

# Technological Progress, Industrial Transformation and Regional Development

## *A Case Study of Yangtze River Delta*

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# Outline

- 1. Research Background**
- 2. The momentum of economic growth and the development of the Yangtze River Delta region**
- 3. The Yangtze River Delta spatial structure under the influence of High-speed traffic and information & communications technology (ICT)**
- 4. Conclusion and Discussion**

# 1. Research Background

- **The impact of technological progress on economic growth**
  - The impact of technological progress on economic growth was recognized by economists when the neoclassical growth theory prevailed (Solow,R.M.,1956) .
  - Due to the acceleration of economic globalization and the strengthening of competition, technological progress has become an important factor in the reconstruction process as well as in corporate and regional competitive position.

# 1. Research Background

- From the perspective of human capital 's promotion for technological progress, scholars explore the relationship between technological progress and employment, industrial structure adjustment and employment (Stoneman,1983 ; Pissarides,1990 ; Paolo Pini,1997 ; Claudio Micheiacci, 2004) .

# 1. Research Background

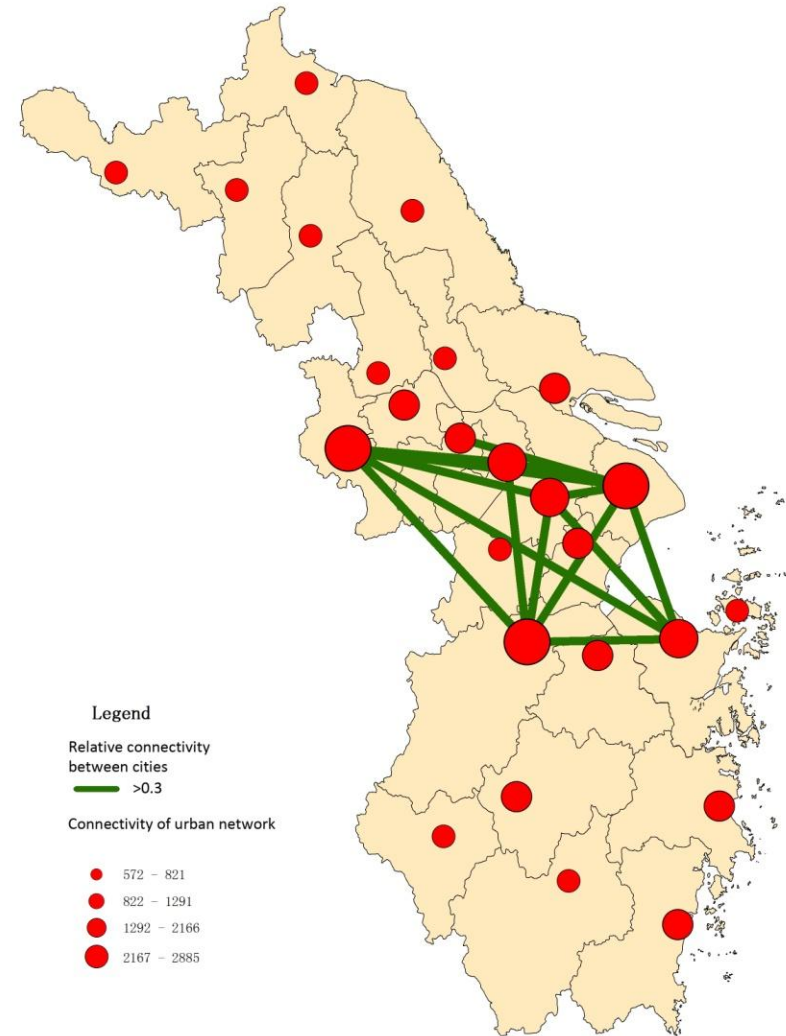
- **Technological progress and regional development and its spatial transformation**
  - The application of high-speed traffic and ICT played a crucial role in regional development and its spatial transformation, which is supported by the concept of “the space of flow”(Castells,1989).
  - Some scholars explored technological innovation and diffusion, competitiveness, space reconstruction and space control in China (Jiang Xu, Anthony G.O. Yeh, 2005 ; Shih-Shen Chien, 2008 ; Chun Yang, 2009) .
  - As “transformation and upgrading "has become the main line for Chinese reform and development, technological progress will exert more impact on the future social and economic development in China.

# 1. Research Background

- **Research Area——Yangtze River Delta**
  - As the most densely populated and most economically developed region, economic development, industrial transformation and spatial restructuring in Yangtze River Delta has attracted extensive attention from scholars at home and abroad.
  - For this paper, Yangtze River Delta includes Shanghai, Jiangsu and Zhejiang province, a total of 25 cities, based on "*regional planning in Yangtze River Delta(2009-2010)*".

# 1. Research Background

- **Research purposes**
  - Based on the background of globalization and informatization, the author intended to discuss the effect of the changes in technology, especially high-speed transport technology and ICT, on the Yangtze River Delta region and its spatial transformation.



## 2. The momentum of economic growth and the development of the Yangtze River Delta

### 2.1 The changes in the momentum of economic growth in China

- For a long time, China's economic growth shows the characteristics of the extensive growth mode, mainly promoted by large amount of capital, energy, raw materials, and labor investment, but technological progress and total factor productivity (TFP) growth contributed little to economic growth.
- Recently, several Chinese economists emphasized the role of technological progress in economic growth.
- Also, with the rapid development of urbanization in China, the current urbanization level is more than 50% ,and the pull effect of urbanization on urban economic growth becomes increasingly prominent.



## 2. The momentum of economic growth and the development of the Yangtze River Delta

### 2.2 Technological progress and regional economical growth in three regions of China: Yangtze River Delta region, Beijing-Tianjin-Hebei region and Pearl River Delta region

- The area of the three regions accounts for 6.3% of the entire territory of China; the economic power of the three regions accounts for 43.66% of GDP.
- Comparing the differences of these three regional economic growth is helpful for understanding the changes in economic growth and its dynamic mechanism in the Yangtze River Delta region.

## 2. The momentum of economic growth and the development of the Yangtze River Delta

- Adopt the high-speed traffic levels and information and communications level to measure the regional technological progress.

the regional information and communications level :

$$LIC=(MC+IN+VPT)/P$$

**LIC** represents for the level of regional information and communications; **Mc** is the number of mobile phone users; **IN** is local Internet users; **VPT** is regional postal business volume; **P** is the total population.

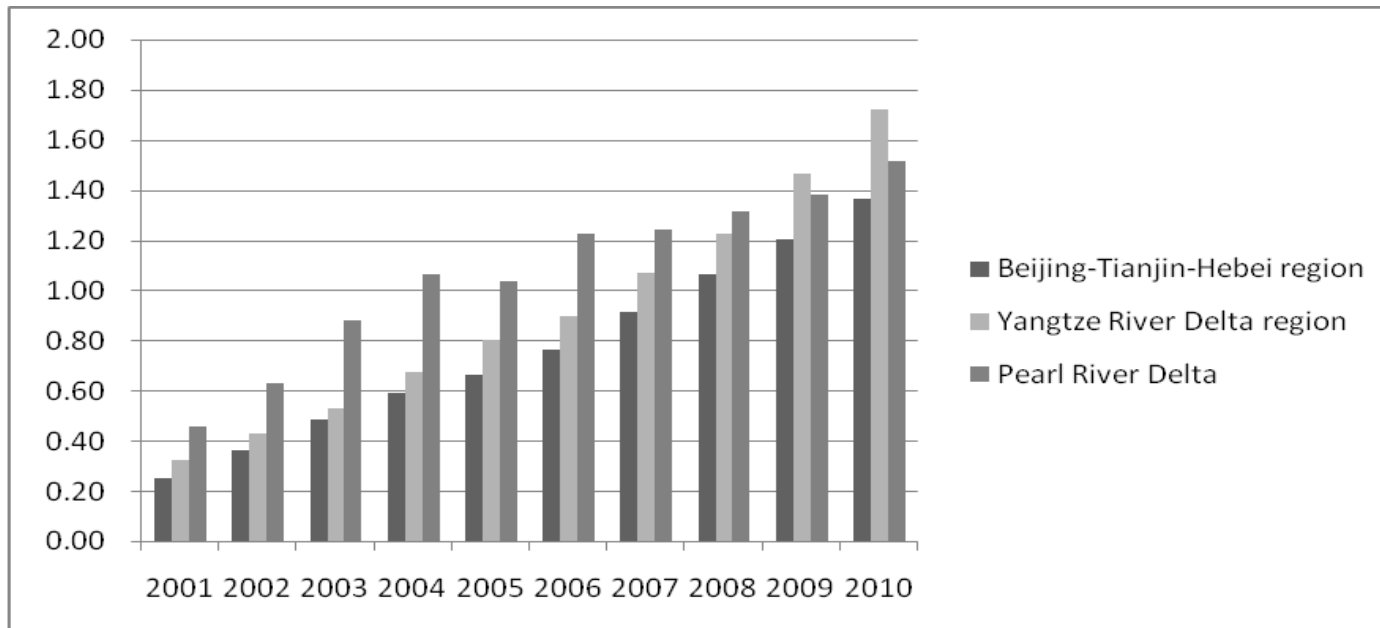
the high-speed traffic level:

$$LHT=(HW+RW)/P$$

**LHT** represents for the high-speed traffic levels; **HW** is highway mileage; **RW** is regional railway operating mileage; **P** is the total population .

