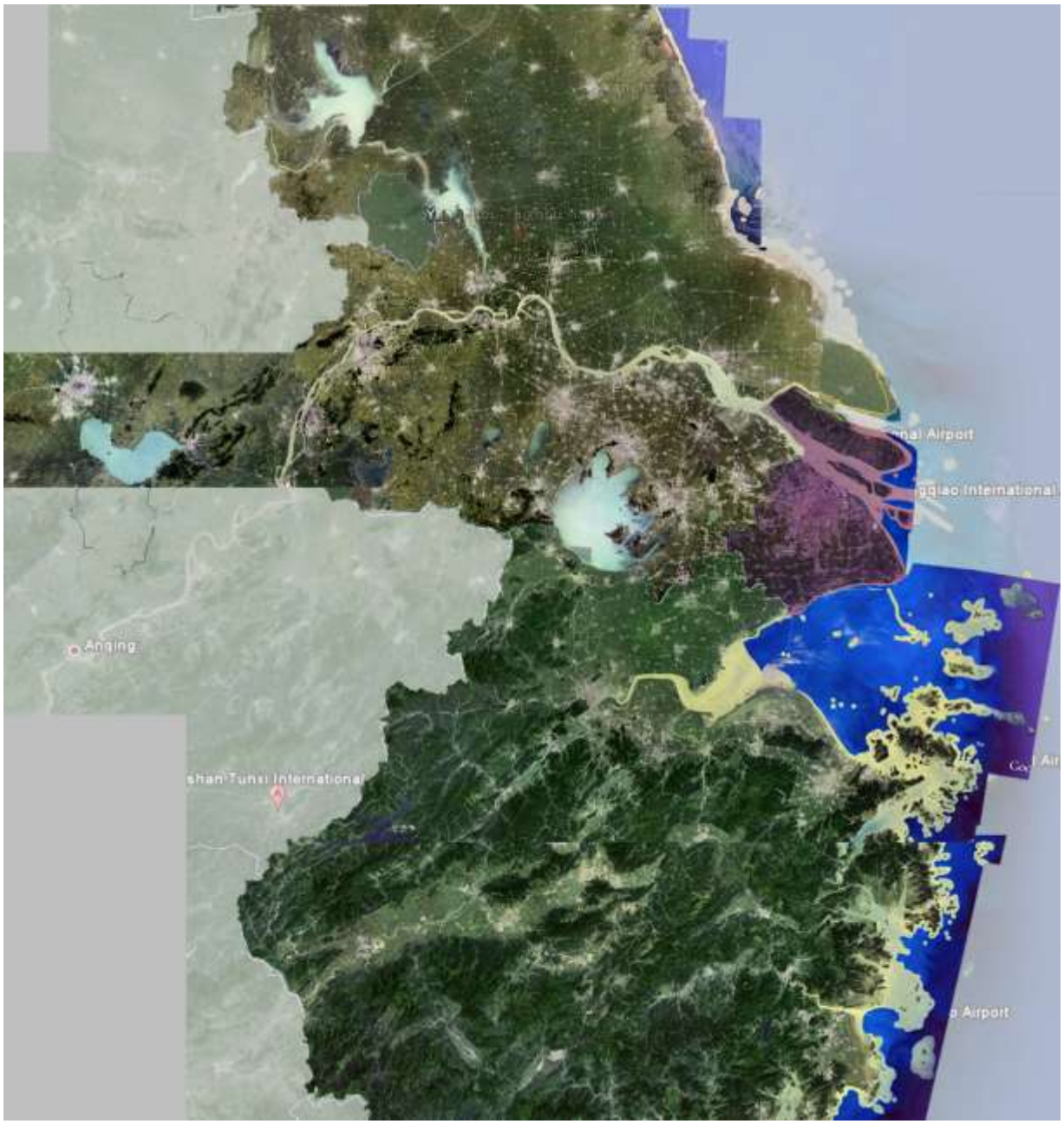


Figure 7- 8 Satellite image of YRD 2013

Source: Google earth, 2013; adjusted by the author

7.2.3 Main findings

1. The spatial transformation is a complicated process, and the city network/linkage could be **one of the factors** to explain it. As we saw, it could explain some cases, but it has limits in others. Some other factors such as lake, mountain, ports/ river, availability of land and other strategic or political decisions, may complete the explanations.

2, When we go back to the image of "Complementary City Network", we could understand that the TOP 50% linkages existed among: Shanghai – Suzhou; Shanghai – Nanjing; Shanghai – Hefei and Shanghai – Hangzhou. For the TOP 75% linkages, it would

add two pairs of cities: Shanghai - Wuxi; Shanghai – Ningbo. Therefore we considered within those two group of cities, their intensity of linkages with Shanghai are similar. But their performances of city expansion are different: **The directions of expansion of Suzhou and Hangzhou could basically be explained by their directions of linkage with Shanghai**. Especially the case of Hangzhou, it has linkages with Shanghai, Huzhou/Nanjing and Ningbo, among which its linkages with Shanghai is the most intensive. And its expansion towards Shanghai direction seemed bigger than it is towards Huzhou/Nanjing. **While the directions of expansion of Nanjing and Hefei could hardly be explained** by their directions of linkages with Shanghai.

So it means the "distance" and the "gravitational model" still matter. Even if the intensity of linkages with Shanghai are similar, cities which are closer to Shanghai fit more to the hypothesis, while cities which are relatively further from Shanghai, get less territorial impacts from Shanghai.

But does the "distance" matter so much? The answer seems not. Take the example of Suzhou and Jiaxing, both cities are with similar distance to Shanghai (1,5 hrs by highway), and their territorial expansions are so different – the expansions (scale and speed) of either central districts or surrounding counties of Jiaxing city are much slower than that of Suzhou city. And the interesting part is the intensity of linkages of Jiaxing city with Shanghai is also much smaller than that of Suzhou city with Shanghai. **Therefore, if we say that the gravitational model could more explain the "attractive power/force" of poles, nevertheless the city network is also important in providing the "attractive paths". Without the linkages as paths, the attractive power could not spread, spill over and make influences.**

3, the intensity of city network and the speed of expansion seem not so related. The cities which have blue back-color are more intensive linked, but their speeds of expansion varied.

BUILD-UP AREA IN THE CENTRAL DISTRICTS (KM²)	1993	2000	2010	2000-1993 Increasing Area	2000-1993 Increasing %	2010-2000 Increasing Area	2010-2000 Increasing %	2010/1993
Shanghai	300	550	866	250	83%	316	57%	2.9
Nanjing	148	201	619	53	36%	418	208%	4.2
Wuxi	73	102	231	29	40%	129	126%	3.2
Changzhou	55	68	153	13	24%	85	125%	2.8
Suzhou	63	86	329	23	37%	243	283%	5.2
Yangzhou	82	48	82	-34	-41%	34	71%	1.0
Zhenjiang	35	57	109	22	63%	52	91%	3.1
Nantong	50	60	125	10	20%	65	108%	2.5
Huai'an		40	120	40		80	200%	
Yancheng	37	28	89	-9	-24%	61	218%	2.4
Taizhou(J)	33	37	65	4	12%	28	76%	2.0
Hangzhou	90	177	413	87	97%	236	133%	4.6
Ningbo	63	69	272	6	10%	203	294%	4.3
Jiaxing	24	43	85	19	79%	42	98%	3.5
Huzhou	23	54	78	31	135%	24	44%	3.4
Shaoxing	18	32	100	14	78%	68	213%	5.6
Jinhua	18	34	72	16	89%	38	112%	4.0
Quzhou	18	25	58	7	39%	33	132%	3.2
Zhoushan	17	50	52	33	194%	2	4%	3.1
Taizhou(Z)		69	116	69		47	68%	
Hefei	76	125	326	49	64%	201	161%	4.3
Ma'anshan	32	38	78	6	19%	40	105%	2.4

Figure 7- 9 Statistics of urban expansion 1993, 2000, 2010

Source: China City Statistical Yearbook 1994, 2001, 2011

4, If the increase of central districts is difficult to be measured or compared through the images above, the growth of intermediate counties/ county-level cities are more obvious: **where the linkages are more intensive, the intermediate counties/ cities get more robust growth.** Or we could say where the linkages are more intensive, the density of towns are higher. Still the scales of growth obey the "gravity model". And it is not only the problem of density of towns or scale of towns, but the problem that **the functions of towns get upgraded.**

5, The territorial transformations help us recognize the boundary of the city network.

6, Relational proximity and spatial proximity: It seems the spatial proximity would facilitate the "spill over" of knowledge, relations, milieum, entrepreneurship and etc.; and on the other hand, the relational proximity seems easy to cross the spatial boundary, and lead to the cross-boundary spatial proximity.

