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Technology Business Incubators in China

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ABSTRACT

Innovation and entrepreneurship are regarded as an economic tool to promote independent innovation and economic growth in the sluggish economy. In China, the Technology-based Business Incubators (BIs) focusing on promoting technology-based small and medium-sized enterprises (SMEs) and regional development are viewed as the innovative carriers under the initiative of “Mass Entrepreneurship and Innovation”. This study attempts to systematically analyze the role of BIs in Chinese economic growth and the role of government play in advancing BIs development through the important literatures and secondary resources, complemented in part with incubation case studies in Wuhan and Shenzhen, and the implementing results of the financial policies and legal reforms. Findings demonstrate that Chinese BIs serves as the catalyst to accelerate S&T development and to provide matching service at technopreneurial functions on the resources of knowledge (high-tech research to patents), communities (high-tech SMEs, universities, and relevant entities), and networks (accessing government, investors, and entrepreneurs), which have promoted regional economic transformation. Meanwhile, the role of Chinese government plays a policy guidance in incubation system, while promoting the transformation of government functions. To conclude this research, BIs are part of the Chinese innovation systems. There is an inseparable relationship between Chinese BIs and the government. The greater the government involvement in BIs support, the greater the interdependence of the BIs and the government. BIs are one of the important factors to facilitate the self-reform of the government, remodeling relations among the government, market and society. In the background of China's “new normal”, the findings of this study provides a future direction to investigate the innovation capability of BIs sustainability. To understand the overall picture of China's rapid growth economic development, the innovation capability of BIs sustainability is worthy of further investigation and discussion.

Key words: Technology business incubators, technology innovation, entrepreneurship, business incubators financial support, business incubators policy support, role of business incubators, role of government in incubators support, Shenzhen innovation, Wuhan East Lake High-tech Development Zone, Chinese economic transformation

摘要

創新及創業被認為是現代社會緩解經濟遲緩、促進經濟增長、引領自主創新的一帖良藥。在中國，以培育科技型中小型企業、促進區域經濟發展的「科技企業孵化器」被視為中國落實「大眾創業，萬眾創新」政策的載體，更被用以促進中國經濟穩定增長的重要舉措之一。本研究試圖透過相關重要文獻及次級數據，輔以極具代表性的深圳及武漢地區之孵化器為案例，再透過財務政策及法律改革等相關數據，系統性地分析科技企業孵化器在中國經濟成長下所扮演的角色，以及中國政府在引領並推進此一創新載體所發揮之作用。研究發現，中國科技企業孵化器可做為促進科技創新與經濟增長之媒介—催化劑，為新創企業匹配早期所需之資源(包含知識移轉、社區實體及關係網絡對接)，直接與間接地促進區域經濟轉型升級，證明了科技企業孵化器有能力促進國家創新能力與經濟可持續增長，並成為推進中國經濟轉型的助力之一。同時，中國政府扮演主導推進孵化體系發展的政策指導者，通過一系列資源及政策支持，指導科技企業孵化器的發展路徑及進程，同時促進了政府職能的轉變。總結本研究結果，科技企業孵化器是中國創新體系的一部分，其與政府之間存在著不可分割的關係。政府對科技企業孵化器的支持參與度越大，科技企業孵化器與政府的相互依賴度就越大。作為中國創新和科技發展政策框架的重要組成部分，科技企業孵化器正推動經濟可持續增長並建立一個技術創業的生態系統，同時重塑政府、市場、社會之間的關係。本研究結果可提供未來相關研究探討科技企業孵化器的可持續發展之創新能力。在中國經濟新常態下，探就可持續性的科技企業孵化器有助於全面了解中國科技與經濟成長之關係，相關研究值得後續進一步分析實證。

關鍵字: 育成中心、科技企業孵化器、科技創新、創業、孵化器的角色、政府在孵化器的角色、深圳創新、武漢東湖高新區、中國經濟轉型

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— 本論文獻給我摯愛的家人 —

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“On your journey through life, make sure your biography has at least one extraordinary chapter.” – Anonymous

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CHAPTER I

INTRODUCTION

Over the past several decades, global economic growth has faltered to a sluggish pace and the growth of the most advanced economies has softened while unpredictable political situations created new uncertainties for the global economy. Despite global economic slowdown, the economic growth of emerging economies remains strong. This can be seen in the People's Republic of China (China), the world's largest emerging economy, which has gradually become the major driving force for global economic growth, accounting for over one quarter of the world's economic growth in 2015 (IMF, 2016). In order to stimulate economic growth, more and more policymakers came to realize that supporting innovation and entrepreneurship creation could be a key element for economic sustainability. One of the means in stimulating sustainable economic growth is to support and establish Business Incubators (BIs).

1.1 Research Motivation and Background of the Study

“Business Incubators” is a term originated in the U.S., known as Yucheng zhongxin (育成中心) in Taiwan, translation of Keji qiye fuhuaqi (科技企业孵化器) in China, and has various related forms in Europe, such as science parks or business centers (KU Leuven, 2016). Even though the extant literature is yet to provide a

standard definition, business incubators, literally mean a controllable working environment with good care to early stage enterprises, supporting and providing various business resources and services in different stages before ventures are ready for traditional means of self-sustaining operation, and the controlled working environments could be either real estate and office facilities or networks (Mac Chinsomboon, 2000).

The BIs industry originated in the U.S. and has a relatively long history in several countries. In the 1970s, the recession resulted in the economic stagnation in much of the Western world during the time. Many governments and businesses were seeking to reverse the downturn as increasingly unemployment and economic stagnation had become major challenges for all countries. Until the late 1970, BIs were considered as a new economic development tool in speeding up job creation and boosting economic growth by supporting the development of innovative and technology-oriented ventures (Cumming, 2010). Since the 1980s, the importance of innovation and entrepreneurship for the economy became increasingly clear. BIs have been seen as a way to stimulate entrepreneurship and innovation in the U.S. and throughout the world.

BIs were first introduced to China in 1988 and has been highly praised in the country. China has a different BIs system with the rest of the world, which unique development and experiences create BIs sustained growth and innovative capacity, particularly promote the development of high-tech sectors creating millions of

employment and economic output in the communities (科学技术部火炬高技术产业开发中心, 2017a)¹. China has a well-developed incubation market as the government playing a predominant role in the BIs program by channeling resources in accordance with the government mandate of high technology-led economic activities. The relevant departments promoted BIs construction and development ever since the State Scientific and Technological Commission released a new bill related to BIs matters in 1994. Since the year of 2001, a series of Five Year Plans (the 10th, 11th, 12th and 13th Five Year Plans) provided guidance related to BIs' development. As part of government priorities, BIs activities were highlighted through promoting technology innovation and entrepreneurship.

The purpose of Chinese BIs is to promote technology transfer and commercialization, serving for science and technology (S&T) enterprises (中国政府网, 2010; 湖北省科学技术厅, 2013). On the China's Torch High-tech Industry Development Center (Torch Center) of the Ministry of Science and Technology (MOST) (MOST, 2013) website, BIs is defined as an important carrier to cultivate technology enterprises and entrepreneurs, which can speed up the process of high technology commercialization, optimize the industrial structure, expand domestic demand and play an important role in building an innovative country. For instance, Guangdong has the

¹ For convenient reference, this research retains all the original languages of sources in in-text citations and references.

largest BIs cluster in southern China. The total economic output of the province was ranked the first in China during the last 27 years, and with an annual economic growth rate of 8.5 per cent (广东省统计信息网, 2016; 国家统计局, 2015).

Ogutu and Kihonge (2015) demonstrated that the number of incubators a country has influenced the country's gross domestic product (GDP) very strongly through examining the historical data and statistical analysis. Despite the slowing down of Chinese economy in recent years, its GDP and the number of BIs are still growing year by year. China is the world's largest emerging market economy, both in terms of population and total economic production. China has become the country with the largest number of BIs worldwide in 2015 (网易科技, 2016).