## 2. The momentum of economic growth and the development of the Yangtze River Delta

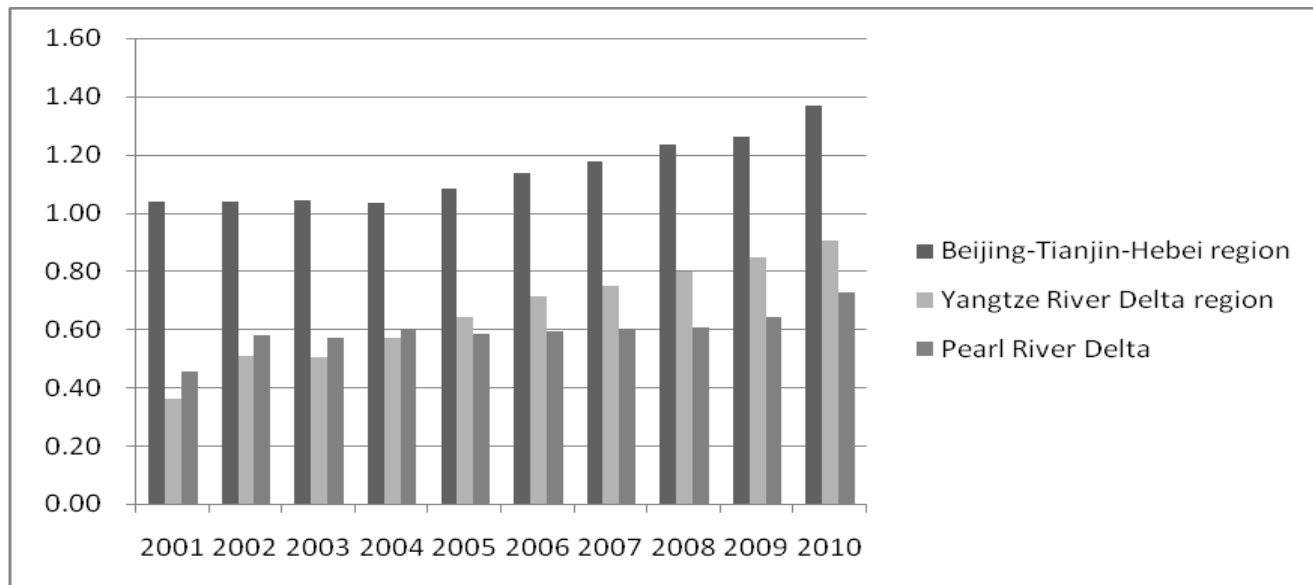
- **Changes in the ICT level of the three regions**
  - The ICT level in the three regions maintained a rapid growth.
  - The total level of the Yangtze River Delta gradually surpassed the Pearl River Delta, making it the region with highest information and communications level in China.



the level of ICT in three region from 2001 to 2010

## 2. The momentum of economic growth and the development of the Yangtze River Delta

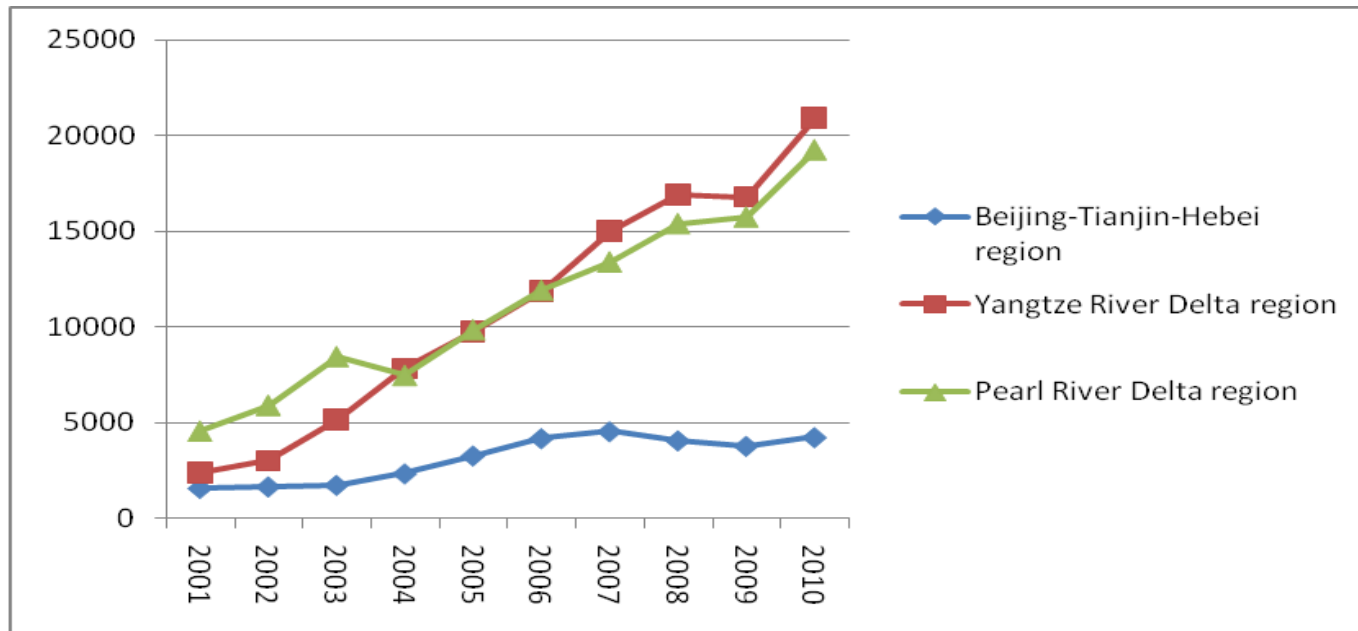
- **Changes in high-speed traffic level of the three regions**
  - The high-speed traffic level maintained a relatively slow growth in three region. High-speed traffic level in Beijing-Tianjin-Hebei region was the highest; High-speed traffic level in Yangtze River Delta region maintained a relatively rapid growth, due to the construction of high-speed railway.