Abstract

This chapter explicated the related demographic and spatial outcomes of the city network in YRD:

- The city network is corresponding to the urban pools, both metropolis and medium size cities, where knowledge and skilled jobs are concentrated
- The city network is related with the territorial expansions (within a limited territorial extension).

PART III *Conclusions*

Chapter 8 Conclusions and Discussions

CHAPTER 8

CONCLUSIONS AND DISCUSSIONS

8.1 The forming of city network in Yangtze River Delta

8.1.1 The existence of the hierarchy of city-networks

In Chapter Five, the hierarchy of city-networks model proposed by Camagni (1993) **was verified in YRD**: cities with the international functions form the first hierarchical level of the network; while cities with the national functions form the secondary level. The same city, for example Shanghai, holds its positions on both levels.

Concerning the complementary network of YRD on the national level, this network is not very balanced, in the sense that most of the links of city network (representing the top 75% of the linkages) converge on the single center of Shanghai. This is **a representative case of network which is based on a megalopolis**, just the same as the regional networks of Paris, London and Milan regions. And they diverge from the networks such as Randstad and Rhine-Main, which are relatively balanced. On the other hand, this study has evaluated the network of YRD until now not matured enough, because the top 75% of the linkages were not connecting cities other than Shanghai. However in the future it can be foreseen that, **the linkages between the megalopolis of Shanghai and the other cities in the region would strengthen. The same would apply also among all other cities, excluding Shanghai.**

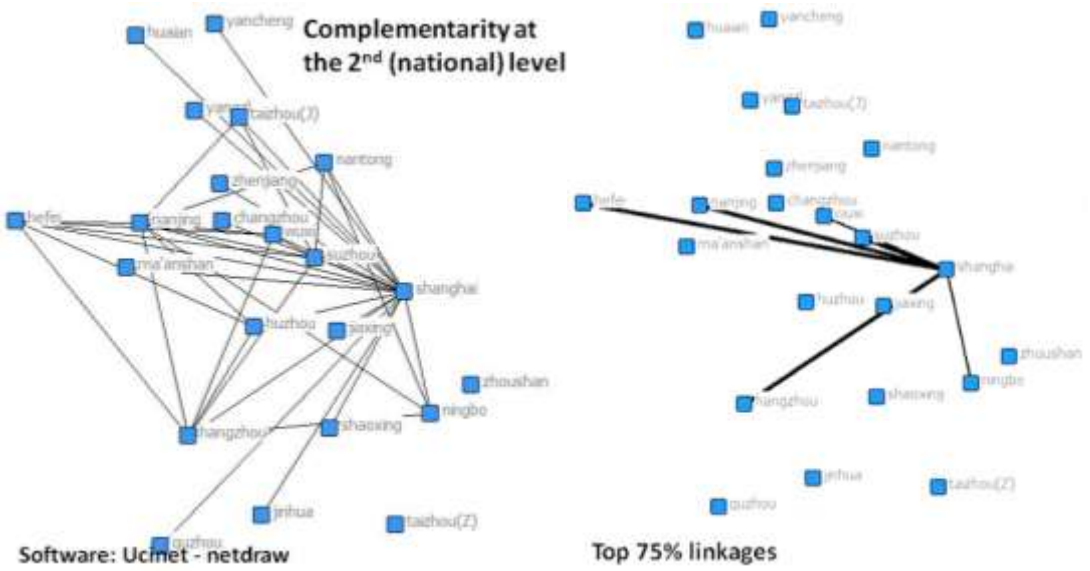


Figure 8- 1 Complementary network on the national level and the top 75% linkages

Source: draw by the author

8.1.2 The base of the city network in Yangtze River Delta

The urban network of YRD at national level is mainly characterized by the following economic sectors:

- **Shanghai** was used to have a complementary relation with the other cities, basing on its specializations of service, management, finance and sales;
- **Ningbo**, based on its port and the related logistic, warehouse and production functions;
- **Suzhou**, based on its multiple and powerful manufacturing: food production, chemical industry, machineries, building materials, electronic industries and software industries;
- **Cities in southern and central Jiangsu Province**, like Wuxi, Changzhou, Zhenjiang, Yangzhou, Taizhou (J) and Nantong, based on their traditional industries, like building materials and machineries;
- **Hangzhou**, used to base on its particular resources, like the training and recreation industries basing on the tourist resources, the electricity productions basing on the water power resource;
- **Nanjing and Hangzhou**, as provincial capitals, have the most advanced service sectors, which help them to make synergies with Shanghai;
- **The other cities in the region** have contributed less on building up complementarity and synergy within the city network.

It is Worth to note that, **the complementary and synergic relations between Shanghai and Suzhou are undergoing an evolutionary process**. In most cases, the complementarity between them is based on services, management and finance for Shanghai and the manufacturing sectors for Suzhou. However, as Suzhou has been continually increasing its specializations in manufacturing, its specializations on service, management, R&D and sales have also been developed. Examples are the headquarters of Nestlé Baby Milk Powder, the R&D branches of TOYOTA and SUMSUNG, and the Software design branch of ORACLE. In this situation, the relation between Shanghai and Suzhou is gradually moving towards synergy. This is the reason of the low value of location quotients in these closely connected cities, (see the investigation about specializations in Chapter Six). In the post-industrialization era in fact the city network is based not only on specialization on manufacturing or services, but also on the complete presence of urban functions.

8.1.3 The role of foreign investments

It has been proved that the foreign investments (multinational enterprises with foreign owners) have contributed to the city network more than the Chinese state-owned enterprises.

In fact in some cases, the foreign investments allocate functional units such as manufacturing, management and sales in different cities respectively in order to the control the value chains. In other cases, more frequent in YRD, foreign companies take advantage of the local skill of a specific city, and complete the whole process of a certain production there. As a result they articulate several productions in different locations in the region and following the economic efficiency. However the Chinese state-owned enterprises trend to make a hierarchical structure consistent with the administrations. Possibly this phenomenon reflected the influences of globalization on the Chinese city networks.

8.2 Topology, Industry, Relational proximities and Governance as the crucial factors

Rozenblat (2010) reorganized Gereffi's (1996) opinion about Global Value Chain and considered that **Economic system, Governance (Intra-firm organization) and Territory (Space and Institution)** were the formative components of firm network (her first quotation was in 2003). Also, Capello (2009) reviewed the theoretical evolution of the interpretation about the agglomeration economies, and pointed out six interpretations basing on **Industry, Geography and Culture/Cognition dimensions**, finally proposing an integrated approach of all three dimensions. City network and firm network share a lot of common characters both can reach agglomeration economies and the externalities produced within the network. So the

thesis tried to explore the factors leading to the city network in Yangtze River Delta basing on these two frameworks.

- Firstly, the thesis considered that **the topography-related economy and the culture, or the local traditions, have played important roles** in the network forming and spreading. In our empirical studies, YRD cities in the Taihu alluvial plain and along the Yangtze River have the strongest connections. In fact historically the same topography has determined similar economic urban bases, which easily have been forming the complementary and synergic relations. Besides that, the plain contributed to the development of a common local culture and value system, that would bring about the relational proximities. Both these two factors – economic base and cultural / value system - laid the foundations of the city network;
- Secondly, considering **the economic and industrial dimensions**, the complementarity based on specializations and the synergy based on functional similarities were verified as said above;
- Thirdly, **the relational proximities (culture/cognition) of different actors represent almost the most important component** in forming the city network. Two kinds of proximities were especially emphasized. One is the proximity of cognition among the city governments, like Shanghai and Jiangsu Provincial government, the latter one proactively took over the industries transferred from Shanghai, which fasten the relations between them. The other is the proximity among investors. Taking the cases of Shanghai, Taicang city and Kunshan city for example, the agglomerations and spill-over were resulted by the similarities of the investor's nationalities and the sectors they carried out, which also created the linkages among cities.
- Fourthly, **the Governance/ Coordination** offer the assistances in forming the city network. For example, the government of Jiangsu Province enacted the synergic policies on the relations and industries: the exchange of mayors between the cities of Suzhou and Wuxi which enabled the mutual cognitions and the better integrations of the strategies and resources of both cities. The coordination for the location of Hyundai Automobile factory in city of Yancheng, which is located at the periphery of YRD region, realized the synergies among Yancheng, Suzhou and Shanghai, in the automobile production. Besides, the study considered the regional governance platform - "YRD economic coordination meeting" which reduced the transaction cost of good flow, traffic flow and knowledge spillover, and at the same time, created new opportunities in enhancing the city network.