Wan, the minister of S&T of PRC emphasized (中国网, 2016b; 人民网, 2017) that the high-tech industry of the tertiary industry can facilitate the structural reform of China's supply side and regional economic development. BIs are one of the means to promote the development of high-tech industry. Zhongguancun in Beijing is a cluster of incubator, which is one of the most successful high-tech development zones in China contributing 24.7% of GDP to Beijing in 2016 (中华人民共和国科学技术部, 2017). As of the 9th Five Year Plan, BIs were included in the national priority. Later 10th to 13th Five Year Plan also targeted to promote S&T innovation and entrepreneurship through supporting BIs industry (中国政府网, 2016a).

The Ministry of Commerce of China (MOC, 2015) considered that expanding the service sector throughout the country is of great significance to the overall reform and opening-up of China. As Chinese government turn their focuses from manufacturing to a service-based economy, more and more spring up emerging sectors drive economic transition, such as e-commerce, internet and technology sectors, to further expansion in service sector. Along with the fact that the significant growth of service sector, the share of tertiary sector was more than 50 per cent of China's GDP for the first time in 2015. The tertiary industry became the biggest industry in China.

As an economic tool, BIs are not only to promote economic growth, but also to nurture the development of technology-based enterprises and entrepreneurs. Peking University (2013) considered that technopreneurship could drives sustainable economic growth. BIs are the driving force on technopreneurship, and the technology and entrepreneurship are driving modern economies to prosperity.

In recent years, technopreneurship are flourishing in China. Shenzhen is one of the most innovative capacity areas in China, often being referred to as “China's Silicon Valley”, “China startup community” or “startup city”, or even “China's business incubator” (CNN, 2015; Nikkei, 2014). About thousands of startups are active in the city. The number of BIs grew from less than 30 in 2001 grew up to 90 in 2016, which includes 12 state-level and 78 municipal-level incubators (深圳市科技创新委员会,

2012; n.d.). The local government greatly support BIs ecosystem, clearly pointed out that BIs have become an important carrier of Shenzhen cultivating high-tech enterprises, constructing innovative systems, promoting the development of regional high-tech industry, and transferring scientific and technological achievements (深圳市科技创新委员会, 2012).

Along with a more open business environment in China, the number of technology-related enterprises, including technopreneurial ventures engaged in technological innovation, has increased significantly in the last couple of years as people are inspired by the success of several technology giants in the world, such as Alibaba, Facebook and Tencent etc. The contribution of the new and high-tech fields is impacting modern society.

Chinese BIs have been very popular in China's entrepreneurship and witnessed China' startups boom. The contribution of BIs reflect economic growth, job opportunity and innovation creation. This phenomenon is really worth exploring.

Although the concept of BIs originated in the U.S., BIs are now being functioning all over the world, especially in China. China is the biggest developing country in the world, as well as the fastest-growing economy in emerging market. China has enjoyed economic growth from its economic and social transformation by joining the World

Trade Organization (WTO) and launching economic stimulus measures. One of the measures is to establish BIs.

In order to catch the wave of new technological revolution in the world, the Chinese government approved the Torch Program, which would facilitate the industrialization and commercialization of high-tech achievements, established China's first national BI in Wuhan in 1988. Since then, Chinese BIs are an important component of China's Torch Program.

As the government views BIs could be a solution to oversupply of labor force and creating employment opportunity, Chinese BIs particular emphasize providing technological services in promoting innovation and technopreneurship, serving for those who are capable of turning their technological savvy into viable, scalable businesses. The China's State Council and the MOST issued relevant guidance on BIs and established national BIs in many provinces, as well as strengthening the cooperation among universities and research institutions.

The Chinese senior leaders have been highlighting the importance of startups and BIs in the new landscape of innovation. Premier Li Keqiang has been visiting key incubators with considerable media coverage (People's Daily, 2015; China Daily, 2016). In 2013, Chinese President Xi Jinping made a speech to encourage Chinese youth towards the road of entrepreneurialism (新华网, 2013). In 2014, Premier Li Keqiang

gave an address about a “new wave of startups from the masses and grassroots” at the World Economic Forum (WEF) held in Tianjin (中国网, 2014). In 2015, Li delivered a report, “Mass Entrepreneurship and Innovation” as a new economic growth driver on the work of the government, to encourage individuals and enterprises braving in innovating and entrepreneurship (中国政府网, 2015a).

Obviously, China's ambitious strategy is trying to move the country from the world's largest manufacturing power to an innovation economy. In order to lead the country to be sustainable, innovation and entrepreneurship creation have gradually become one of the policy priorities.

The National Business Incubation Association (2012) estimated that there were over 1,250 BIs at the end of 2012 in the U.S., up from only 12 in 1980, and about 7,000 of BIs worldwide. In Asia, the number of BIs has grown steadily. According to the official statistics (科学技术部火炬高技术产业开发中心, 2017a), China reached 2,536 registered BIs in 2015, and the number of BIs have increased by more than 14% per year since the 10th Five Year Plan. In North America, BIs assisted about 49,000 startup companies that provided full-time employment for nearly 200,000 employees and generated annual revenue of almost \$15 billion (NBIA, 2012). Regarding the employment creation, in 2014, benefiting from central government policies' support, more than 1,600 BIs have cultivated 80,000 incubatees, created 1.75 million jobs,

achieved nearly 300,000 technology transformation, and reached the turnover in technical contract around RMB 857.7 billion (中国政府网, 2016b). BIs have been one of the channels that Chinese people can join tide of Mass Entrepreneurship and Innovation. By 2015, more than 2,500 BIs cultivated 100,000 incubatees (中国政府网, 2016c). The number of startups reached 443.9 million, and over 12,000 enterprises were born every day, while driving the transformation of industrial structure (中国政府网, 2016d).

1.2 Research Purposes and Research Questions

As discussed in the previous section, it is important to explore the connection between BIs and Chinese economic development in order to understand the role of BIs in Chinese economy, with the aim to make contribution to the body of knowledge in the field of incubations in China. Moreover, this research is also conducted with the goal to provide more insight about the role of Chinese government in leading the emergence of incubators market. The research questions in this research are:

1. What is the main role of BIs in Chinese economic growth?
2. What is the role of the Chinese government in leading the emergence of the Chinese BIs and its performance?

1.3 Research Methodology

The qualitative research approach was selected for this thesis. The methodology applied is primarily literature-based, complemented in part with secondary data analysis. The breakdown of research methodology is as following:

Literature Analysis. Literature analysis is a method of researching the literature by collecting, analyzing and extracting the required information, and making an objective and systematic research. The research intends to understand the role of BIs in Chinese economic growth as well as the role of Chinese government in leading the emergence of BIs. Relevant literatures will be systematically examined, analyzed and synthesized to reach the conclusion for the determined questions. In addition, this research will review the representative BIs studies, journal articles, conference papers, online resources, international, organization's reports and government publication.

Secondary Data Analysis. In addition to the analysis of relevant studies, the functions and performance of two main elements of the role of Chinese BIs and Chinese government will be studied in order to understand the factors leading to the emergence and accomplishment of Chinese BIs.

In addition, due to the shortage of literature concerning the necessary data of Chinese BIs, particular in the relevant empirical research. Apart from the data derived from the relevant literature, the secondary data including multiple articles, news articles,

commentaries from reliable sources and official documents will be collected and analyzed in order to further understand the role of Chinese BIs and the role of Chinese government.

1.4 Scope and Limitation of the Research

Temporal scope of the research. Chinese BIs were included in the national priority in the 9th Five Year Plan (1996-2000) and significantly took off since the 10th Five Year Plan (2001-2005). It was particularly since 2001 when China joined the WTO, the increase in BIs' activities were impressive. To provide a valuable reference, the temporal scope of this research would be from 1995 until present.