**the level of high-speed traffic in three region from 2001 to 2010  
(Kilometers per million people)**

## 2. The momentum of economic growth and the development of the Yangtze River Delta

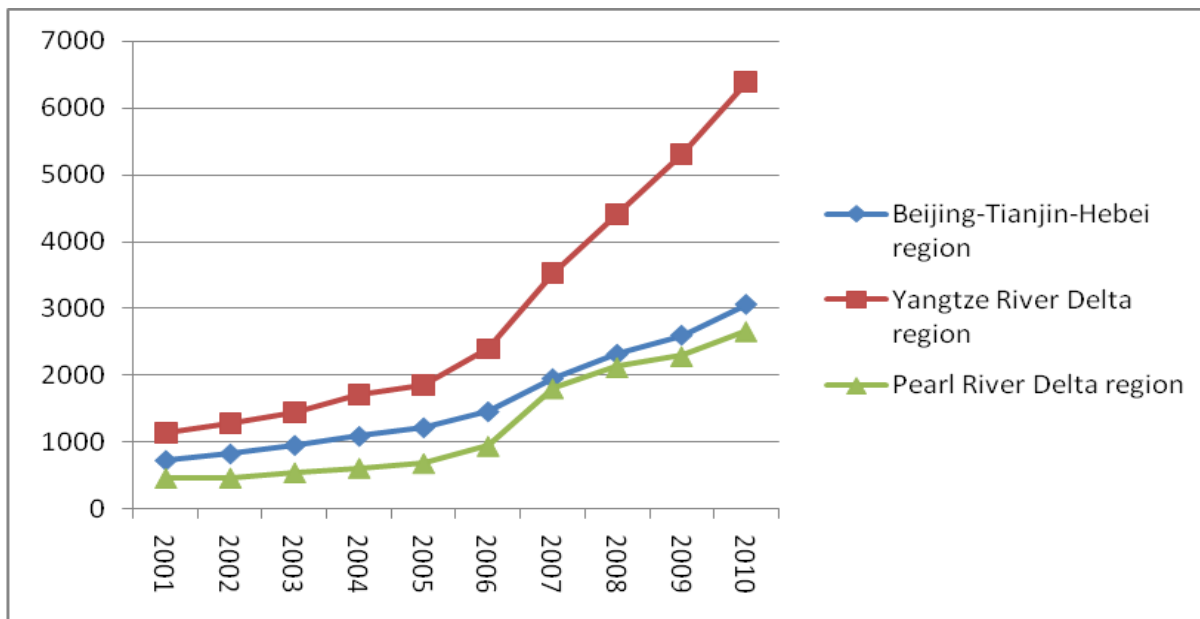
- **Economic growth trends in three regions: electronic information industry**
  - It grew rapidly in Yangtze River Delta and Beijing-Tianjin-Hebei region.
  - The development of electronic information industry in the Yangtze River Delta maintained the rapidest growth and the highest output in China.



The growth trends of the manufacture of information industry in three regions from 2001 to 2010

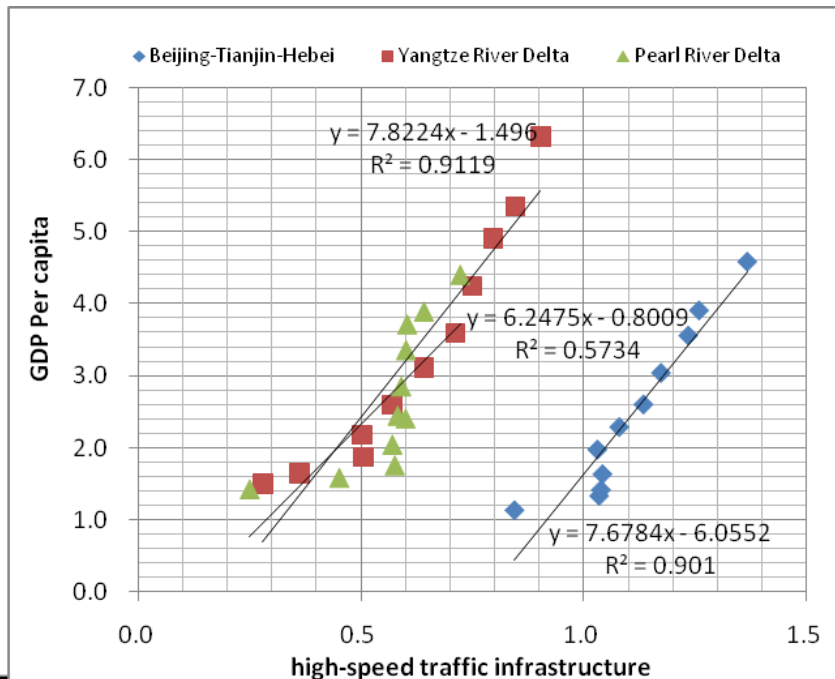
## 2. The momentum of economic growth and the development of the Yangtze River Delta

- **Economic growth trends in three regions: Financial industry**
  - The financial industry grew swiftly since 2006, especially in the Yangtze River Delta.
  - the Yangtze River Delta region own obvious advantages over the other regions, because of the international financial centre in shanghai and the accumulated private capital in Jiangsu and Zhejiang.

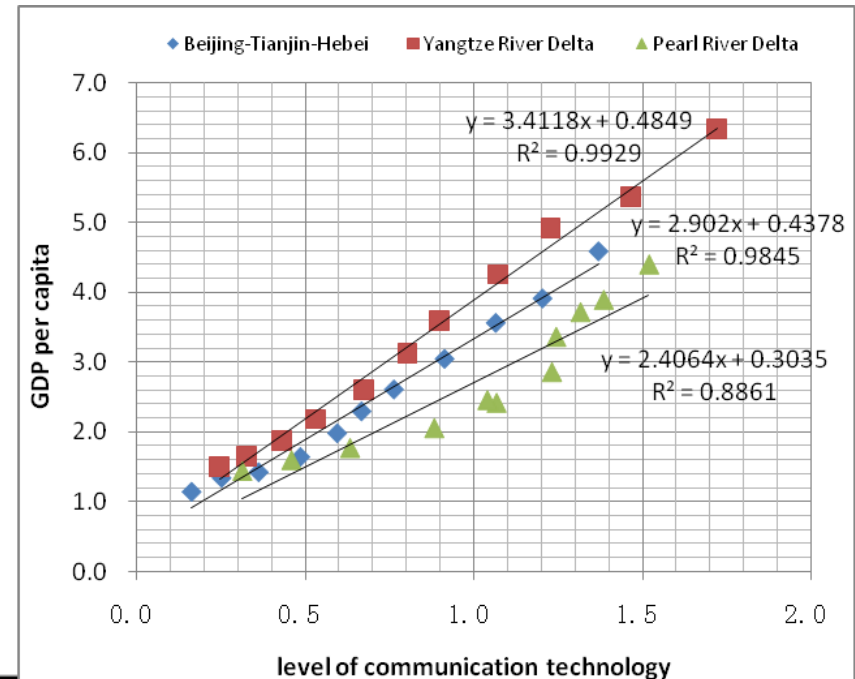


# 2. The momentum of economic growth and the development of the Yangtze River Delta

- **Regional technological progress and economic growth**
- The high-speed traffic level had a strong correlation with economic growth in Yangtze River Delta and Beijing-tianjin-hebei region.
- The correlation coefficient between the information and communication level and the per capita GDP in the Yangtze River Delta maintained the highest in China.



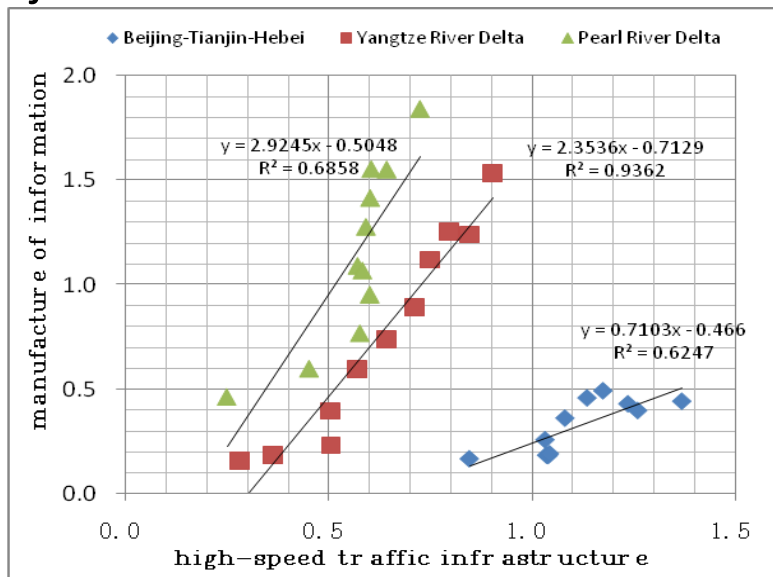
(a) high-speed traffic and GDP



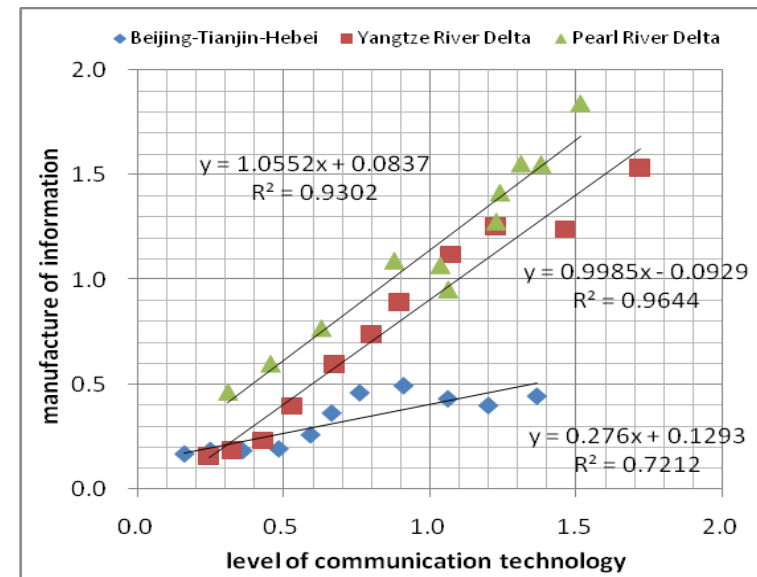
(b) the level of ICT and GDP

## 2. The momentum of economic growth and the development of the Yangtze River Delta

- Regional technological progress and the development of manufacturing industry
- Technological progress played a more significantly role in advancing manufacturing industry growth in the Yangtze River Delta than Pearl River Delta and Beijing-Tianjin-Hebei.