8.3 The allocation of production factors as corresponding outcome

By investigating the socio-economic dynamics, in terms of population, employment and education level (college degree and above) and the spatial transformations of YRD cities, this study considered:

- **the city network is corresponding to the urban pools**, both megalopolis and medium size cities[6], where knowledge and skilled jobs are concentrated;
- And **it is corresponding to the territorial expansions** (within a limited territorial extension). It turns out that, **if we say that the gravitational model could more explain the "attractive power/force" of poles, nevertheless the city network is also important in providing the "attractive paths". Without the linkages as paths, the attractive power could not spread, spill over and make influences.**

Also the single city performance and city network are actually enhanced reciprocally: the city network has been a model for allocating production factors – human, land and knowledge, and these factors also feed-back enhancing the city network itself.

8.4 The prospects about the city network in Yangtze River Delta

On the base of the crucial factors of topology, industry, relational proximities and governance, this study would discuss about the prospects of the city network in YRD. As the relational proximities are the most important components and topology is one of the bases in foresting the relational proximities/ cognitions, so the extension of the network would still be based on the topology and sub-territories.

- Firstly, **the network will continuously extend westward and penetrate towards the hinterland along the economic axis of Yangtze River and the main China railway of Longhai Line** (from east coast of China towards west China, and finally joining with the European railway system);
- Secondly, **the network will be strengthen northwards (in Jiangsu Province),** because the Government of Jiangsu Province is always practicing its policies in order to create the relational proximities and the integration of their province;
- Lastly, **southwards**, it may arise also a paradox. On one hand, the cities in Southern Zhejiang Province, like Jinhua, Taizhou(Z) and Wenzhou, possess the largest diversities on specializations with respect to the cities of Shanghai and Jiangsu Province, allowing them to achieve a complementarity. On the other hand, the

[6] The definition of medium size city in China was cities with population in central districts around 200-500 thousand in the "City Planning Law of China" (1990-2008). As this law was replaced by the "Urban and Rural Planning Law of China" 2008, and the new law does not have a definition of medium size city, this concept is a little bit vague. But in practices, it is recognized as the cities with population in central districts around 500 thousand – 1 million.

possibility of industrial cooperation between these cities and Shanghai/ Jiangsu Province will be quite low, due to their different economic development models and fewer cognitions. Therefore, the network between these cities and Shanghai/Jiangsu Province will be developed later than the westward and northward ones.

Worth to be noted, on the "YRD economic coordination meeting" in 2013, eight cities were ratified as new members. And the extent of this coordination meeting covered all the prefectural cities of Jiangsu Province and Zhejiang Province and five prefectural cities of Anhui Province. Interestingly, instead of expanding along Yangtze River (towards South-west), two of three new members of Anhui Provinces (Chuzhou and Huainan) locate to the north-west of the region. These cities are geographical close to and have prioritized transportation connections with the capital city of Anhui Province – Hefei and the capital city of Jiangsu Province – Nanjing. And in such an economic political occasion ("YRD economic coordination meeting" is the mayors' meeting), this kind of hinterland cities get preferential positions. Still deeper exploration could be carried out concerning this statement.

Figure 8- 2 The extent of YRD economic coordination meeting 2013

Source: draw by the author

8.5 The prospects about this study

Four aspects could be further deepened in the following research:

- Firstly, **more relational data about firm ownerships and activities could greatly improve the research results.**. This thesis has investigated 18 multi-national enterprises (covered 18 sectors, both foreign and Chinese ones), but more samples are worth to be comprised. And the city network focusing on one certain sector could be developed;
- Secondly, this research traced the intra-firm relations, however it is worth to study **the inter-firm relations** basing on the complementarities on the value chains, and basing on the synergies on the techniques and cognitions between enterprises;
- Thirdly, the observations and interpretations about the economic activities and their evolutionary mechanisms in the study area are worth **to be carried at a smaller territorial scale**, for instance at the county level administration units and at the industrial district level;
- Fourthly, it is also worth to go deeper into **the study of specializations on sectors**. For example the specializations of transportations manufacturing could be further split into ship manufacturing, truck and engineering vehicles manufacturing, high-middle class car manufacturing, and middle-low class car manufacturing in further reaches with the availability of more exact information and data. It too general in this research to categorize them as one big sector.

Abstract

This chapter concluded the main findings and proposed the discussions and prospects:

- The city network was verified in YRD, basing on the complementary and synergic relations on sectors among especially Shanghai and Southern Jiangsu, Northern Zhejiang cities. Also the foreign investments contributed more than the Chinese ones to the city network.
- It is argued that the relational proximities is the most important factor in forming and spreading the city network. And the topology, industry and governance are relative factors.
- City network influenced the allocations of productions factors.
- The spreading of the city network in YRD may follow the west – north – south sequences, basing on the presences of the curtail factors.
- Four aspects are worth to be developed more in the further study.

APPENDIX

Appendix I - The concepts of City and Population in Chinese administration

1. Structural hierarchy of the administrative divisions of the People's Republic of China

Italy	Level	**China**	Types
Regional level	**1**	Provincial level 省级行政区 (33) (1 claimed)	• Provinces (省 shěng) (22) • Claimed province (1) • Autonomous regions (自治区 zìzhìqū) (5) • Municipalities (直辖市 zhíxiáshì) (4) • Special administrative regions (特别行政区 tèbié xíngzhèngqū) (2)
Provincial level	**2**	Prefectural level 地级行政区 (333)	• Prefectures (地区 dìqū) (17) • Prefecture-level cities (地级市 dìjíshì) (283) • Autonomous prefectures (自治州 zìzhìzhōu) (30) • Leagues (盟 méng) (3)
Comuune	**3**	County level 县级行政区 (2,858)	• Counties (县 xiàn) (1,464) • Districts (市辖区 shìxiáqū) (855) • County-level cities (县级市 xiànjíshì) (367) • Autonomous counties (自治县 zìzhìxiàn) (117) • Banners (旗 qí) (49) • Autonomous banners (自治旗 zìzhìqí) (3) • Special districts (特区 tèqū) (3) • Forestry areas (林区 línqū) (1)
Fraction	**4**	Township level 乡级行政区 (40,859)	• Towns (镇 zhèn) (19,141) • Townships (乡 xiāng) (14,646) • Subdistricts (街道办事处 jiēdàobànshìchù) (6,686) • Ethnic townships (民族乡 mínzúxiāng) (1,098) • Sumu (苏木 sūmù) (181) • District public offices (区公所 qūgōngsuǒ) (2) • Ethnic sumu (民族苏木 mínzúsūmù) (1)
	5	Village level 村级行政区 (informal)	• Village committees (村民委员会 cūnmínwěiyuánhùi) (623,669) • Neighborhood committees (社区居民委员会 jūmínwěiyuánhùi) (80,717) • Communities (社区 shèqū) Neighborhoods (居民区 jūmínqū)

Source: (Wikipedia, Citation year 2013), the Italian part is added by the author.

Figure Appendix-1: Prefectural level administration territories of the P.R. China: 333 in total
Source: (Wikipedia, Citation year 2013)

Figure Appendix-2: County level administration territories of the P.R. China: 2858 in total
Source: (Wikipedia, Citation year 2013)

2. When mentioning of a "City":

The term "city" would have 3 implications in Chinese administration system:

- Municipalities governed by central government (直辖市): there are 4 in China – Beijing, Tianjin, Shanghai, Chongqing, which belongs to the Provincial level.
- Prefecture-level cities (地级市): there are 283 in China, which belongs to the Prefecture-level.
- County-level cities (县级市): there are 367 in China, which belongs to the County-level.

Take Prefecture-level city – Fuzhou for example (Figure below), this prefecture-level city is composed by 5 central districts, 2 county-level cities and 6 counties. All the central district, county-level city and county are on the same administration level – they are on county-level, and they are governed by the prefecture-level. Some prefecture-level city does not have county-level cities, but usually it governs several countries. The data used for analysis in this thesis are data of prefecture-level (and above) units, including the performance of central districts, county-level cities and counties – there are 22 prefecture-level (and above) cities in Yangtze River Delta. And it is also worth to explore the performance of each county-level units – there are around 70-80 county-level units in YRD, which I believe would reach more explicit results, but that would be a further exploration.