Study scope of the research. In China, the incubators and incubatees alike depend to a large extent on government policies and funding, the government plays a predominant role in BIs market by channeling resources and policy supports. This research will explore the development of BIs program in light of Chinese government policies, to review and evaluate the policies and implementation in terms of the role of government. The evaluation of public policy and public finance are not within the research.

Limitation of the research. This research is aimed at providing the macroeconomic study in Chinese BIs development. Due to time and geographical

distance constraints, the primary deficiency of this research would be an inability to conduct interview with relevant officials of Chinese government. However, there still are a sufficient amount of relevant reports from government official websites, all of which could make up for this deficiency. Another shortcoming would be that the majority of data and information are from open sources, the depth and breadth of these data may be limited. Nevertheless, a great deal of relevant literature and studies, periodicals, institution reports and commentaries from reliable sources, others official publications can be utilized to remedy this lack of resources.

1.5 Organization of Thesis

This research comprises five chapters. **Chapter I Introduction** contains five sections offering a brief overview of the study, including background of the study, research purposes and questions, research methodology, scope and limitation. **Chapter II Literature Review** provides overview of BIs, including the understanding of BIs, the roles of BIs in economic development and the roles of government in advancing BIs development. **Chapter III The Role of Business Incubators in China**, which discusses the relationship of BIs program and service sector, and examines the role of BIs in two empirical cases. **Chapter IV The Role of Chinese Government in Business Incubators Development** examines the role of government in two aspects including

financial support and policies support by focusing on the main policies from Chinese government. **CHAPTER V Conclusion** offers the research result and provides the summary of research finding.



Chapter II

Literature Review

BIs originated in Batavia, New York in 1959, where a large local business closed down, left a number of empty buildings and caused rising unemployment. A local resident took over some empty buildings, then leased the space to small and medium-sized enterprises (SMEs). By providing office services and business advices, assistance of fundraising, some startups were launched, and created thousands of jobs in the area (NBIA, 2006). This event was considered to be the first time when the concept of BIs was formalized. Later on, in 1960, the first BI appeared in the U.K. as a part of science park (Colombo & Delmastro, 2002). In the early 1980s, BIs began to expand in the U.S. and spread to the U.K. and other European countries through various forms. In Asia, China welcomed their first BIs in 1988.

2.1 What are Business Incubators?

The National Business Incubation Association of the U.S. (NBIA) defined BIs as entities that accelerate the successful development of enterprises through an array of resources and services, developed or orchestrated by incubator management, offered both in the incubator and through its network of contacts (NBIA, 2012). Another interesting definition of BIs considered that incubator is a controlled environment that

fosters the care, growth, and protection of a new venture at an early stage before it is ready for traditional means of self-sustaining operation. In today's world, where information technology and the internet are normal parts of the business environment the term 'controlled environment' could be either physical (real estate and office facilities) or virtual (networks) (Merriam-Webster's, date: 1857; Chinsomboon, 2000, p.24)

It is notable that the Organization for Economic Cooperation and Development (OECD, 1997) gave a definition of the term "technology incubator", argued that one a specific type of BIs: a property-based venture which provides tangible and intangible services to new technology-based firms, entrepreneurs and universities. In addition, OECD considered that technology BIs have four main objectives including economic development, technology commercialization, property venture/real estate development, and entrepreneurship.

钱平凡 (2000) defined BIs as a new type of socio-economic organization between market and enterprises. The purposes of BIs are to help new companies start up, survive and grow through providing office space, business services, coaching and mentoring, funding, and access to networks.

Over the past few decades, BIs have been developed and adjusted to meet the needs of social changes, economic development and globalization. There has not been

a universally accepted definition or standard, as BIs have a different understanding and interpretation in different countries in different periods. Dozens of definitions are available in academic literature, reflecting local cultures, scholars' vision or national policies. Considering that the concept itself is constantly evolving, the degree of understanding in different countries and their societies is not the same.

Since the first Chinese BI was established in 1988, BIs have grown into a major policy instrument for commercializing scientific achievements, cultivating high-tech enterprises and technopreneurs, promoting innovation and entrepreneurship, and aiming to build China into an innovative country (中华人民共和国科学技术部, 2006a; 中国政府网, 2010).

As an important part within the policy framework of China's S&T, BIs are viewed as special service agencies in terms of S&T sector, and they are identified, managed and sponsored by Chinese government. Examples of representative BIs include Beijing Zhongguancun and Wuhan East Lake High-tech Development Zone (or High-tech Industrial Zone, Innovation Center), which belong to the state-level incubations as well as one of the main contributors to regional economy.

It is widely accepted that BIs in China are referring to technology-oriented incubators, which are officially called "Technology Business Incubators" (中华人民共和国科学技术部, 2006a; 中国政府网, 2010). In view of China's special incubation

market, the Chinese Business Incubators (BIs) in this research mainly refer to Technology Business Incubators.

2.2 The Role of Business Incubators in Economic Development

A great deal of studies have discussed the role of BIs' in different scopes and purposes in the history of economic and social development. This section reviews the roles of BIs which are mostly discussed.

Creating Employment Opportunities. After the stagnation of the U.S. economy during the 1970s - 1980s, BIs were effectively used as a new economic development tool since they offered low-cost services, reduced overhead costs and time devoted to non-value-adding activities (De Cleyn & Festel, 2016).

More and more policymakers realize that investment in entrepreneurial support infrastructure is important. According to a study conducted for the U.S. Department of Commerce Economic Development Administration (U.S. EDA, 2011), BIs provide communities with significantly greater results at less cost than do any other types of public works infrastructure project. It showed that incubators provide up to 20 times more jobs than community infrastructure projects. As a result, BIs need to be a part of the job creation equation.

BIs in the EU make a significant contribution to job creation. A research cited that United Kingdom Business Incubation (UKBI) runs more than 300 BIs operated in the U.K. and directly support 12,000 companies while 40,000 additional firms experience indirect benefits from this support, creating more than 50,000 jobs in the nation (Dee et al., 2011). In addition, a report from the Centre for Strategy & Evaluation Services (CSES, 2002) studied that till 2002, some 40,000 new (net) jobs were generated each year by BIs, and the growth of BIs also create indirect effects on employment. The study also estimated a ratio of 1:1.5 for direct:indirect job creation from incubatees.

Nowadays, BIs have become a popular tool for local economic development and employment. Monkman (2010), the former President & CEO of National Business Incubation Association (NBIA), also viewed that the most common goals of BIs are creating jobs in a community, enhancing a community's entrepreneurial climate, retaining businesses in a community, building or accelerating growth in a local industry, and diversifying local economies.

Supporting SMEs and Entrepreneurs. In recent years, entrepreneurship has re-emerged as an important component underlying economic growth around the world. Wong et al. (2005) indicates that the trend toward an entrepreneurial society is accelerating. Entrepreneurship development is perceived to have a positive impact on economic growth, which can be locally fostered through BIs (Lesáková, 2012). Craig

et al. (2004) also emphasized that small businesses are important to economic vibrancy, employment growth and wealth creation for almost all economies. Al-Mubarak and Busler (2011a) examined 10 case studies of BIs in developing countries, and found that BIs are an effective and innovative tool in supporting the startup businesses.

It is generally accepted that SMEs lack the necessary resources to effectively scale up and grow their businesses. Yet BIs offer some of the greatest opportunities for innovation, employment and value creation. Dichter et al. (2010) have shown that BIs can be an effective tool for supporting local innovation, new business creation, and can reduce SME failure rates substantially. Experience in Israel has demonstrated that one of the right support incubating system in creating SMEs' is the use of BIs with business support, which was really promoting Israel's GDP (OECD,2010a; Berry, 2009).