(a) high-speed traffic and manufacturing industry

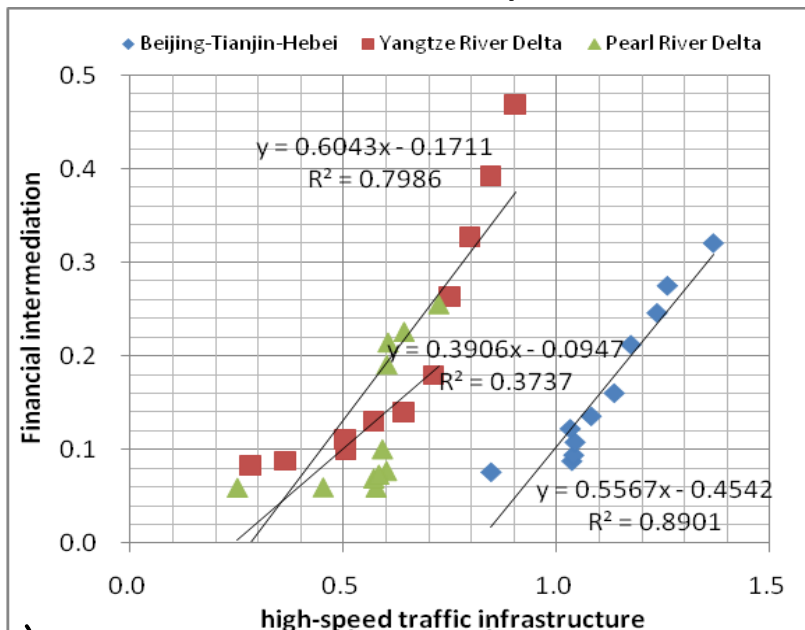


(b) the ICT level and manufacturing industry

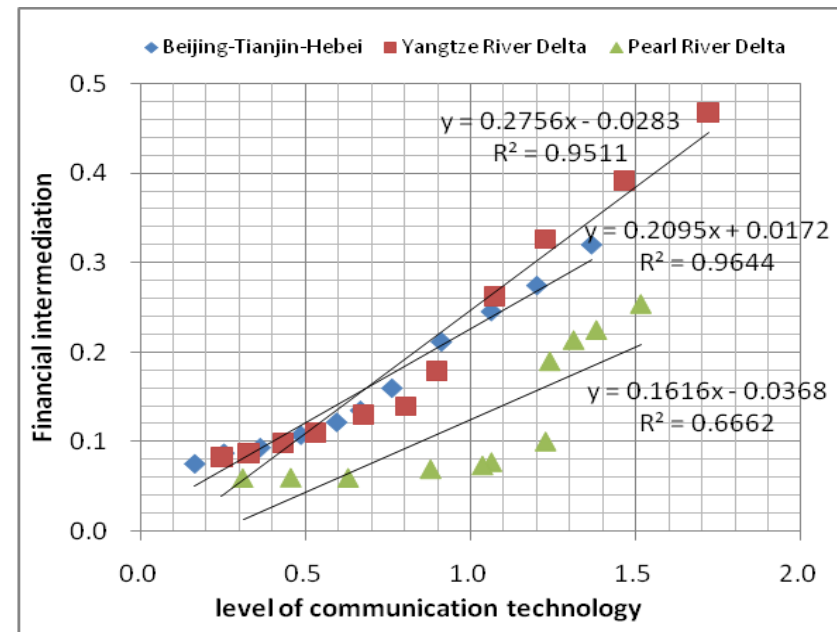


## 2. The momentum of economic growth and the development of the Yangtze River Delta

- **Regional technological progress and the development of financial industry**
  - The correlation between technological progress and the financial industry is higher in Yangtze River Delta region than that in the other two regions.
  - Technological progress played a very strong role in promoting the development of financial industry .



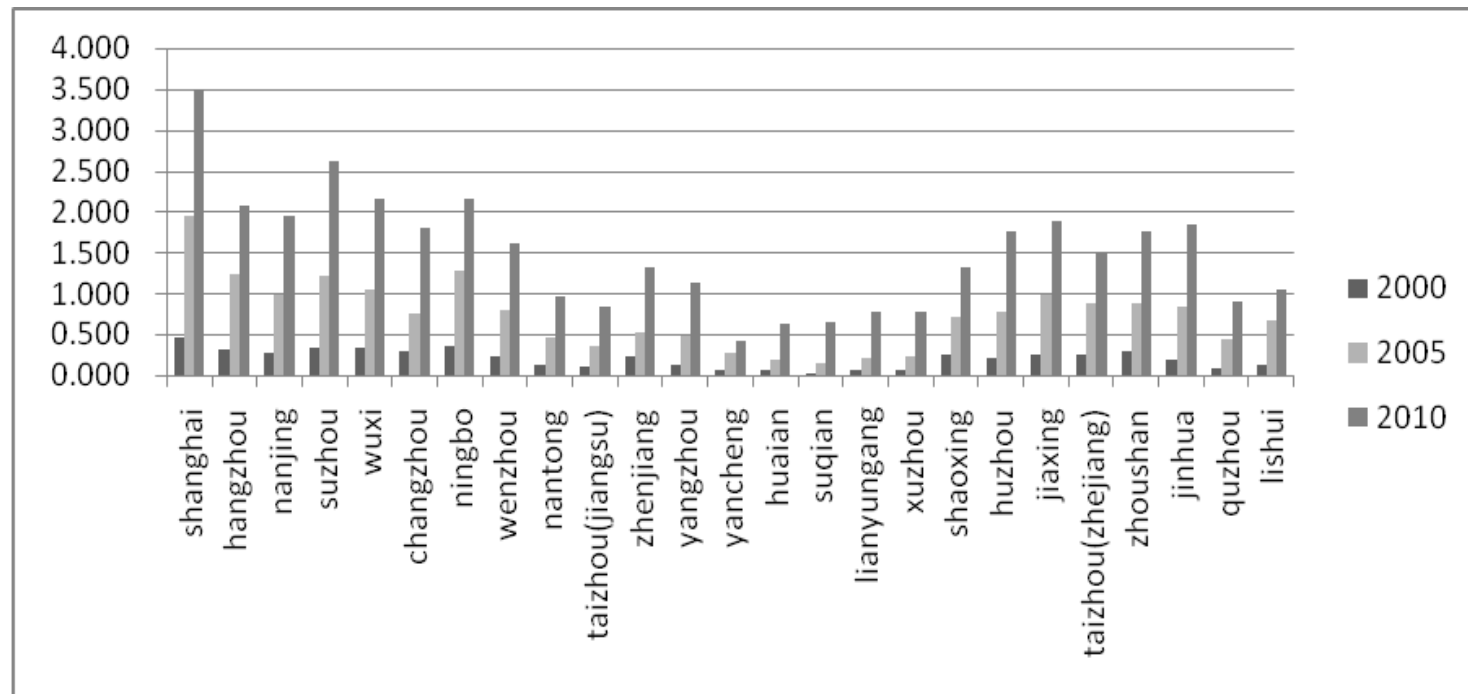
(a) high-speed traffic and financial industry



(b) the level of ICT and financial industry

## 2.3 Infrastructure investment and city economic growth in Yangtze River Delta

- **Urban infrastructure differences**
- Cities with rapid economic growth maintained rapid ICT growth rate, such as Shanghai, Hangzhou, Nanjing, Suzhou, Ningbo etc..