Figure Appendix-3: A model of "prefectural level city"
source: draw by the author

3. When mentioning of "Population":

Due to the special population regulations in China, the term "population" in statistical books has 3 categories:

- When a person is born or immigrates to one city, he/she would be **registered** locally, and would have a "Hukou (户口)", which is the base for him/her to access the public services such as primary school, hospital and etc. This kind of population is **registered population**.
- At the moment when he/she is registered, he/she would be registered as **Agriculture population** or **Non-agriculture population**. The agriculture population has the use right of its field and homestead (the property right is owned by the village collectively), and he/she benefits the other system of public service, which is different from the urban one. The non-agriculture population does not "own" land, but he/she could benefit the urban public service system.
- Accompanying the economic development, more and more people left its hometown and tried to look for opportunities in other cities. For some reason they could not be registered in those cities (for instance Shanghai has a ranking system), and this kind of population has become the **Floating population**.
- The registered population and the floating population who has lived in that city for half a year, form the **Resident population**.

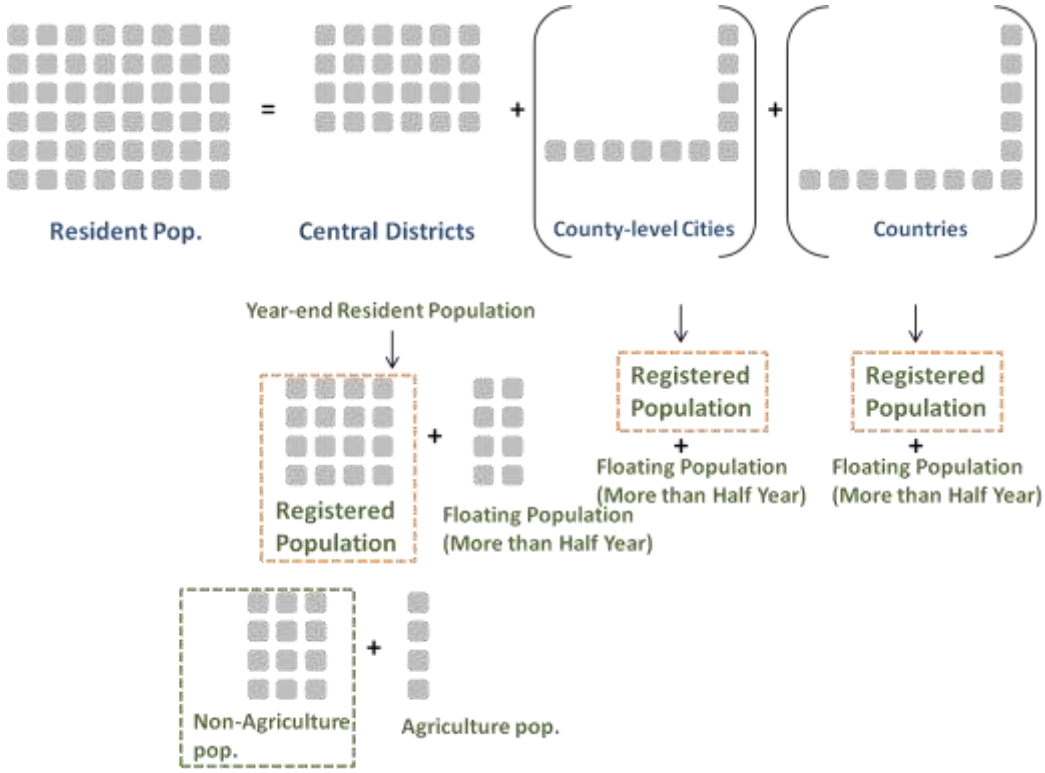


Figure Appendix-4: The concepts in the census
Source: draw by the author

The traditional Rank-size analysis carried out in China was based on the non-agriculture population, which is just part of the registered population, and very probably part of the resident population. Because it is considered as the stable amount and the main part contributing to the urban economy. But actually in the case of Yangtze River Delta, the amount non-agriculture population used to be far small than the resident population, which includes the registered population and also the floating population. For example, basing on the National Census 2011, at the end of 2010, the resident population in Shanghai (whole city) is 23,027 Million, while the registered population is 14,123 Million (the floating population is 8,9 Million), the non-agriculture population is 12,549 Million, which is around 54,5% of the resident population. And using the non-agriculture population for dynamic analysis would influence the results.

The author used both data to carry out the rank-size analysis, and found out that if we use the resident population data, the slopes are both less than 1, which implies the region is not so centralized; if we use the non-agriculture population data, the slopes are both more than 1, which implies the primacy ratio of Shanghai is high; but the trends are not contradictory in the sense of polarization. On the question of regional structure – is it a centralized region? Where did the dynamics come from? – the author prefer to chose the result basing on the resident population (the upper one).

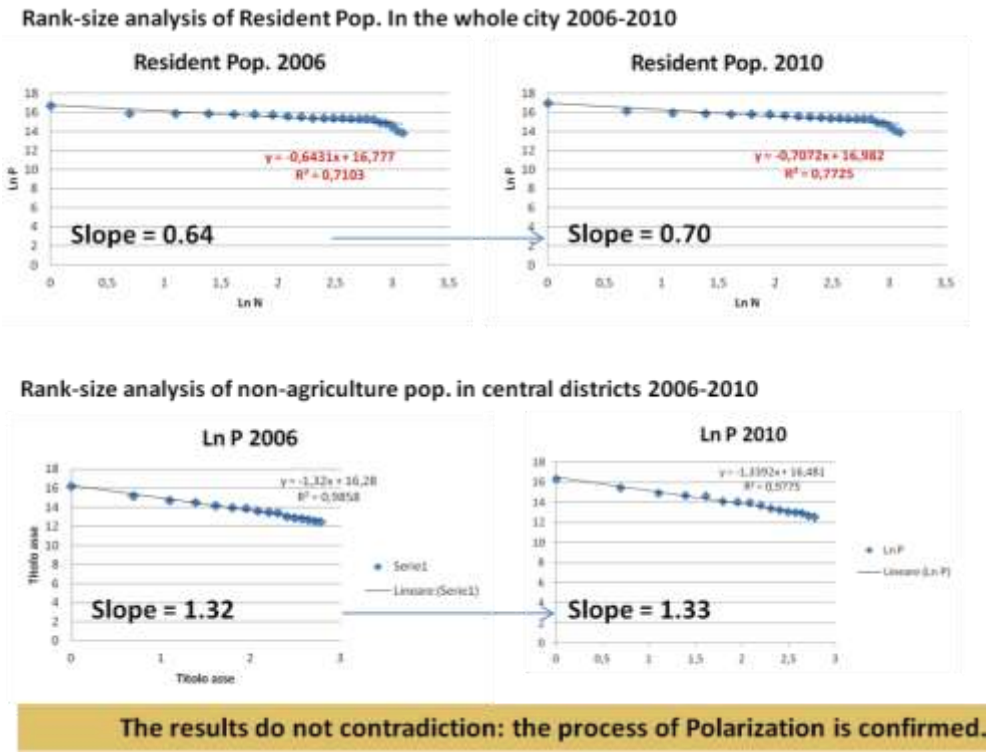


Figure Appendix-5: Rank-size analysis basing on different population category – the resident population and the non-agriculture population

