Chapter 48
A Romance of the Three Kingdoms:
Biotechnology Clusters in Beijing, Shanghai and Guangdong Province, China

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ABSTRACT

The cornerstone of China's strategy for developing high-technology activities is construction of scientific parks to create conditions emulating the successful High-technology clusters in the West. This is a comparative case study of biotechnology clusters in Guangdong province and the better documented ones in Beijing and Shanghai and Shenzhen. The experience of the government-controlled and supported 'construction' and evolution of biotechnology clusters in Beijing, Shanghai and Guangdong province is compared with high-tech clustering in the West. The paper documents the existence and performance of the hitherto largely ignored Guangzhou biopharmaceutical cluster. Despite the rapid development of biopharmaceutical activities in Guangdong province, biotechnology is not yet a significant high-tech/high value-added alternative to Guangdong's specialization the labor-intensive export industries.

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INTRODUCTION

Since the beginning of economic reform in the late 1970's, the Guangdong Pearl River Delta area has been an "experimental region" for China's economic reform. Such policies have enabled the creation of a market economy in China. One of the advantages that contributed to Guangdong's transformation has been its proximity to Hong Kong.

Based on the last forty year's exercise of "open economy", the Guangdong province has transformed from producer and exporter of agriculture and traditional labor-intensive products into the largest provincial economy in China and the manufacturing shop-floor of the world. In 2014, the population of Guangdong was more than 105 million and the average GDP per capita in 2013 was 9,600 US$, 30% higher than China's average 7,000 US$, at market values.

Although Guangdong's GDP still ranks first among the 31 provinces in macroeconomic competitiveness, its lead is declining since 2010. According to the latest research conducted by Chinese Academy of Social Sciences, Guangdong's challenge is the transition from labor-intensive processing to innovation-based high-technology manufacturing and services. Among the key sources of Guangdong's economic success are the highly specialized production clusters in various traditional labor-intensive manufacturing industries and the low value-added assembly of electronic products and computer & communication equipment. In the last ten years, the GDP created by one new employment in Guangdong was only 14 500 US$, much lower than the 106 024 US$ of Jiangsu, 30 120 US$ of Zhejiang or 26 500 US$ of Shandong (Sun & Shi, 2011).

The growing environmental problems, energy shortages, rising labor costs and unrest show that further expansion of the labor–intensive, export-oriented industrialization is not sustainable (Yu & Wang, 2010; Arvanitis, 2006; Kroll & Tagsherer, 2009). In reaction to this reality, the Province adopted a "double transfer" strategy, which aims at:

1. Moving the low value-added, labor-intensive traditional manufacturing sectors to the relatively less-developed inland cities, and
2. Foster the development of high-tech and high value-added industries and services.

This paper deals with the second strategy, focusing on prioritized high-tech, high-value-added industries: specifically, development of the commercial use of modern biotechnology. The biotechnology '*industry*' is a "collection of firms that focus on the application of recombinant DNA and the related technologies" (Feldman, 2003). Many nations target the development of biotechnology as one of the industries with a high potential and likely source of new technological revolution in the twenty-first century (OECD, 2006). Biotechnology processes are transforming agriculture, environmental technology, renewable energy, and manufacturing. Above all, they are increasingly applied in pharmaceutical and health science related research, manufacturing and services.

Given China's successful policy of export-oriented production clusters, central, provincial and municipal administrations replicate the cluster-based industrial strategy by promoting and funding construction and generous incentives for localization to attract high-tech enterprises into high-tech industrial zones, science and innovation parks. That said, the cluster policies exploiting economies of agglomeration and scale in labor-intensive export assembly industries are less likely to be successful in biotechnology, due to the requirement for highly qualified manpower for biotechnological research and production. The successful innovation clusters in high-technology, contemporary science-based fields such as ICT or biotechnology,