In Europe, Aernoudt (2004) argued that BIs are bridging the entrepreneurial gap and exploring how the region can become more business friendly. In addition, a study emphasized that BIs are the place where the incubation activities are carried out, and where entrepreneurs and the existing SMEs would find a suitable place, in terms of facilities and expertise, to address their needs, develop their business ideas and transform them into sustainable realities (Dichter et al., 2010).

In addition, BIs were sufficient to stimulate the growth of new companies as their activities have proven to be very successful within entrepreneurship-friendly

environment. To get the funding from investors, BIs assist ventures to transfer scientific and technological achievements, as well as to prepare to bear the risk inherent in early stage technology development (De Cleyn & Festel, 2016).

The chairman of UKBI, Russell (2010), considered that BIs have an above average chance of success as the innovators and entrepreneurs could better prepare to turn their business ideas into successful startups. He indicated that BIs environments reduce the risk of business failures. Furthermore, BIs practitioners report generally showed that more than 85 per cent of all firms that exited from their BIs are still in business, compare with a standard survival rate for startups of around 50 per cent.

Ogutu and Kihonge (2015) examined countries such as the U.S., China, and Germany, found that the countries with high economic growth have the highest number of BIs, and the number of incubators a country has influenced the country's GDP very strongly. Their findings indicated that there was a very strong connection between the amount of BIs and the economic growth of a country, and showed that BIs have a great amount of influence over the entrepreneurship development.

Promoting Innovation Creation. Incubation is a strategic tool of enterprise development and economic growth, it provides a leap from imitation to innovation (Lalkaka, 1997). Al-Mubarak and Busler (2011b) found that one of the important benefits of BIs is the pace of innovation as the potential applications of BIs including

promoting the establishment and long term survival of new ventures that will likely lead to a significant increase in job creation as well as promoting a climate of innovation and entrepreneurial spirit.

Regarding the importance of innovation in today's world, the White House (2010) of the U.S. indicated that the 21st century will be shaped and built by technologies and innovation because the innovation will create new jobs and catalyze broadly shared economic growth. One of their strategies is to encourage high-growth and innovation-based entrepreneurship as it is essential for entrepreneurs continue to create new and vibrant businesses that lead to new jobs and economic growth. It is clear that supporting innovation creation is an important economic tool, and it is one of the significant roles of BIs program.

Promoting Technology Transfer and Commercialization. Another role of BIs is designed to help bridge the gap between knowledge and innovation in order to let the research innovation to the marketplace, which promotes transformation of scientific and technological achievements (Lesáková, 2012). Peters et al. (2004) argued that BIs are to act as an intermediary or mediator between incubatees and relevant critical systems. An OECD report (2010b) indicated that BIs have the ability to transfer the knowledge from universities to industries. In addition, a study indicated that research facilities at universities and public research institutions start to transfer their research

findings and commercialize their intellectual property (IP), which have led to a growth of incubators (De Cleyn & Festel, 2016). The above studies have shown that BIs can convert research ideas and research results into sustainable businesses.

In general, stimulation of technology transfer and research commercialization are generally considered as important components in goal portfolio of incubators activities, especially in the case of BIs and science parks (Grimaldi & Grandi, 2005). In addition, BIs can create a sound ecosystem between universities and researches. BIs in not-for-profit university science parks have been the recipients of business income tax concessions, which is thought that this will encourage universities to undertake more research and technology transfer, thereby accumulating more funding to reinvest in R&D (Su et al., 2011).

Revitalizing neighborhoods. Monkman (2010) found that BIs and incubatees are playing an increasingly important role in developing and transforming economies, which have shown positive impact in the community and improved the local climate for entrepreneurship to create jobs. Many communities are recognizing the need to help local residents build new businesses from the ground up through BIs. In addition, the majority of BIs stay within the community after graduation as more and more policymakers provide incentive mechanisms in encouraging entrepreneurship. BIs nurture entrepreneurs who create enterprises, some of incubatees create direct and

indirect employment after leaving BIs. Their incomes and assets in turn contribute to economic growth.

Moreover, the Silicon Valley in the U.S., Tel Aviv in Israel, and Zhongguancun in China are surrounded by universities, S&T and innovation parks as they encourage their partnerships with graduates to start new businesses with innovative ideas (Ogutu & Kihonge, 2015; Liefner et al, 2006). It is clearly that any forms/models of BIs have capacity to stir development in the surrounding neighborhood.

2.3 The Role of Government in Business Incubators

In terms of government aspect, Lalkaka (1996) pointed out that the success of the BIs is not only in the strength of the technopreneur, but also in the state policies. Both of them stimulate innovation and contribute to the BIs' performance. The boom of BIs is also fueled by Chinese government support. The central and local governments have taken unprecedented steps to develop incubating system. The government put resources in place to encourage their young generations enter into this new startup system. When the Chinese government wants something, it seems to always happen. This might be one of the reasons for this massive growth of the startups scene across China. The government's roles include supporting BIs in the initial stage, providing supportive policy and sound infrastructure, and offering financial support.

Supporting Business Incubators in the Initial Stage. In view of the structural barriers in the environment to the creation of private sector, coupled with the need to have effective transition to the market system, the Chinese government uses BIs as policy tools of market creation by offering financial support for construction and operations (Chandra, 2007).

Lalkaka (2000) argued that the government, universities or other sponsors should support BIs at its very early stage, in the form of a low (or no) rent vacant building and operating subsidies, until rents and fees from incubatees grow to match operating expenses. The support providers can see this an investment in the social infrastructure while also obtaining tax income, foreign investment, culture change and other benefit.

BIs will need strong government support in the initial years, and the private associations, such as entrepreneurial and commercial institution could be brought in as partners from the start. All the available networks could play an overall role in promoting BIs concept and mobilizing wide support. In fact, BIs will have a better chance of sustainability if getting the political support of government agencies as well as financial and substantive involvement of local sponsors and the state, particularly at the initial startups stage (Lalkaka, 2000).

Supportive Policy and Sound Infrastructure Provider. BIs are one of the strong sources of creating SMEs. The survival of SME's is seen as an important component of economic growth and development especially among developing countries. Ayyagari et al. (2007) showed that governments support enterprise development by providing a suitable business environment for creation, growth and proliferation of SME's rip high dividends in terms of increased job creation especially for the youth entrepreneurship, economic growth and poverty reduction.

Lalkaka (2000) argued that the supportive state policies and sound technical infrastructure are the prime responsibilities of governments, such as a good financial system. A sound environment could greatly support BIs facilities and services that could tailor to their special needs when the technology-oriented businesses encounter difficulties from technical, financial, personnel or other resources.

Ogutu & Kihonge (2015) discussed economic growth in some countries like Brazil, Israel, South Korea and Spain. The key factors in the rapid economic growth is clearly an enabling operating environment, entrepreneurship support policies, government support to technology diffusion, market access and business support services, such as BIs and startups centers. Business environment in Germany is closely related to composition of startups entrepreneurs. It showed that enterprises in Germany are supported by an integrated business support ecosystem that involves universities,

national and local government, sources of funding and existence of technology, startup centers and incubators devolved all over Germany.

Financial Supporter. In addition to providing a sound infrastructure, supporting the initial funding is essential for incubators successfully starting its businesses. Lalkaka (2000) indicated that for the financial structure of a for-profit incubator in the U.S. state and city governments has an important role in the capital investment. In the initial support and prudent management, several states of the U.S. brought annual profit to its owners which is ploughed back in to expansion and improvement of facilities. Those state and city governments also benefited by the creation of local jobs, tax collection and an entrepreneurial culture in the community.