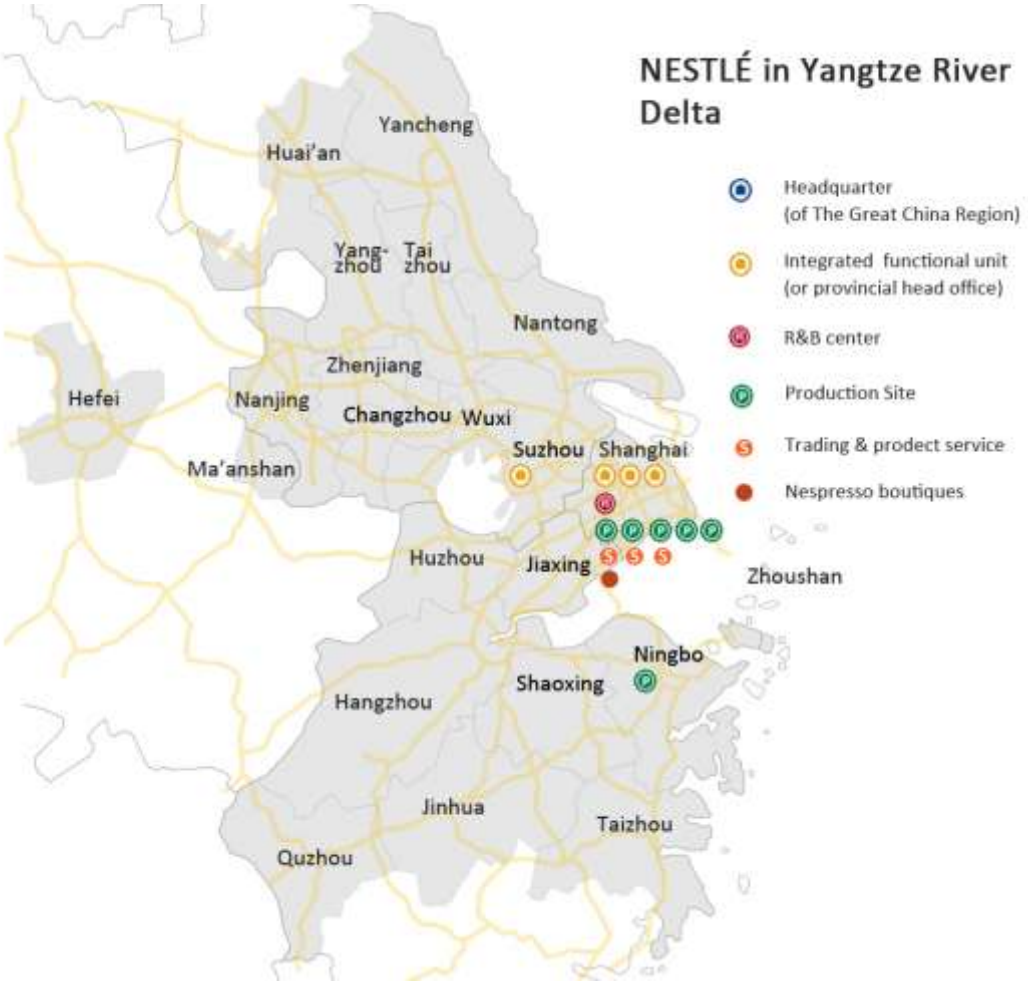
Source: draw by the author

Appendix II - The Locations of Fortune 500 Firms

Complementarity: Shanghai more emphasizes on upstream (management) and downstream (sale) functions, while the other port cities – **Ningbo** and **Nantong** are complementary with it by their middle stream function (Production and logistics)

Synergy: Shanghai – Wuxi – Nanjing – Huzhou – Hangzhou – Ningbo in provincial head office function.

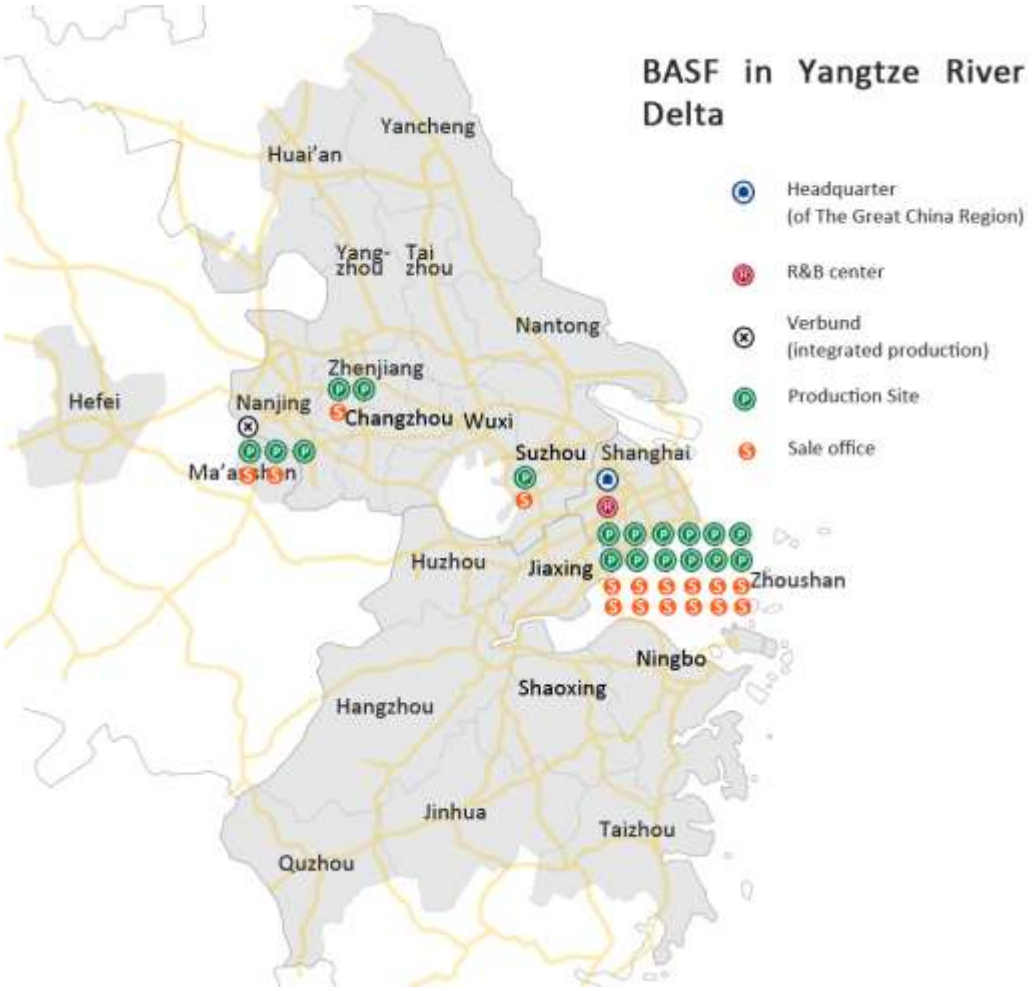
Hierarchy: Other cities seem to be on the hierarchical low level of **Shanghai** and **Ningbo**.



Shanghai has full sets of the functions, is on hierarchical top level.

Complementarity: no

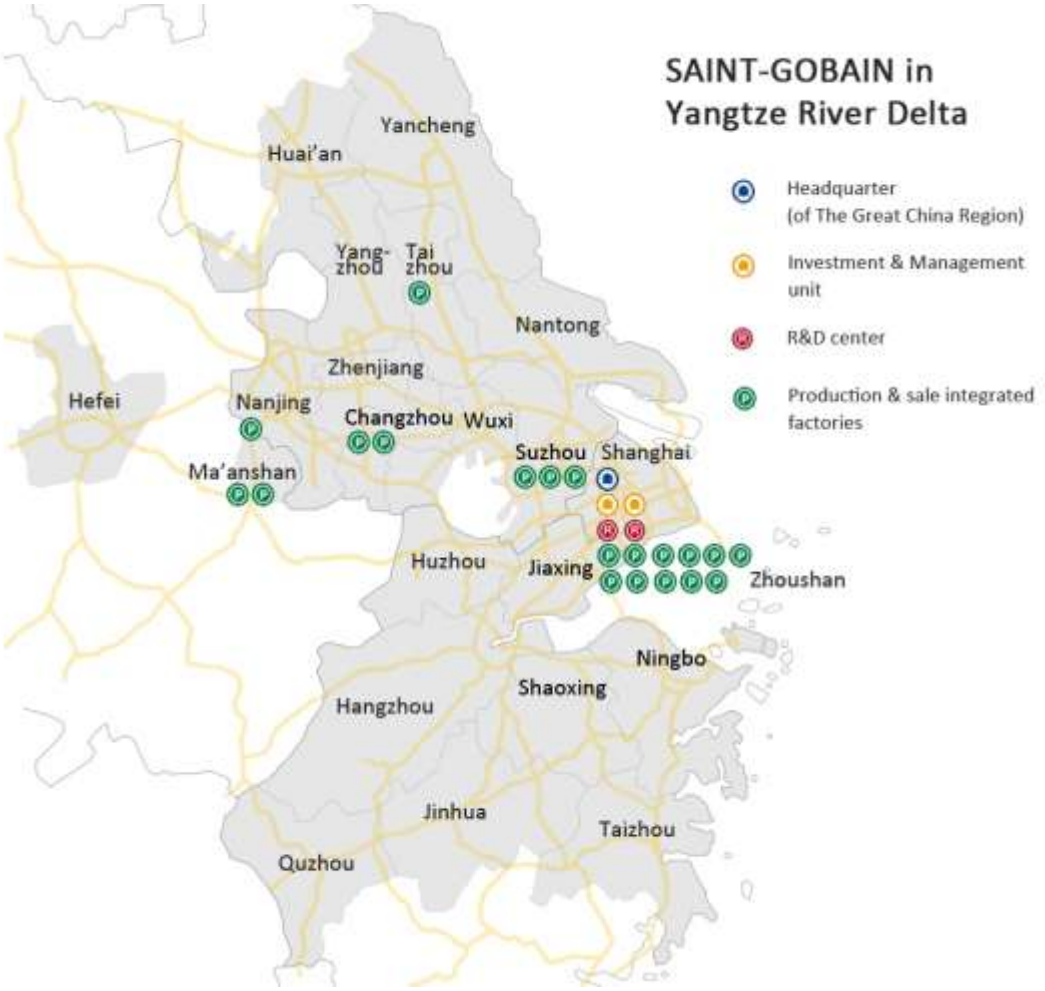
Synergy: Suzhou and **Ningbo** have the synergic functions with Shanghai.



