The city and innovation: building biotech in Shanghai

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Outline

• Introduction: the phenomenal growth of biotech in Shanghai ZJHP, using this as an example to study urban-based regional innovation system (RIS)

• Highlight: a. the limit of the cluster theory; b. the role of the city in RIS
Introduction

- Shanghai’s biopharma industries: (biotech, pharmaceutical manufacturing, professional services) from 76.3 billion Yuan in 2006 to 137.8 billion Yuan in 2010.

- Gross value of biotech: 2.72 billion Yuan to 6.76 billion Yuan in the same period; - 20% annual growth

- Profit increased from 310 million Yuan to 1470 million, 36.5%

- One of 20 “Pharma-biotech complexes” in the world (Zeller, 2010).

- Very high concentration in ZJHP: in 2009, revenue grew to 16.7 billion Yuan
• Research question: why has the biotech in Shanghai experienced rapid growth of biotech R&D?

• What is the role of the city in the “building” of innovation?
Literature review: biotech innovation and the city

- Agglomeration and spatial proximity, knowledge spillover (Porter, 2000), ‘neo-Marshalian’ industrial district, inter-connection between the firms: a firm level view

- External environment: regional innovation system (RIS) (Cooke et al 1997), social capital and trust, triple helix model (Etzkowitz and Leydesdorff, 2000): beyond the firms and look into the ‘institution’

- “Related variety” (Boshma and Frenken 2006): not the agglomeration (path-dependency) but evolutionary (path-breaking): further into ‘institution’ and geography (co-locating as an important mechanism)

- These perspectives are useful but need to be contextualized: are these perspectives adequate to explain Shanghai’s biotech growth?
These explanations are useful but quite ‘generic’

- These explanations are derived from western contexts;
- Possible to apply them in China –
- But there is a need to understand the specific political economic process of building clusters
  - The specificity does not mean it is only a unique Chinese perspective, the view may be expanded: development process, the concentration of human resource, and networks built across different places.
  - beyond the city as “innovation milieus” but treat the city as “key geographical loci”, because “factors other than interactions and learning, factors such as the social position of agents and their market power” may also explain why innovation are developed in cities (Shearmur, 2012, p.515).
Biotech clusters

• Cooke (2004, 2005): “biotech mega centres” – from multinational ‘big pharma’ to the city: a) highly complex networked processes, b) scale economy cannot be further achieved in big pharma;

• Zeller (2004, 2010): “the pharma-biotech complex” – leading pharma inserted into global production network (GPN), different proximities in the city-region, e.g. talent
What is missing in general literature and biotech studies: the city

- A political economic view of the development process of biotech (innovation).

- This question needs to be addressed in a specifically geographically relevant way, not in a generic term (spatial agglomeration).
Methodology

- Qualitative case approach
- Government reports, media coverage
- Company reports
- Interview with officials, planners, and biotech CEO (only one), 2006-2013
- Planning permits issued from 1993 to 2007
Biotech in Zhangjiang

- ZJHP: established in 1992, 25 km², initially.

- In 2009, 319 biotech companies (240 are SMEs, and 29 groups and large enterprises).

- Contracted Research Organizations (CROs): 40. In 2011: biotech income reaching 23.5 billion Yuan, gross Industrial output value 13.47 billion): 1/3 of Shanghai
Growth of Zhangjiang biotech

- Overall increase in R&D intensity in the city of Shanghai: from 2.31% in 2005 to 3.11% in 2011

- Central government support for biotech: but limited in terms of actual funding (3.7 billion USD, compared with 51 billion USD in the US (Yu, 2007)

- Strong policy support: relocating Chinese National Human Genome Centre in Shanghai; … the total national bases reach 29 bases.