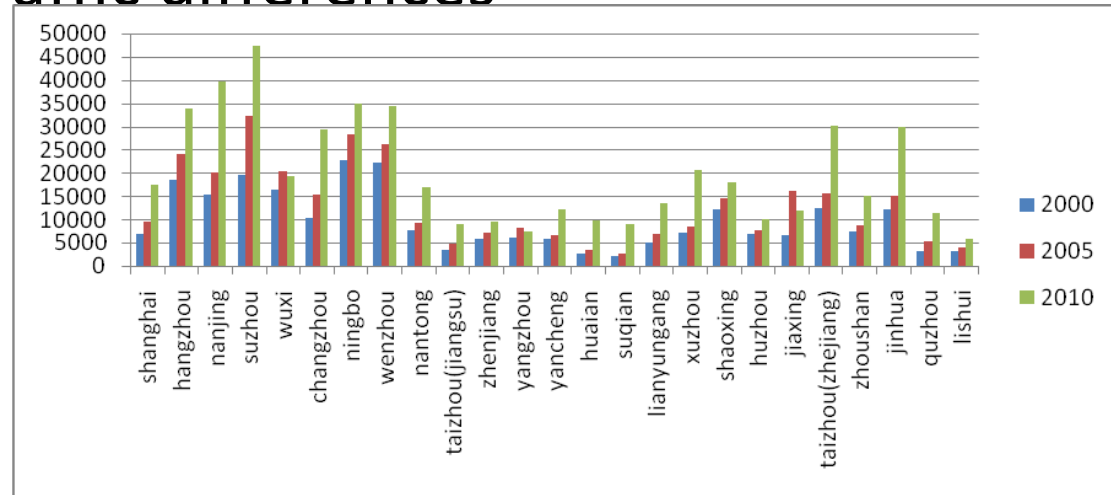


ICT growth in the cities of Yangtze River Delta

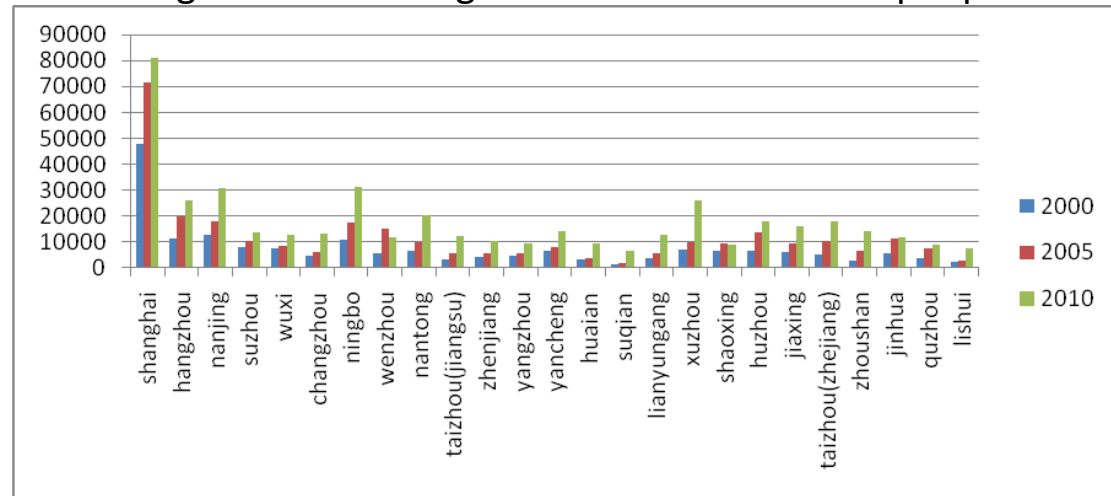
# 2.3 Infrastructure investment and city economic growth in Yangtze River Delta

## Passenger and cargo traffic differences

- Spatial dislocation exists in the passenger and cargo traffic.
- Passenger traffic was concentrated on Hangzhou, Nanjing and Suzhou.
- Cargo traffic was concentrated on Shanghai, Ningbo and Xuzhou.



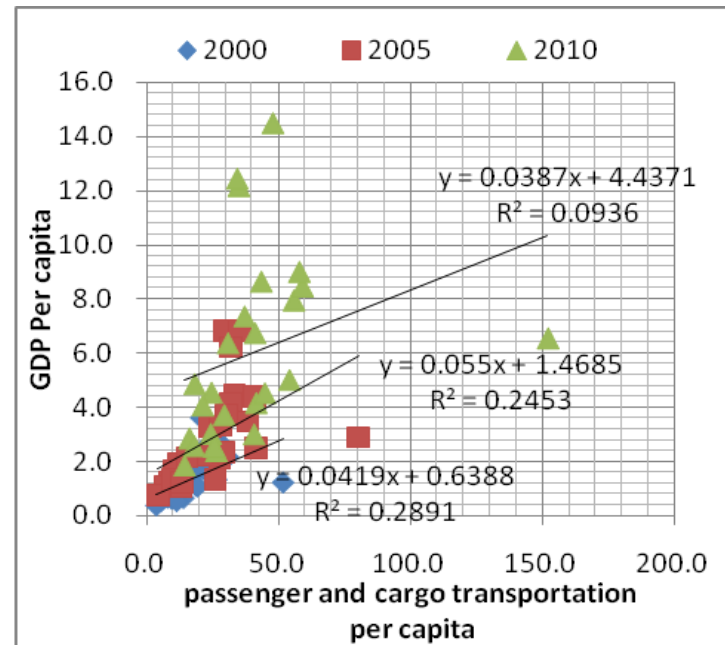
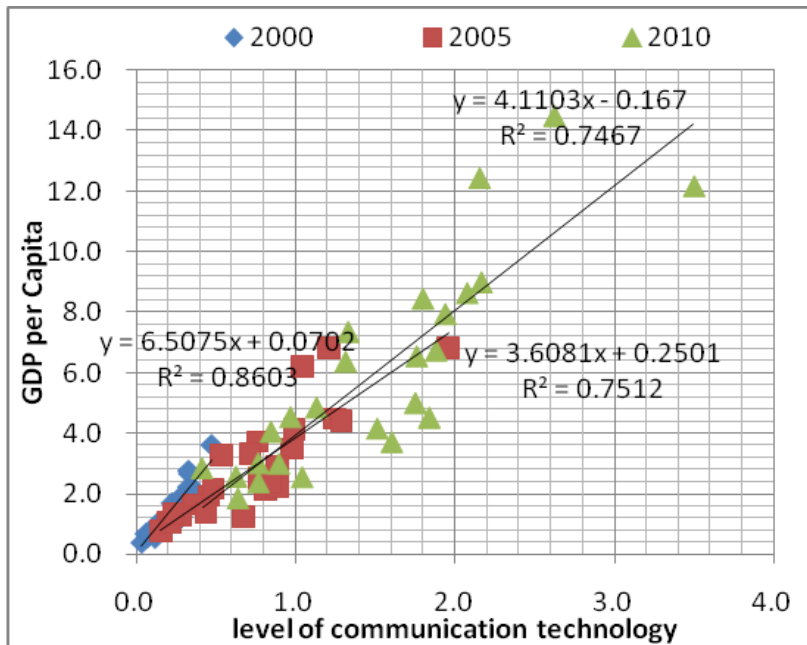
Passenger traffic in Yangtze River Delta (10000 people)



Cargo traffic in Yangtze River Delta (10000 t)

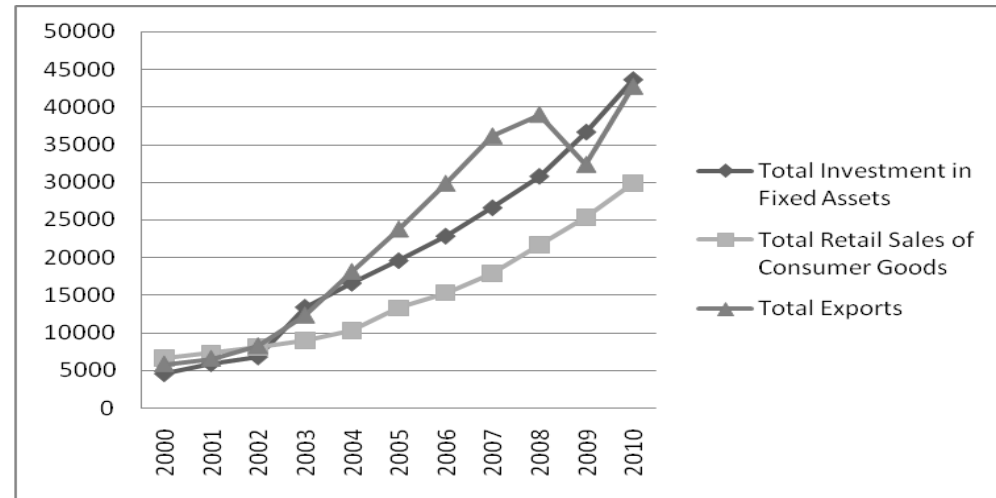
## 2.3 Infrastructure investment and city economic growth in Yangtze River Delta

- The relationship between infrastructure investment and economic growth
- The investment in ICT enhanced the economic growth obviously.
- The passenger and cargo traffic had little effect on city's GDP growth.