Hierarchy: there is a **hierarchical structure** in this region, because Shanghai has 4 of the total 5 functions, while other cities at most have 3.

Complementarity: there is **one complementary relation** between **Nanjing, Zhenjiang, Suzhou, and Shanghai**. Because Nanjing has the Verbund site (there are only 6 through the world), while Shanghai does not have.

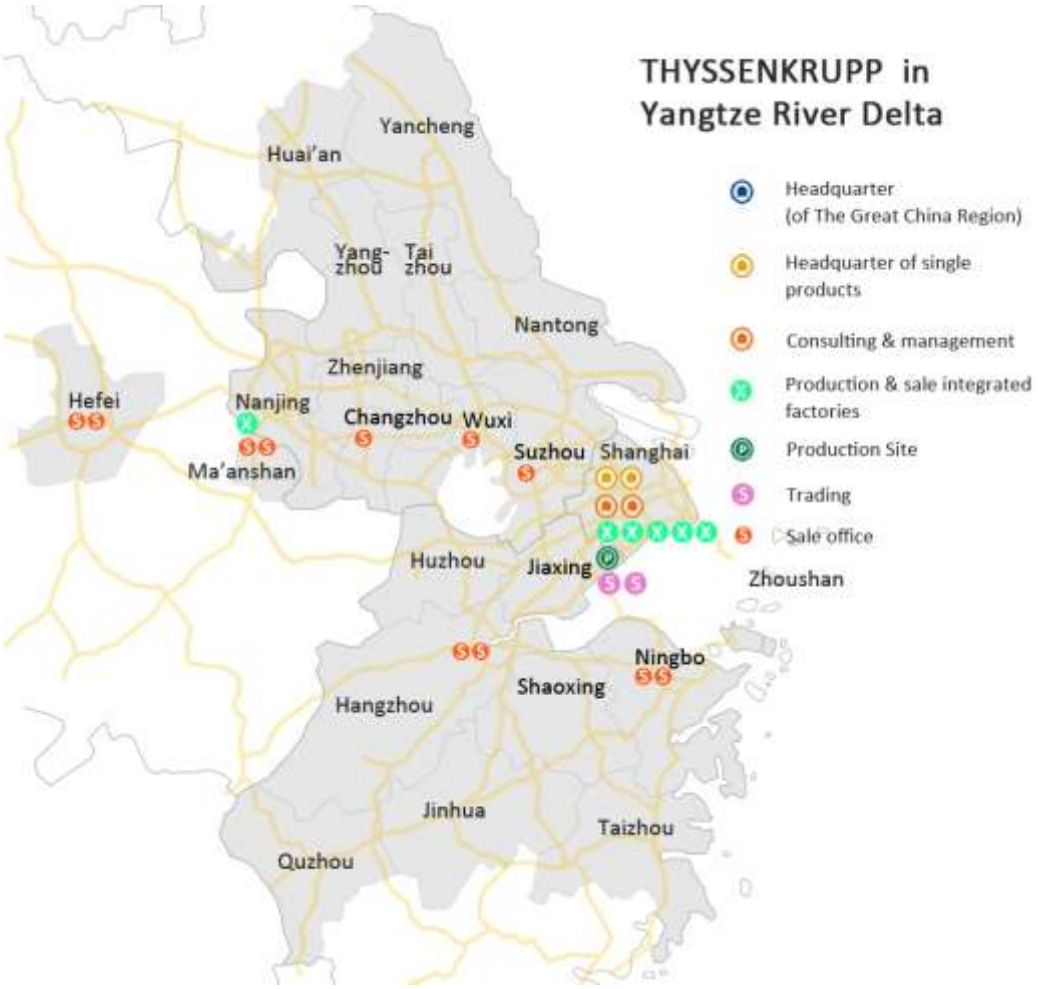
Synergy: Nanjing – Zhenjiang – Suzhou - Shanghai



Hierarchy: Shanghai has full sets of the functions, is on hierarchical top level.

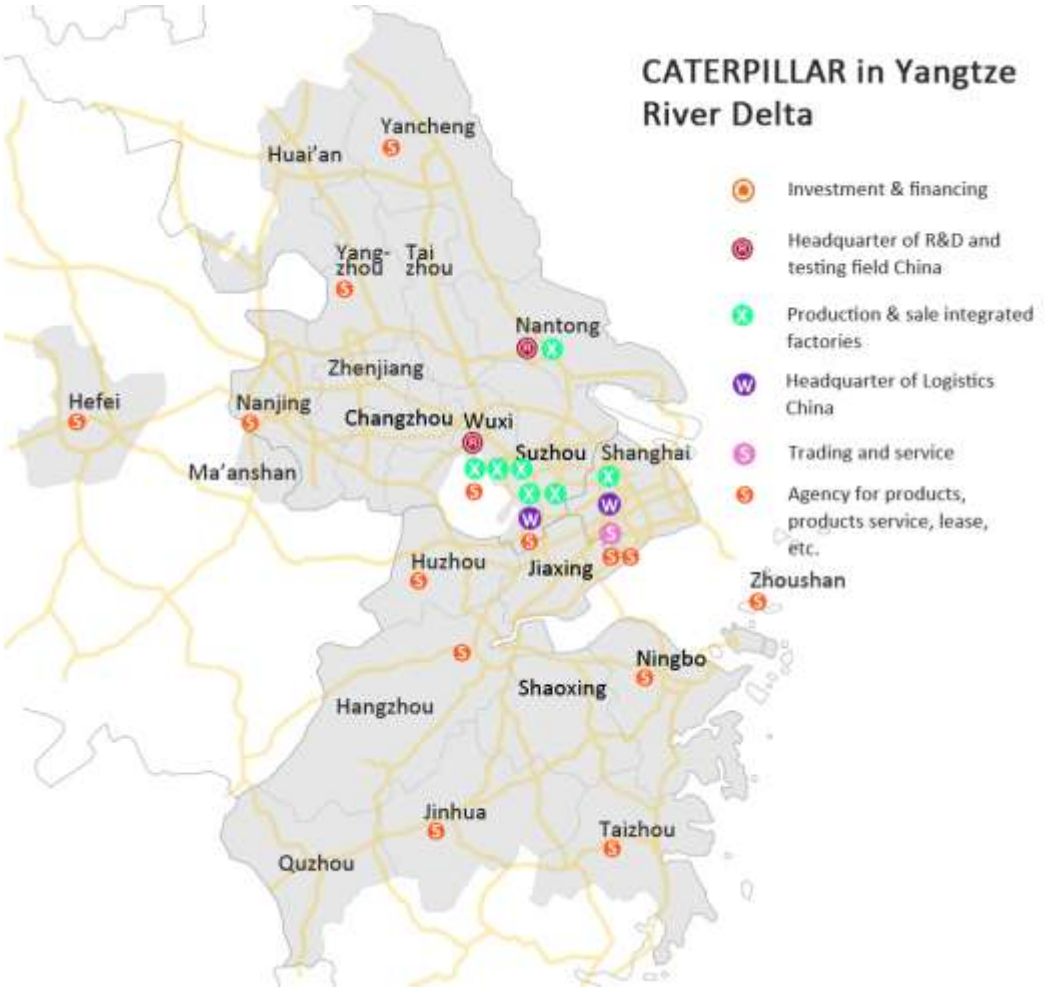
Complementarity: More in detail of products, **cities of Ma'anshan & Suzhou** have Pipe and solar board that Shanghai does not produce.