In China, the government plays a predominant role in BIs funding, supporting and operation. The Chinese government impacts BIs including model, organization, funding and strategy (Scaramuzzi, 2002; 顾军, 2005; 王咏, 2016). The differences of the development and distribution decided the level of development in eastern, central and western China (李具恆 & 張美玲, 2009). Chinese government is not only managing the majority of BIs but is the main financial provider. Funding is one of the essential elements for Chinese BIs sustainability. The government involvement could sustain BIs operation, it causes the lack of BIs' own profitability as BIs heavily rely on the government's financial support and management (顾军, 2005).

In the U.S., the government is also one of the main financial supporter in BIs industry, the other sponsors are universities and corporates along with rental and consulting income. The government funding sources includes the State economic development agencies, capital funds from the State's legislative allocation, and State's competitive and matching grants (Knopp, 2007).

BIs in the U.S. have several types of formal and informal financial supports. The formal sources are mainly from public support including capital funds from the State's legislative allocation for BIs infrastructure, competitive grants from the State to select BIs, matching grants for service support for new ventures and funds that were channeled through the State Economic Development Agency. The informal support included tax incentives in BIs, private partnership funding for BIs operational funds etc. (Chandra & Fealey, 2009).

Concluding Remarks. As the concept of BIs are a relatively new, popular and the phenomenon mixed different background and environment, many scholars discussing and arguing over the roles, factors and evaluation underlying its accomplishment. It could be observed that many studies have discussed the roles of BIs and the roles of governments in economic and social development. However, few of them investigated the role of Chinese BIs in specific case study, and the role of Chinese government in

leading the emergence of the development of Chinese BIs, partly due to the lack of relevant materials. In light of this, this research is thus aiming to provide more insight about the connection of BIs, economic development and the role of Chinese government by examining representative cases and policies analysis.



Chapter III

The Role of Business Incubators in China

China has a different incubation market unlike the rest of the world, which unique development and experiences create BIs sustained growth and innovative capacity. Chinese BIs experienced the evolution of the past few years, and gradually became the essential part of Chinese innovation systems as they provide services with more distinctive features and objectives. In this Chapter, incubations in the two representative regions, Wuhan and Shenzhen will be examined in order to understand the critical roles of BIs in regional economic development.

3.1 Overview of Chinese Business Incubators

Most BIs in China were founded by the Chinese government in order to develop China's S&T capacity. The incubators in China emerged in the year of 1988 when the first state-level BIs was formally established in China. It was the first BI predominantly founded and operated in a high-tech development zone by government. Over the past decades, Chinese BIs have played a remarkable role in transforming the Chinese economy as the government is aiming to improve China's competitiveness in S&T development.

The director of Torch Center viewed that there are 5 types of BIs in China, which includes type of Investment-Oriented, type of Counselling Training, type of Media Extension, type of Professional Services and type of Makerspace (人民网, 2015).

Type of Investment-Oriented. This type of BIs are helping startups who meet financing problems, helping incubatees connect investment resources, and advancing ventures odds of success. Garage Café (chekucafe) is one of the representative incubators, it provides one-stop investment and financing solution, helps incubatees get financing assistance in the short time.

Type of Counselling Training. To enhance the entrepreneurial capacity, this type of BIs focus on entrepreneurship education and training counseling, and making full use of their network resources. They invite well-known entrepreneurs, venture capital experts, industry experts as mentors, offer counselling for entrepreneurial companies. Peking University Entrepreneur's Training Camp is one example, which provides a series of curriculum training and mentor program by using university educational resources and alumni resources during the earlier stage of incubatees.

Type of Media Extension. This type of BIs are founded by the media. These BIs use the advantages of media promotion and make a combination of online and offline services. They provide a comprehensive business resources, including publicity, information and investment and more. The typical one is 36Kr, which is a technology

media platform. 36Kr is one of the leading service providers for internet entrepreneurial enterprise, including the media 36kr.com, financing platform and enterprise incubator Kr Space.

Type of Professional Services. This type of BIs are established by leading companies of the industry. They committed to serve mobile internet industry by providing social networking, professional and technical services, and supporting industrial resources. These BIs are having cloud computing ability, such as Microsoft Cloud Accelerator Program. The Microsoft Cloud Accelerator Program is a series of targeted learning resources and experiences that provides clear guidance on how customers can increasingly take advantage of the benefits of cloud.

Lastly, **Type of Makerspace.** Makerspace is a concept of open workshop that provide access to a range of tools and resources for making physical objects. To serve enterprises who have individual needs, these BIs are set up on the ideas from internet and technology fields, and providing open source hardware and 3D printed manufacturing tools. They are such a converter transforming ideas into real products, offering a platform for products making, workshop coaching and mentoring, product design counseling, supply chain management services and idea brainstorming. The typical one is Chaihuo Makerspace, which provides an open and collaborative environment for makers who want able to make their ideas happened and encourages

cross-field communication through meetup and workshop. Chinese people see makerspace is an approach to help China cultivate an attitude of “self-making” and “self-entrepreneurship”.

Along with a more open business environment in China, the number of technology-related enterprises, including technopreneurial ventures engaged in technological innovation, has increased significantly in the last couple of years. Also, China’s incubators and incubatees have grown faster than in other countries and have created millions of job openings. By the end of 2015, incubators and incubatees reached 2,536 and 102,170 respectively, and would be more than double in near future. The number of employees of incubatees was less than 30,000 people in 1995 went up to over 1.5 million people engaged in BIs system, nearly 65 times of growth over the last two decades. The results are given in Figure 1.

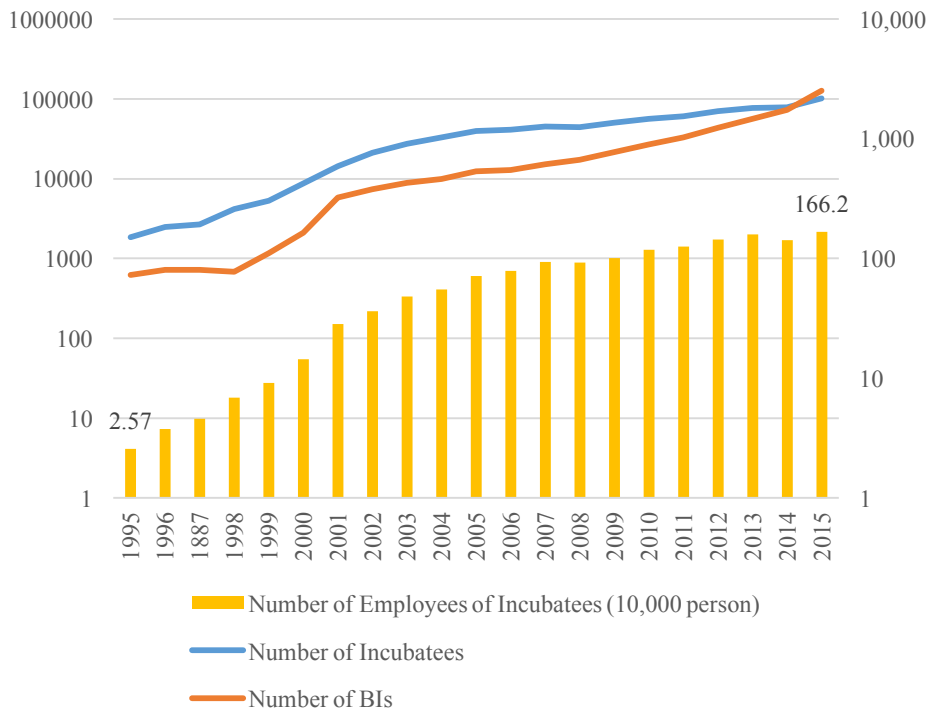


Figure 1. The number of BIs, incubatees, employee of incubatees, 1995-2015

Source: 科学技术部火炬高技术产业开发中心 (2017a)

As one of the most important policy initiatives, the MOST set up a Torch Center to guide the development of BIs, and was put in place in 1988 with the purpose to reinforce overall environment for technology innovation and to promote high-tech industrialization (Torch Center, n.d.). Of all the programs initiated by Chinese government, the Torch Program is not only the one program to start China's high-tech innovation but to boost startup companies. The Torch Program has four major parts, one of them is supporting BIs in providing technology services.