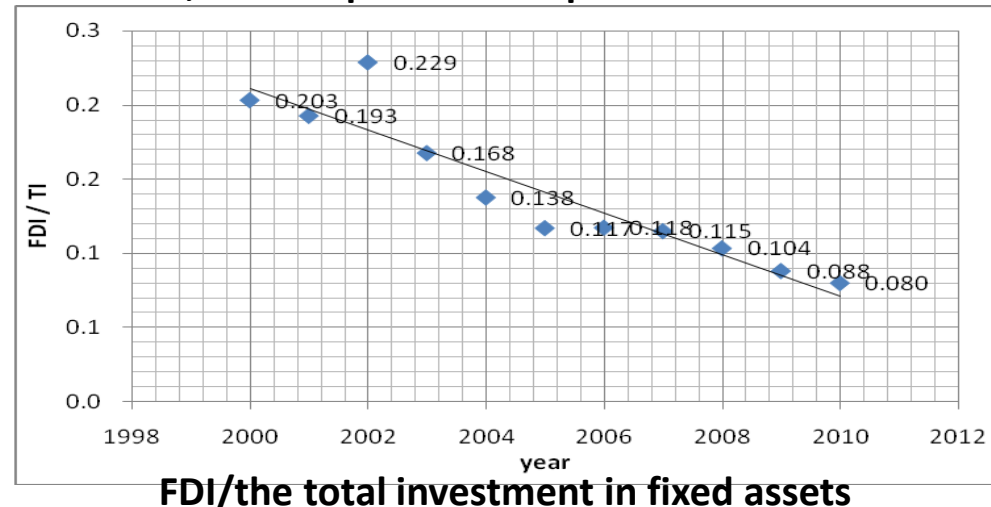


# 2.4 Regional development in Yangtze River Delta : from FDI to Endogenous growth

- Economic growth mode :from export to investment,consumme and export shared growth.
- Investment mode:from foreign and domestic investment to domestic investment.



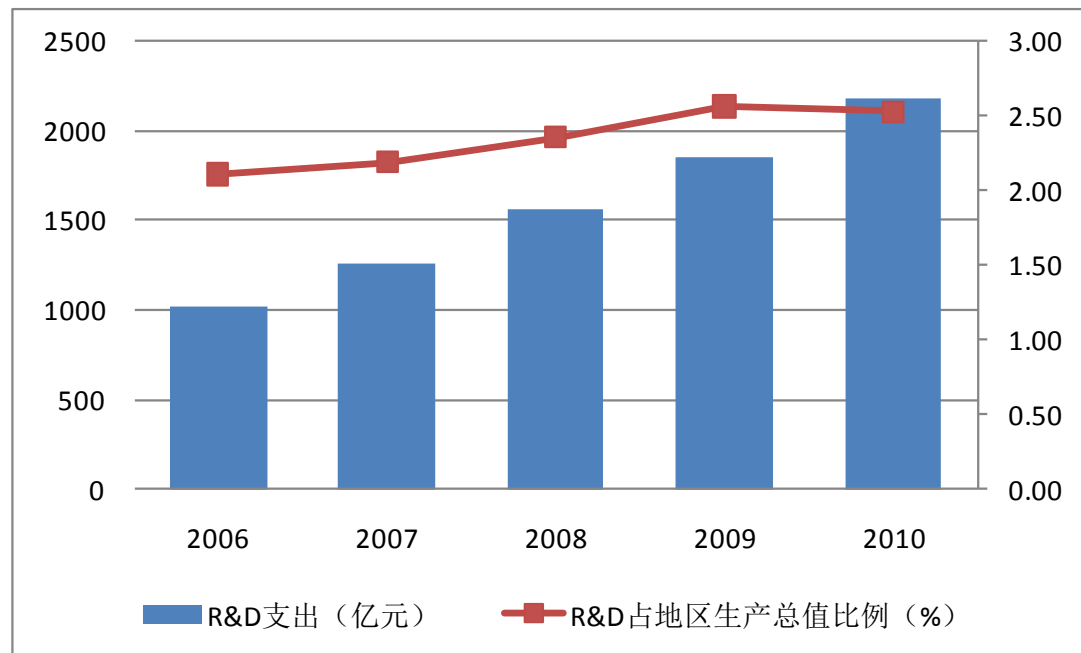
Investment, consumption and export (100 million Yuan)



# 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

## 3.1 The spatial influence of technological progress

- Through increased investment of *R & D* funding, Yangtze River Delta region promote the development of regional innovation capability.
- The high-tech industry and creative industries were promoted by technological progress in the Yangtze River Delta.