Synergy: Shanghai – Suzhou – Changzhou – Ma'anshan – Nanjing- Taizhou



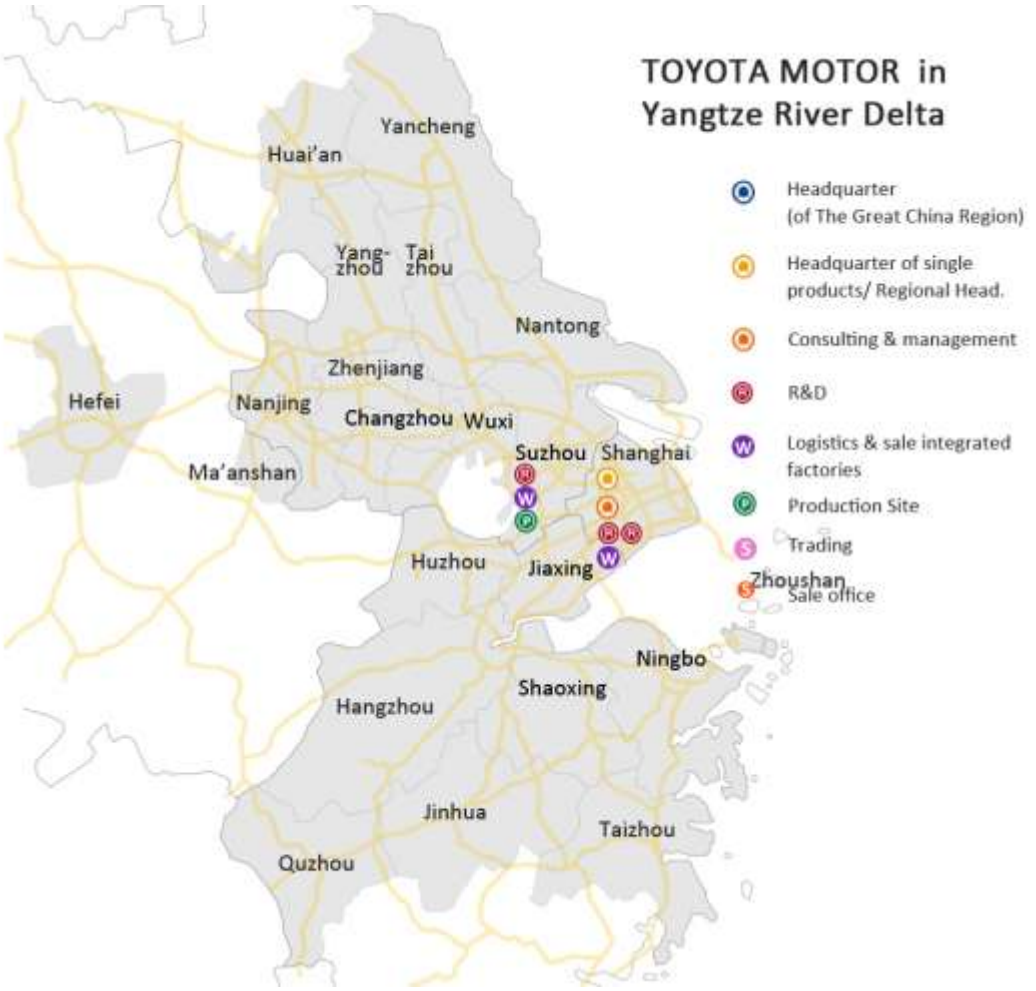
Hierarchy: Shanghai has full sets of the functions; it is on hierarchical top level.

Complementarity or Synergy: It has complementary function with **Nanjing**, because Nanjing produces different products.



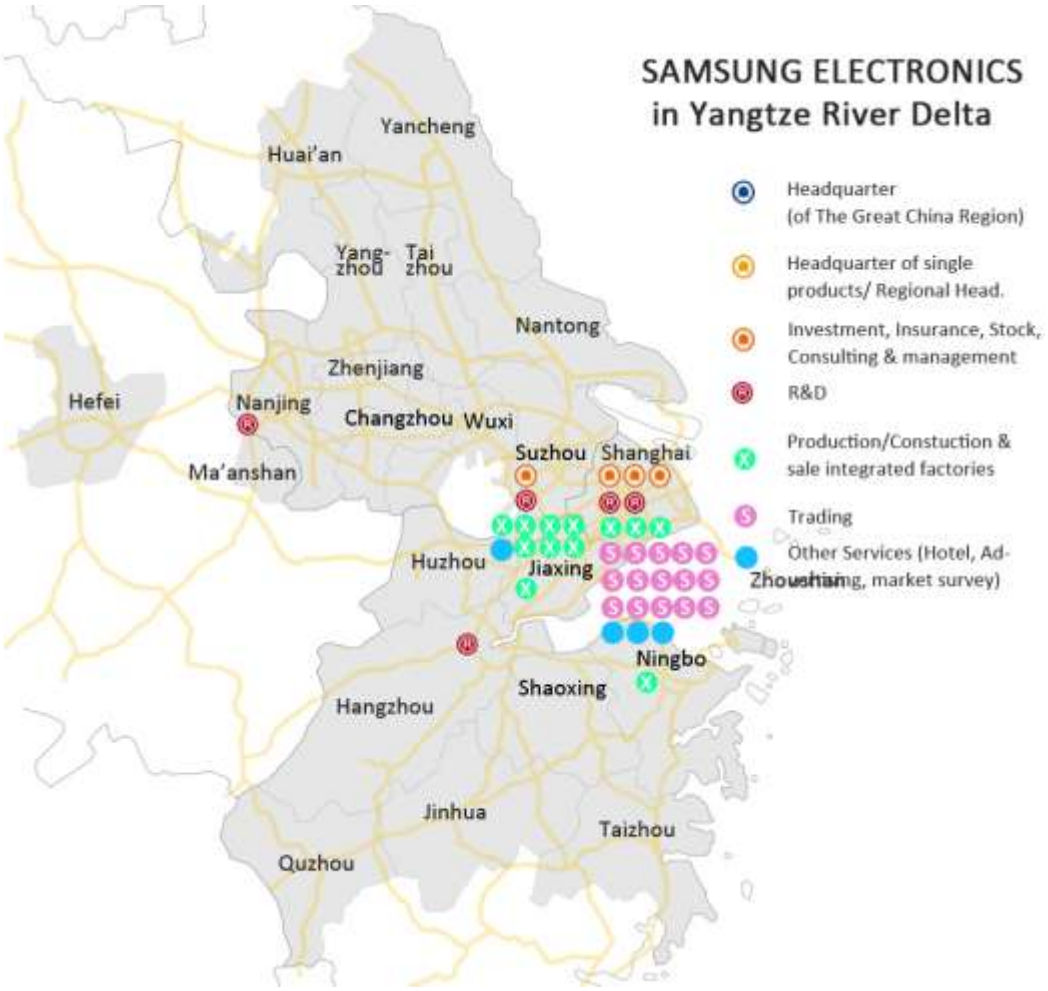
Complementarity: a very good example of complementation among Research, Production, Logistics and Trading/sales (**Nantong, Wuxi – Shanghai, Suzhou**).

Synergy: Nantong – Wuxi in R&D; **Shanghai –Suzhou** in Logistics; **Nantong – Wuxi – Shanghai – Suzhou** in Production.



Complementarity: Shanghai and **Suzhou** have complementary relations in headquarter, management, and production aspects.

Synergy: Shanghai and Suzhou have synergic relationship in R&D and Logistics sale aspects.



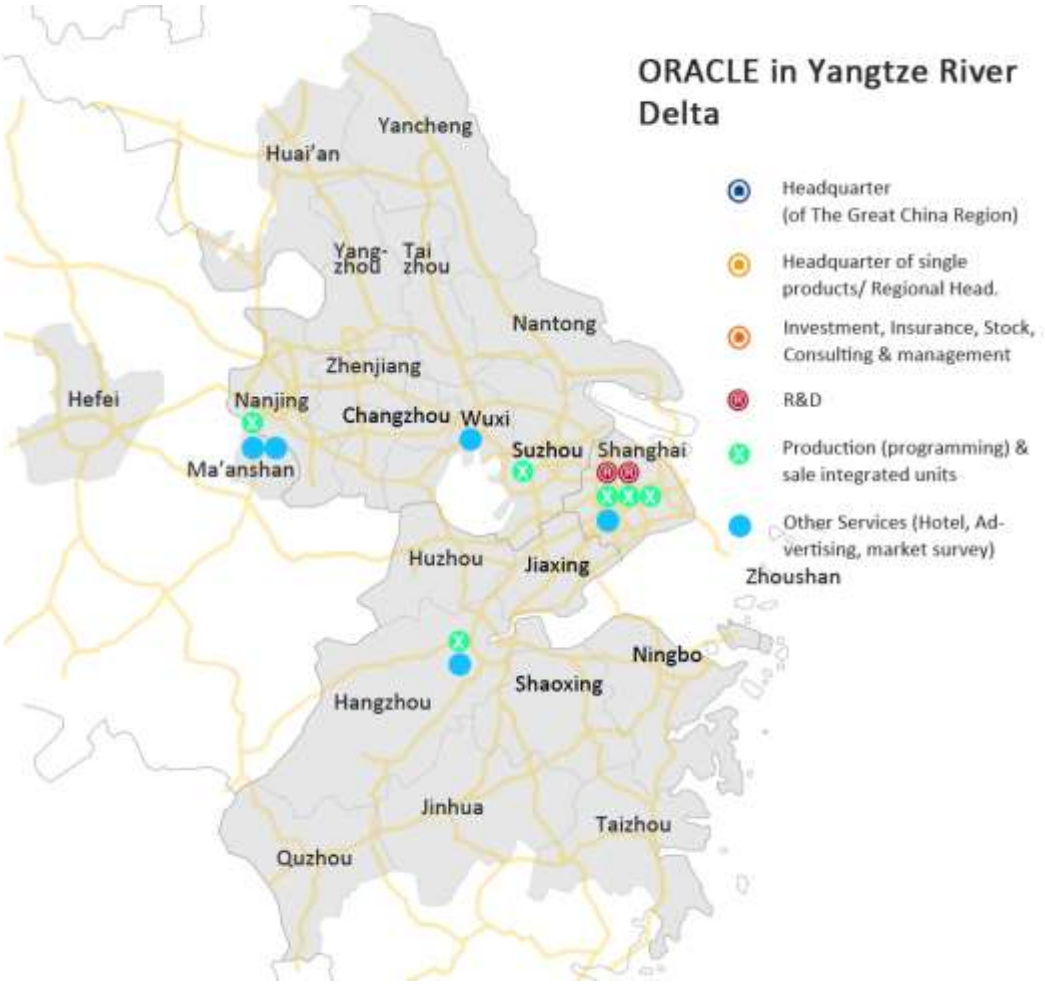
Hierarchy: Shanghai has full sets of the functions, it is on hierarchical top level.