The Torch Program is a part of the MOST priority, aimed at providing great support of BIs in China, and has made massive investments in BIs through its

incubating funds. In order to speed up the establishment of BIs fostering and tutorial system, the government has several lines of dedicated funds to support BIs in the form of “construction” funds for BIs, “seed capital” funds for startups and “innovation” funds for SMEs that are in the growth phase of their life cycle (中华人民共和国科学技术部, 2002a).

In the process of the development of socialist market economy with Chinese characteristics, Chinese BIs have different features comparing to BIs in other countries. They are grouped into three main characteristics by their organizer including high-tech development zone, university science park and private entity (Ping, 2005).

High-tech Development Zone. With BIs program is an important component of high-tech development zone. The first Chinese BI, also the first state-level BI, was driven by the government and set up in the high-tech development zone. Chinese high-tech development zones have led the country's industrial innovation, and played an important role in the nation's social and economic development. The most representative one is Zhongguancun Science Park. The park is the first state-level high-tech development zone and has attracted countless incubators, accelerator programs, startup grants and venture capital funds that are the elements needed to help Chinese young entrepreneurs succeed.

University Science Park. To encourage university students to start a business while in college, the Chinese government has been actively constructing University Science Park since the 1990s. The incubation form of university-based scientific research facilities have strong research capabilities and scientific and technological innovation to assist the promotion of regional economic development. According to a survey, the number of University Science Park grew from 44 in 2002 to 100 in 2015 (凤凰新媒体, 2015). Peking University Science Park is a prime example. This park is located at the center of the Zhongguancun Science Park, where talent resources and technical personnel are the most concentrated and is often referred to the hotbed for high technology in China.

Private Entity. With the growth of BIs, Chinese private entities also join BIs market. The first private BIs was established at the end of 1999 in Nanjing (陈吴 & 殷群, 2008). Since 2002, Chinese private BIs began a trend of diversification in operational models, becoming more market-oriented, focusing on specific sectors, multiplicity of ownership and intensifying networks (陈吴 & 殷群, 2008). Garage Café is one of the successful examples. Garage Café is a popular space in Beijing for startups, entrepreneurs, investors, and companies to meet, work and talk. The space focuses on nurturing internet and high-tech startups, and promotes people cooperation in different fields. Garage Café designed the cafe as a platform for startups to find all

the necessary resources and help their need. It is a place, where ideas meet capital. It can be seen that the private incubators can stimulate the enthusiasm of private capital into BIs ecosystem, as well as creating the unique culture of Chinese entrepreneurship.

In summary, BIs in China are focusing on nurturing entrepreneurs with the goals of economic development, job creation and S&T services. However, these strategic objectives tended to vary with the business model of the BIs and the type of sponsorship of government involvement. The source of incubator funding in many instances determines the BIs' strategic focus and incubatees selection. For instance, government-funded BIs operate with a goal of economic development, relative to a university-affiliated BIs that may have technology transfer as its primary goal. Additionally, more and more Chinese private entities join BIs market. Many specialized BIs provide services with more distinctive features and objectives, focus on specific sectors and more market-oriented. As BIs gain popularity in various parts of the world, incubator models have evolved in variety and complexity along with the environment and society.

3.2 Business Incubators and Service Sector

The Chinese economy has witnessed tremendous transition and growth since the reform and opening-up policy in 1978. The rapid growth of BIs plays an important role

in facilitating China's transitions from a centrally planned economy to a capitalist market economy. The change is promoting the country toward a service-based economy.

China is the world's largest emerging market economy, both in terms of population and total economic product. Its gross domestic product (GDP) is broadly contributed by three broader sectors or industries, including primary industry (or agriculture), secondary industry (or construction and manufacturing) and tertiary industry (or service sector). In modern society, S&T sector is one of the most active sectors in the tertiary industry. To provide S&T services to high-tech enterprises, the incubation system is included in the major part of Torch Program as BIs are an important carrier in promoting S&T services in Chinese economy.

Since 1995, The service sector's share of GDP has increased every year. Along with the fact that the significant growth of service sector, the share of tertiary sector was more than 50 per cent of China's GDP for the first time in 2015 (see Figure 2). It is a remarkable fact that the tertiary industry exceeded secondary industry for the first time in 2013. Since then, the tertiary industry has become to the biggest industry in China as well as being the main force to promote China's economic growth.

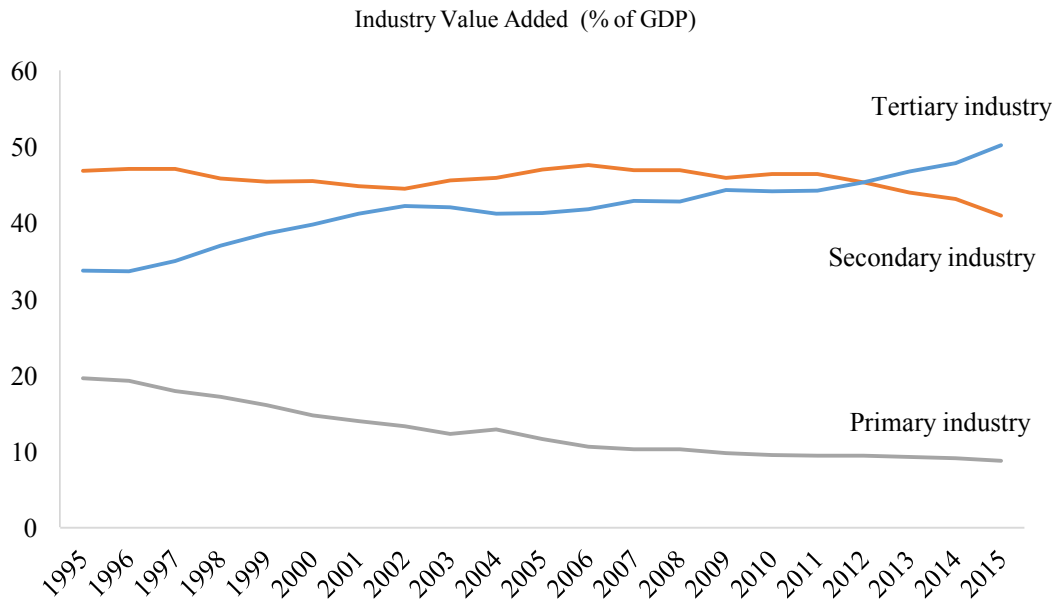


Figure 2. The three broader sectors as percentage of China's GDP, 1995-2015

Source: 中华人民共和国国家统计局 (2016)

The minister of MOST views that the high-tech sector of tertiary industry has the ability to promote China's supply-side structural reform and economic transformation and upgrading (中华人民共和国科学技术部, 2017a). Chinese BIs are viewed as big innovative clusters which gather high-tech enterprises and offer business resources to promote S&T progress. For instance, Beijing's Zhongguancun own the largest BIs cluster in northern China, which contributed 24.7 per cent of GDP to Beijing in 2016 (中华网, 2017). Science and technology are closely related to each other, and BIs are a platform to make it happen -- transfer research result to productivity.

The growth of Chinese economy has decreased significantly over the past few years. Since 2008, the annual growth rate of GDP has gradually declined, while the growth rate of Chinese BIs and incubatees were not affected by GDP downturn. The

evidence can be observed in Figure 3. Although China's GDP growth rate dropped to 7 per cent in 2015, the growth rate of BIs and Incubatees reached 45.1 per cent and 29.4 per cent respectively. Figure 2 and Figure 3 have shown the positive correlation between the increasing trends of BIs and tertiary industry. It is clearly that BIs as a key carrier of S&T sectors playing one of the most essential roles in tertiary industry.