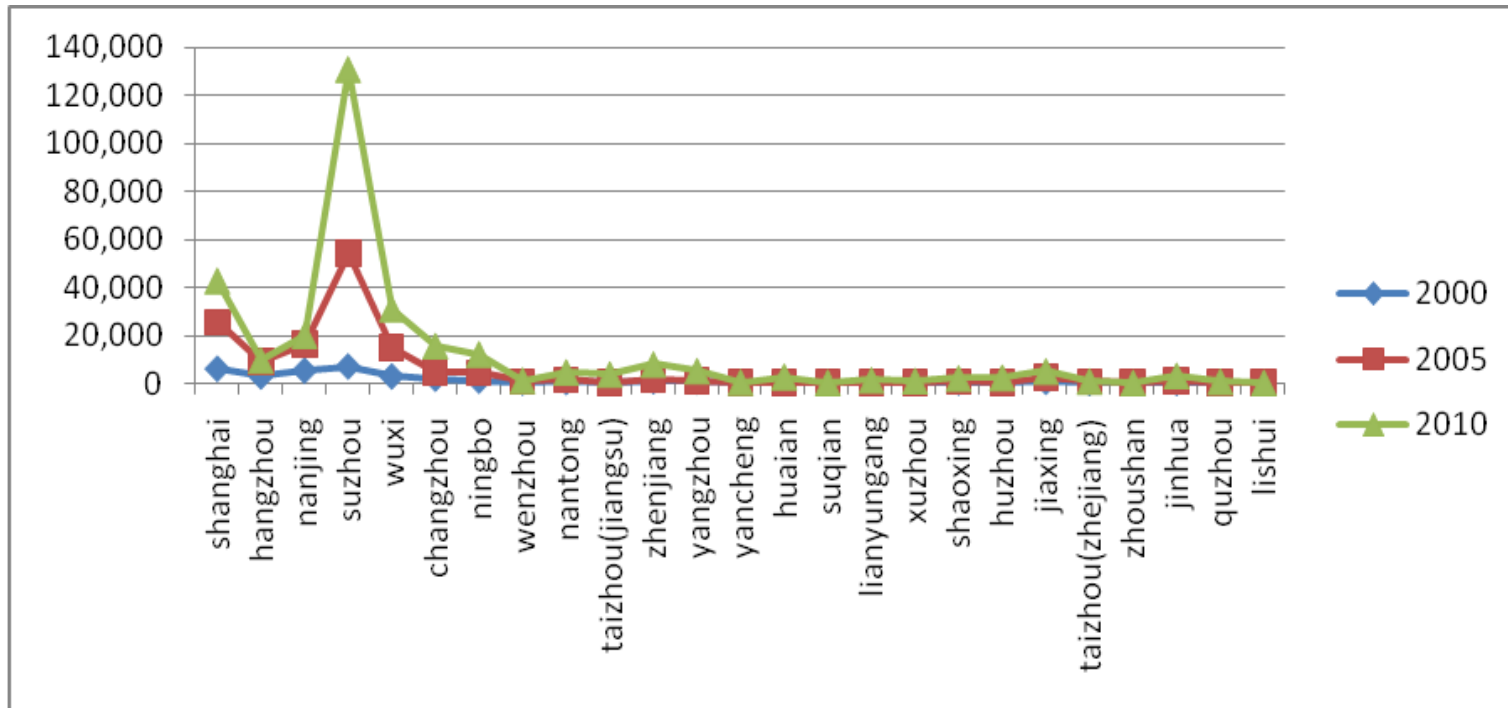


**R & D expenditure accounted for the proportion of regional GDP**

# 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

- 3.2 The changes in industrial space

## Changes in location of the high-tech industry activities



The manufacture of information industry in Yangtze River Delta

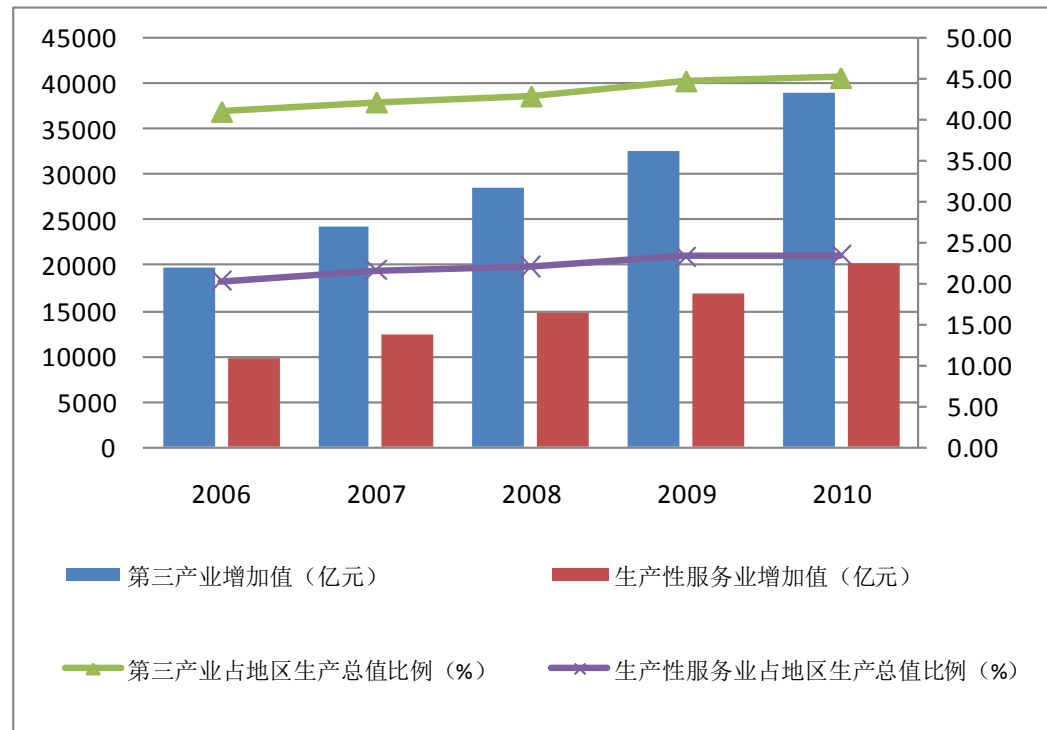
Hi-tech industrial corridor from Nanjing to Shanghai

### 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

- The changes in industrial space

#### Changes in location of the producer services industry activities

- Productive value of producer services industry increased from 977.741 billion in 2006 to 2.02 trillion yuan in 2010.
- The proportion of producer services in regional GDP also increased to 23.46% from 20.36%.

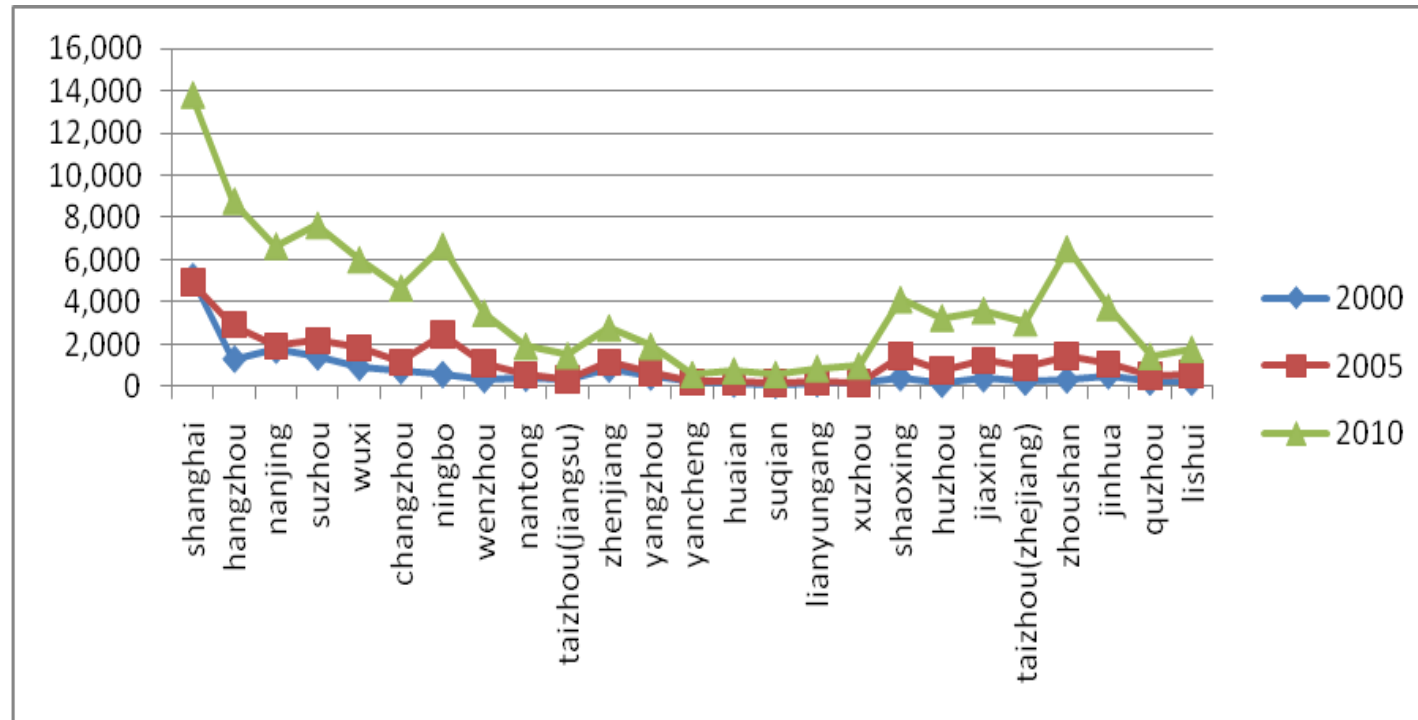




### 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

- The changes in industrial space

#### Changes in location of the producer services industry activities



Urban financial industry in Yangtze River Delta

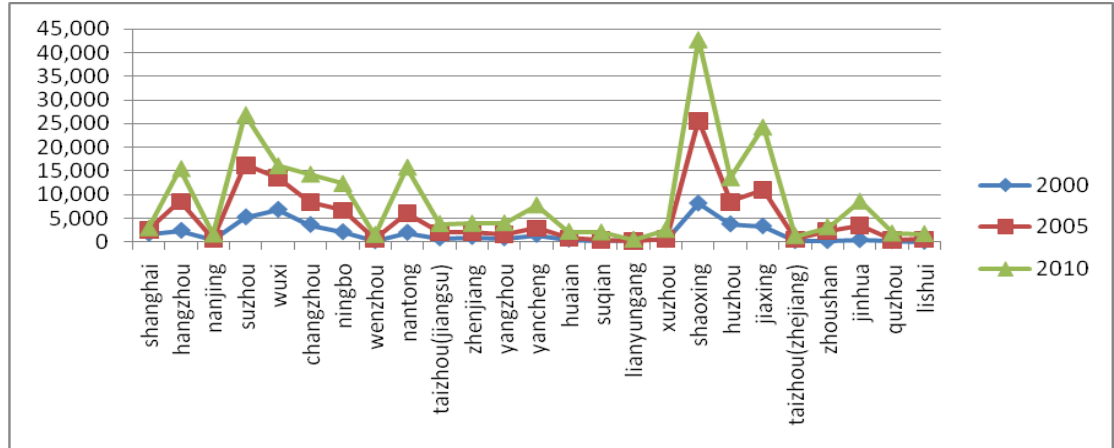
# 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