Complementarity: all the trading functions are in **Shanghai**

Synergy: especially R&D aspects: Shanghai – Suzhou – Nanjing - Hangzhou

Quite typical organization of the state owned firms – the **hierarchical** structure basing on the area of each province.

Complementarity: even though, **Shanghai** is weak in the Production of electricity, Construction and Operation of the Grid, while it emphasizes on the headquarter and financial functions.



The subsidiaries of tertiary industry are relatively less, also it is difficult to divide the R&D from production.

– **Hierarchical: Shanghai**

– **Complementarity: Wuxi & Suzhou**

_ **Synergy: Nanjing, Suzhou , Hangzhou**

The subsidiaries of tertiary industry are relatively less, also it is difficult to divide the R&D from production.

– **Hierarchical: Shanghai**

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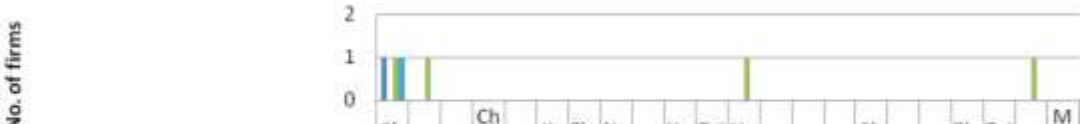
_ **Synergy: Nanjing, Suzhou , Hangzhou**

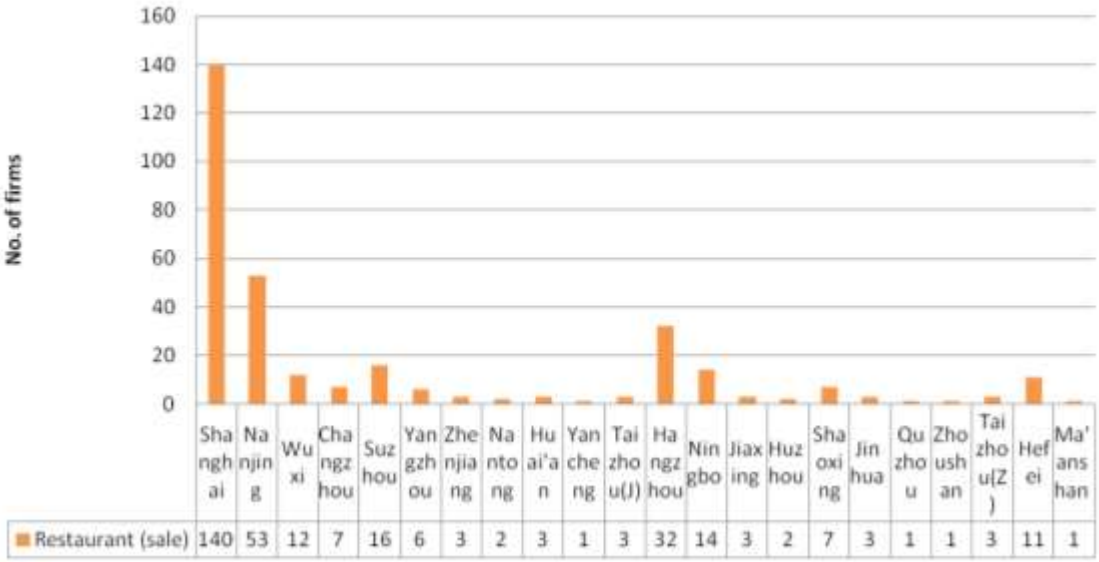
A.P. MØLLER-MÆRSK GROUP in Yangtze River Delta

	Shanghai	Nanjing	Suzhou	Nantong	Hangzhou	Ningbo	Hefei
Headquarter of the Great China region							
Headquarter of single products/ regional headquarter	3						
Investment & real estate development							
R&D							
Terminal	1						
Sales, Customer Service & Warehouse						1	
Sale and Customer Service	1	2	1	1	1	2	
Representative (sale) office			1				1

MCDONALD'S in Yangtze River Delta



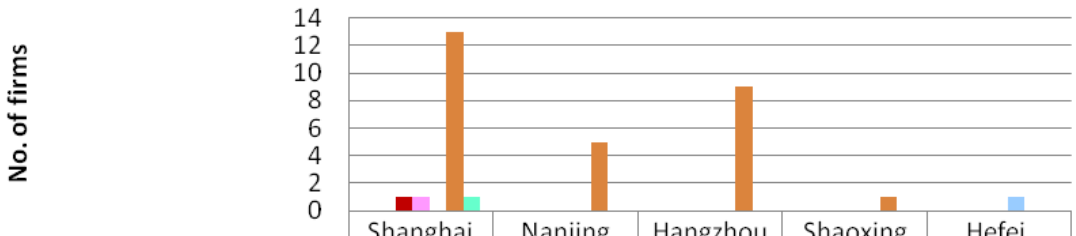
	Shanghai	Nanjing	Wuxi	Changzhou	Suzhou	Yangzhou	Zhenjiang	Nantong	Huai'an	Yancheng	Taizhou (J)	Hangzhou	Ningbo	Jiaxing	Huzhou	Shaoxing	Jinhua	Quzhou	Zhoushan	Taizhou (Z)	Hefei	Ma'anshan
Headquarter of the Great China region	1																					
Headquarter of single products/ regional headquarter																						
intergrated unit (Operation, Training, HR, Marketing, Public Relation, Engineering, real easte, Finance, purchase, etc.)	1	1										1									1	
Other Service (McDonald's Hamburg University)	1																					



	Shanghai	Nanjing	Wuxi	Changzhou	Suzhou	Yangzhou	Zhenjiang	Nantong	Huai'an	Yancheng	Taizhou(J)	Hangzhou	Ningbo	Jiaxing	Huzhou	Shaoxing	Jinhua	Quzhou	Zhoushan	Taizhou(Z)	Hefei	Ma'anshan
Restaurant (sale)	140	53	12	7	16	6	3	2	3	1	3	32	14	3	2	7	3	1	1	3	11	1

	Shanghai	Nanjing	Wuxi	Changzhou	Suzhou	Yangzhou	Zhenjiang	Nantong	Huai'an	Yancheng	Taizhou(J)	Hangzhou	Ningbo	Jiaxing	Huzhou	Shaoxing	Jinhua	Quzhou	Zhoushan	Taizhou(Z)	Hefei	Ma'anshan
Headquarter of the Great China region																						
regional headquarter/ Electronic Commerce HQ	1																					
Investment & real estate development																						
R&D																						
Walmart Supercenter	20	6	4	3	7	1	1	0	1	1	0	7	4	4	1	4	2	1	0	0	8	2
Sam's club (whole+retail)	1																					
Warehouse and Logistics for Electronic Commerce	1																					

ING GROUP in Yangtze River Delta



	Shanghai	Nanjing	Hangzhou	Shaoxing	Hefei
Headquarter of the Great China region					
Headquarter of single products/ regional headquarter					
Commercial Banking	1				
Real Estate	1				
Life Insurance					1
insurance and investment products	13	5	9	1	
Fund	1				

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