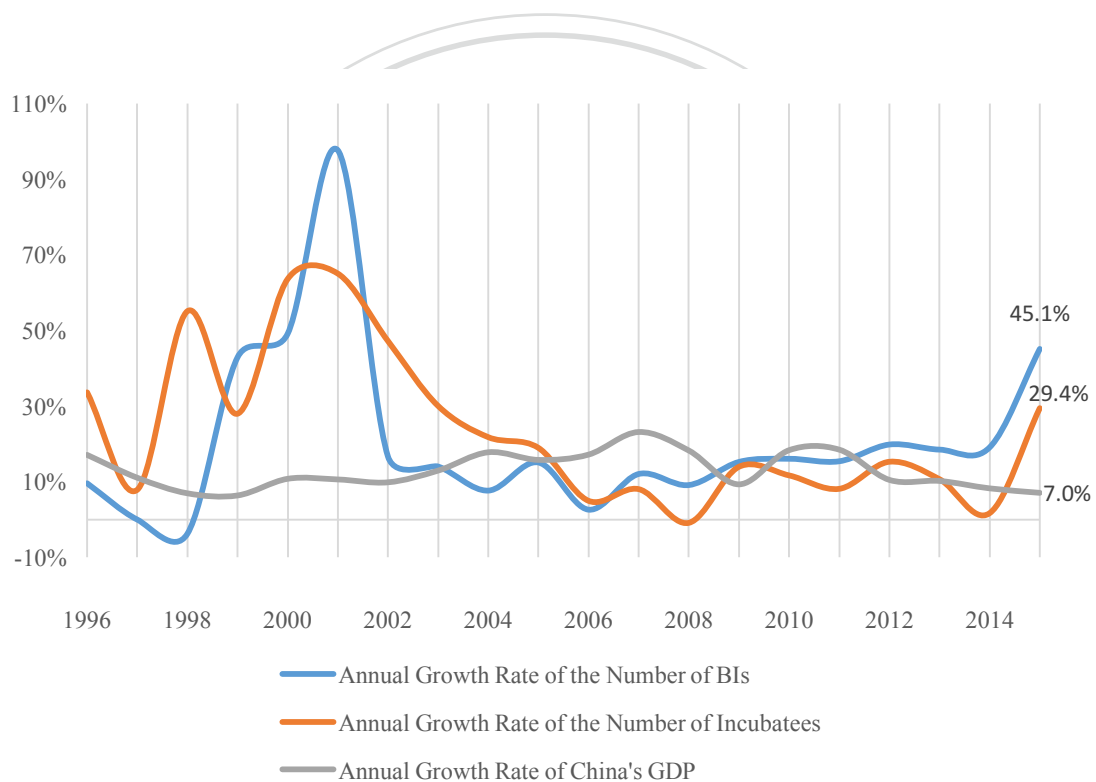


Figure 3. The growth rate of number of BIs, incubatees, and China's GDP, 1996-2015
 Source: 中华人民共和国国家统计局 (2016); 中华人民共和国科学技术部 (2015a)

China is trying to become a service-based economy through implementing various economic tools and political measures. A report (Kelley et al., 2016) by the Global Entrepreneurship Monitor (GEM) concluded that the establishment of BIs is one the

essential means that can deal with youth unemployment in developing economies. In China, the annual growing number of BIs reflects the growth of incubatees, and the rise of incubatees leads a significant increase in job creation and annual income of BIs market. Additionally, more and more incubating enterprises leave BIs system as they have learnt the survivability of social adaptation. Those economic indicators including the number of incubators, incubatees and employees of incubates are growing stably as illustrated in Figure 4, which demonstrated that BIs have played a remarkable role on regional economic development and job creation. The more BIs established in the areas means the more job opportunities and income created in the regions. A surge of Chinese BIs witnesses that BIs is one of the best choices for China' startups. BIs have been proved that there is a strong case on the role of BIs in the overall promotion of entrepreneurship development and economic development by development of enterprises and creation of jobs (Waeltring & Dornberger, 2014).

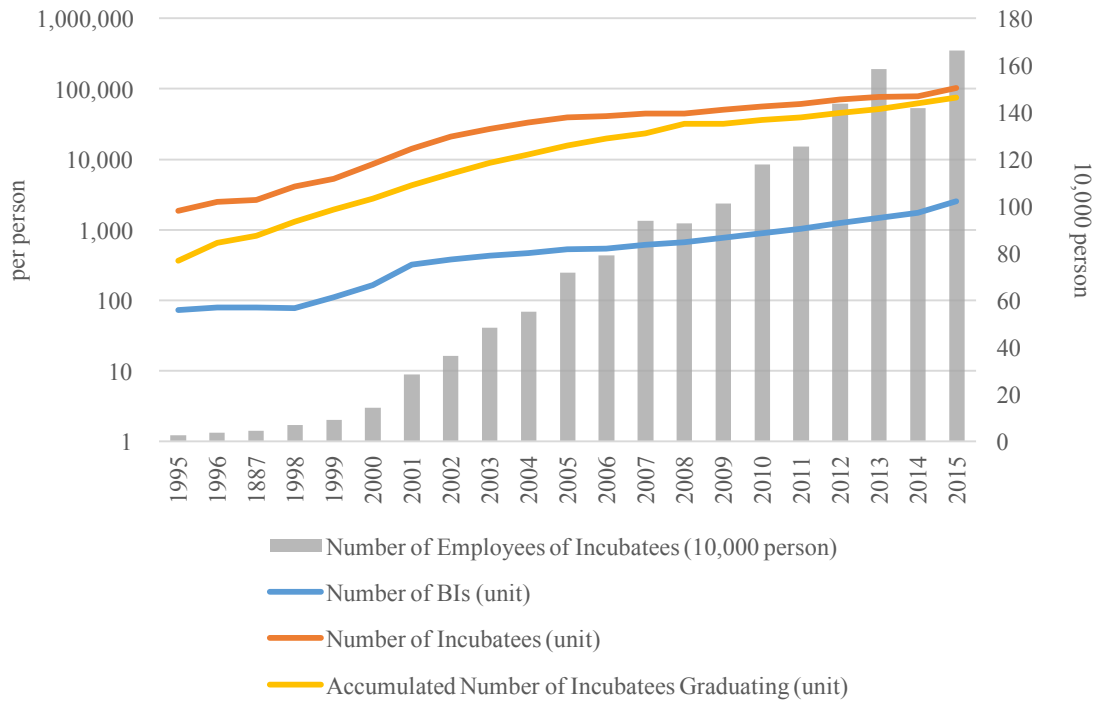


Figure 4. The overall economic data of BIs, 1995-2015

Source: 中华人民共和国科学技术部 (2015a)

3.3 Two Cases on the Role of Chinese Business Incubators

To improve the innovative capacity and S&T development of the country, some of the major cities and areas selected by Chinese government to establish national high-tech development zones. The selected cities and areas can lead to economic output with an economic radiation effect over its nearby areas. In order to explore the critical roles of BIs in the impact of regional economic development, the typical incubation systems including Wuhan and Shenzhen are selected in this chapter.

Wuhan, the capital of Hubei province, is the birthplace of Chinese BIs. The city has for decades been a traditional base for manufacturing, and has also become one of

the areas promoting modern industrial change. Benefitting from its strategic position in central China, Wuhan naturally became a hub for the efficient distribution of products for many industries, particularly in modern manufacturing and high-tech industries.

Shenzhen is a city of sub-provincial administrative status in Guangdong province, and often referring as “China's Silicon Valley”. Under economic liberalization policies of the 1980s carried out by Deng Xiaoping, the city became China's first and the most successful “Special Economic Zone”. Shenzhen has focused on high-tech industries and high-value added production and services over the last decade.