- The change in industrial space

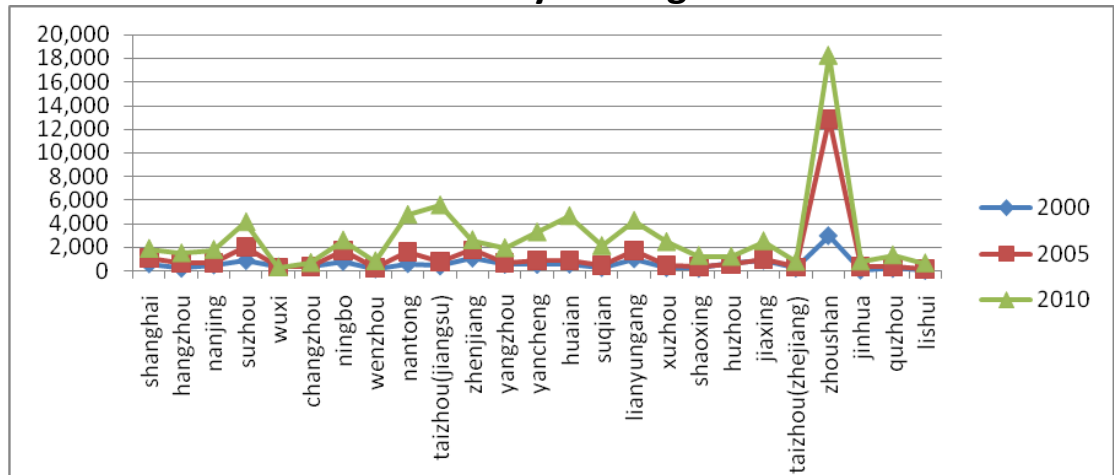
## Changes in location of traditional manufacture

path dependence on textile industry Spatial Agglomeration

The total production of the agro-food processing industry is gradually reduced in central cities and economically developed cities. The development in economically backward regions became faster than before.



## Urban textile industry in Yangtze River Delta



## agro-food processing industry in Yangtze River Delta

### 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

- New system of city network— —rescaling

From the perspective of the enterprise network, the analytical framework of "enterprise - enterprise network - network of cities" was established to simulate the connection between cities by analyzing the layout of producer services .

Select 220 samples from the 11 categories of producer services, and use interlocking network method (*P. Taylor*) to estimate the contact network between the cities in the Yangtze River Delta.

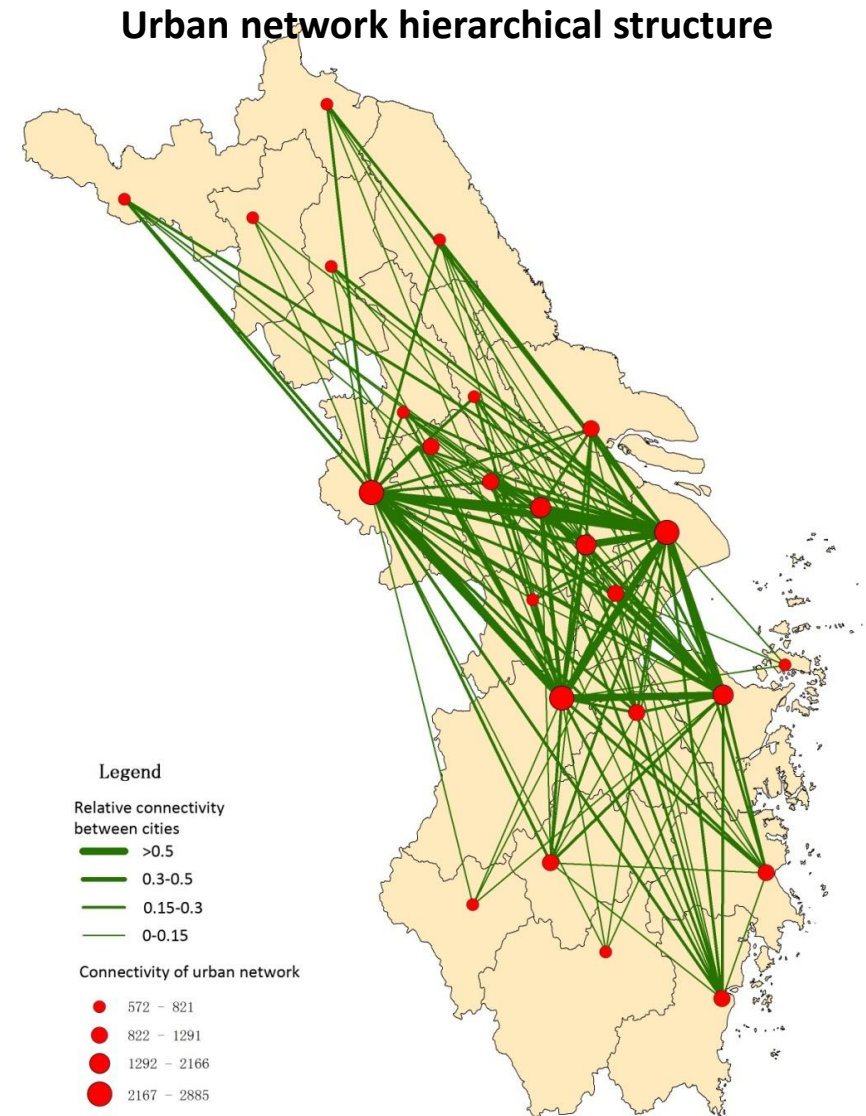
**The distribution of city network in the Yangtze River Delta based on producer services**

Level	Relative connection rate	Number of cities	City name
“core”	0.80-1.00	3	Shanghai、Nanjing、Hangzhou
“Semi-core”	0.49-0.79	3	Ningbo、Suzhou、Wuxi
“Semi-periphery”	0.27-0.48	9	Wenzhou、Changzhou、Nantong、Shaoxing、Jinhua、Taizhou(zhejiang)、Jiaxing、Zhenjiang、Yangzhou
“periphery”	0.00-0.26	10	Huzhou、taizhou、Xuzhou、Yancheng、Huaiian Lianyungang、Lishui、Zhoushan、Qazhou、Suqian

### 3. Regional spatial structure in Yangtze River Delta under the influence of technology progress

- New system of city network

Shanghai is the Yangtze River Delta region's most influential "core". Except for the 6 cities of Zhejiang province, such as Huzhou, Shaoxing, the remaining 15 cities' first contact is pointed to Shanghai. Hangzhou is the "core" of Yangtze River Delta's south wing; Nanjing is still the regional "core" of the Yangtze River Delta's north wing.



# 4. Main Conclusions

- **This paper discussed the technological progress's influence on regional industrial development**

Based on the background of current economic growth regional development transformation, with technological progress as the logical clues, the paper discussed the Yangtze river delta regional economic growth factor and changes in the momentum of regional development, and mainly explained the influence of high-speed traffic and information communications technology on regional industrial development, and then analyzed the Yangtze river delta city network system based on the producer service industry.

- **Industrial economy has transformed to the common development of the service sector and industry sector**

The economy in the Yangtze river Delta has changed from the previous stage dominated by industrial economy into the current stage driven by service sector and industry sector. The development mode promoted by endogenous growth in the Yangtze river delta has been revealed.

# The main conclusion

- The regional economic transformation and upgrading in the Yangtze River Delta has produced new changes in regional industrial space, but it is different for each city in different sub-region. For the Nanjing-Shanghai-Hangzhou urban corridor, with the construction of high-speed railway, the rapid development of advanced producer services have attract more talent, which would be the leading factor to affect the sub-region spatial structure.



- **The development of information communications and transportation technology strengthen the social economic contact between enterprises and individuals in different cities of internal region, and then exerted positive effect on regional development and its spatial pattern.**



# Discussion

- **How to use technological progress to promote urban and regional development?**

With the improvement of high-speed rail network in the Yangtze River Delta region , how to seize the opportunities of the high-speed railway construction to make the city fully integrate into the regional network will be a key factor in deciding the future direction of Urban and Regional Development.

- **coordination between the government and the enterprises is very important in different provinces and cities (counties)**

Since the cities in Yangtze River Delta region belong to three different provincial administrative units of Shanghai, Jiangsu and Zhejiang, how to coordinate development policies among different administrative regions becomes a crucial constraint to the network development of cities in Yangtze River Delta .



- **Data and research scale leads to the conclusion deviation**

- This paper only analyzes and discusses the data of overall level of the district-level cities in the Yangtze River Delta, but in fact, the division of space level may mask some very important spatial growth pole of the node role, especially county-level cities. The ongoing reform of the provincial cities (counties) in Yangtze River Delta region may contribute to the improvement of the entire regional network.

thank you!