- Local government policy: e.g. improving custom clearance for biotech CROs.
Entrepreneurial governance and land development

- National innovation system: from a mission oriented one to a more enterprise-centered one

- The development of market mechanism for park development: ZJHP development corporation: entrepreneurial governance

- Entrepreneurial governance reflected in the ownership structure: the State-owned Asset Monitor and Management of Pudong District of Shanghai – Zhangjiang Corporation Group –ZJ Development Corporation Ltd (in the stock market) – special project companies
Understanding the role of the city

• “Virtual circulation of capital”, an innovation of land development model in Pudong, Shanghai

• Using the instrument of land development to facilitate the building of biotech cluster
Land-driven development model

Central government

Land assets

Shanghai Municipal government

ZJHT Park development Co. Ltd.

IPO (Shanghai)

ZJHT investment Fund

Land and share swap agreement

Start-ups

Pay rent

IPO

Rent as investment

Build properties

Profit

Use land assets for bank loan

Real estate market

ZJHT Co. Revenue: CNY 2.27bn, Net income: CNY 370m, Employee: 133 (2013)
Zhangjiang changed from a development zone to a more urban-based science park, data of land development permit shows that the plot ratio of ZJ increased over years: from an industrial development zone

Source: Luo (2012, p. 115)
State-orchestrated city-captured talent concentration

- Returned entrepreneurs in Asian high-tech development (Saxenian, 2004);

- The role of returnees in mainland China has been acknowledged (Prevenzer, 2008).

- The creative class (Florida) is attracted by the particular characteristics of the place (e.g. tolerance)

- Shanghai ZJHP: more than 6,000 returnees. Shanghai as a Chinese global city, attracting the talent.

- The “role of the city” in inter-city competition, and a multi-scalar view: the central state’s “Thousand Talents” program, Shanghai is able to capture centrally-funded talent programs.
• The returnees fill a gap between scientific research and business development: e.g. the founder of Hutchison MediPharma ltd., business experience in ‘big pharma’

• Social relation (guanxi): returnees’ cultural affinity, familiarity with western management, and local politics

• In short, the concentration of talents in the cluster must be understood beyond the characteristics of places and in the East Asian context a notion of the ‘developmental state’. It must be understood through the complex, specific, multi-scalar political economy of ‘building’ the cluster.
Building biotech and spatial expansion in the metropolitan region

- The ‘brand’ of Zhangjiang: extending biotech in the metropolitan region
- In 2006, Shanghai High Tech Development Zone → Shanghai Zhangjiang High Tech Development Zone
- Endorsing six parks under the brand of “Zhangjiang”: “one zone and six parks”, consequently, the area expanded from 25 km$^2$ to 47 km$^2$
- Up-scaling: In 1999: “focusing on Zhangjiang” (municipal policy), and in 2011: “national experiment and demonstration zone for indigenous innovation”
For biotech: a new spatial development in the metropolitan region, comprising 6 industrial and commercialization bases

• Zhangjiang-Zhoukang

• Fenglin

• Zizhu Science Park

• Xinzhuang and Pujiang part of Caohejing

• Fengxian torch program

• Jinshan chemical medi and medical devices
More recent development in 2011: One Zone, 12 parks to a space of 290 km²
Conclusion

- Shanghai seeing biotech clustering – in ZJHP

- cannot be adequately explained by the ‘cluster theory’ (spatial proximity)

- the role of the city and multi-scalar dynamics between the park, the municipality and the central government

- A political economic perspective to see, how the cluster is “built”

- 1) entrepreneurial governance and land-driven development; 2) state-orchestrated talent concentration; 3) spatial planning and extension to form a network of parks
• Biotech innovation and development in the cluster is part of Pudong and Shanghai’s overall development → seeing the cluster in the context of the city;

• Spatially, science park development is part of overall development of the city, taking place in the metropolitan region.

• Science parks are developed and operated in the political economic environments where other developments such as ‘new towns’, ‘gated communities’, and ‘informal settlements’ are developed. In addition to the specific knowledge of inter-firm linkages’, ‘knowledge spillovers’, an understanding of the environment is also necessary.