Some of the startups coming out of incubation, such as China's best known international brands Lenovo (computers), Huawei (telecommunication), Suntech Power (solar energy) and DJI (civilian-drone) are among the companies which have graduated from BIs system in China (Proksch, 2015; South China Morning Post, 2017).

3.3.1 Wuhan: Case of the First Business Incubator in China

In June 1988, Wuhan witnessed the establishment of China's first BI, Wuhan East Lake High-tech Development Zone (EHDZ), which is also the first state-level incubation system driven by the government and set up in the high-tech development zone. As one of China's most famous and developed state-level high-tech development zones, Wuhan EHDZ gathered and cultivated a large number of knowledge-intensive

high-tech enterprises through promoting the interaction between industry, university and research institutes. The development of BIs system is one of the key measures to promote economic output in Wuhan EHDZ. According to the website of the government of Hubei Province (2016), all the high-tech development zones in Hubei have incubated over 50 per cent of high-tech BIs, 60 per cent of high-tech enterprises and 50 per cent of authorized patents of the region, which greatly contributed S&T achievement.

Although there is no complete data available on how many BIs and incubatees are in Wuhan EHDZ, the economic output presents real contribution by launching economic measures. The incubation of Wuhan EHDZ accumulated over 35,000 registered enterprises, created nearly ten thousand new registered companies, and supported 511,934 direct jobs in the area. The contribution also reflected on the growth trend of gross industrial output in Wuhan EHDZ. Over the decade (2005-2015), the gross industrial output grew 11 times and reached over 28 per cent in the average growth rate. The evidence can be observed from the economic indicators in Figure 5 and Table 1.

Gross Industrial Output

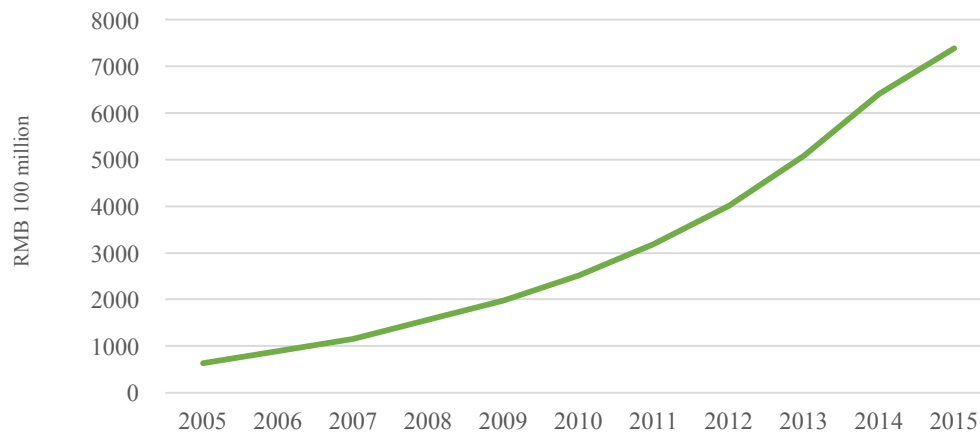


Figure 5. The gross industrial output in Wuhan EHDZ, 2005-2015.

Source: 武汉东湖新技术开发区政务网. (2017)

Table 1. The economic indicators of Wuhan EHDZ, 2005-2015

Wuhan East Lake High-tech Development Zone (EHDZ)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Gross Industrial Output (RMB 100 million)	629.0	889.4	1156.3	1572.3	1975.5	2508.8	3191.4	4012.2	5086.2	6412.3	7389.3
Annual growth rate of Gross Industrial Output		41.4%	30.0%	36.0%	25.6%	27.0%	27.2%	25.7%	26.8%	26.1%	15.2%
Accumulated Number of Registered Companies	9893	11593	11336	12784	13919	16615	19117	17555	21047	26897	35982
Number of New Registered Companies	665	1700	1831	2205	1135	3619	3322	3136	4107	6211	9621
Number of Persons Engaged in High-tech Incubatees	142400	162300	185123	232804	295821	328822	360935	382467	419022	449644	511934
Number of Authorized Patents in Wuhan EHDZ	n.a.	1954	1456	1754	2173	3985	4634	6963	8501	9533	9882
Total Number of Authorized Patents in Wuhan City	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	11588	13689	15901	16553	21740

Source: 武汉东湖新技术开发区政务网. (2006, 2007, 2011, 2012, 2013, 2014, 2016 & 2017); 武汉市科学技术局 (2016)

Apart from the gross industrial output, the Wuhan EHDZ has created impressive number of authorized patents each year. The amount of authorized patents of Wuhan EHDZ has accounted for nearly 50 per cent of the total authorized patents of Wuhan city. The evidence can be observed in Figure 6, showing a remarkable increase from

the year 2011 to 2015 (武汉市科学技术局, 2016; 武汉东湖新技术开发区政务网, 2017). The Wuhan EHDZ has the largest contribution of authorized patents in the region.

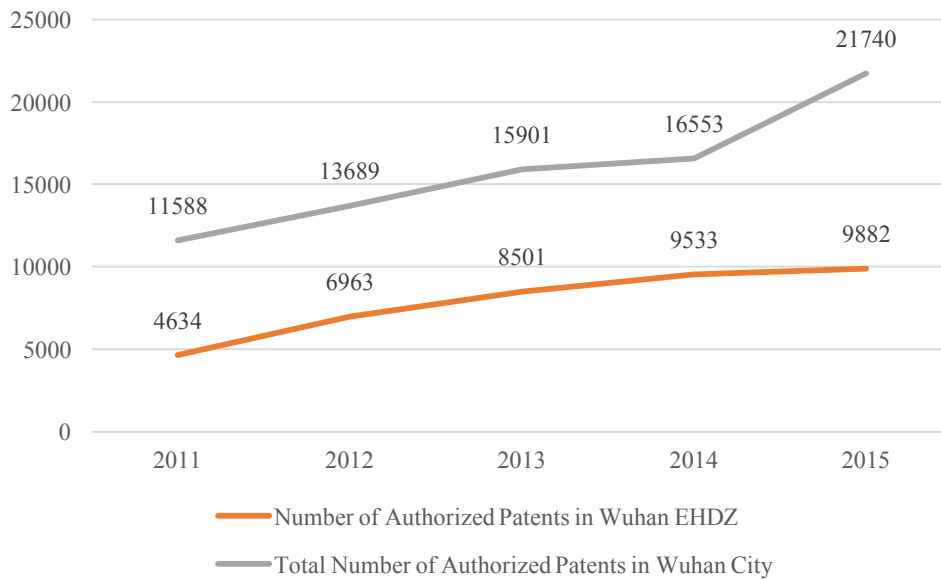


Figure 6. The number of authorized patents in Wuhan EHDZ and Wuhan City, 2011-2015.

Source: 武汉市科学技术局, (2016); 武汉东湖新技术开发区政务网, (2017)

The employment status in Wuhan EHDZ was also impressive. As the key innovative demonstration area as well as the first national BI in China, the central and local governments have made massive financial and policies support to Wuhan EHDZ. Meanwhile, as a pioneer of Chinese S&T development, Wuhan EHDZ is linked to the government's vision and expected to be an undertaker in public responsibility.

According to the statistics by local government (武汉东湖新技术开发区政务网, 2017), the number of persons engaging in high-tech incubates has increased nearly 4

times during the past decade (2005-2015). There is no less enthusiastic about the accumulated number of registered companies and yearly new registered companies in Wuhan EHDZ. The average annual growth rates were growing stably, roughly 14 per cent and 47 per cent respectively. The growth trend of the three indicators is illustrated in Figure 7.

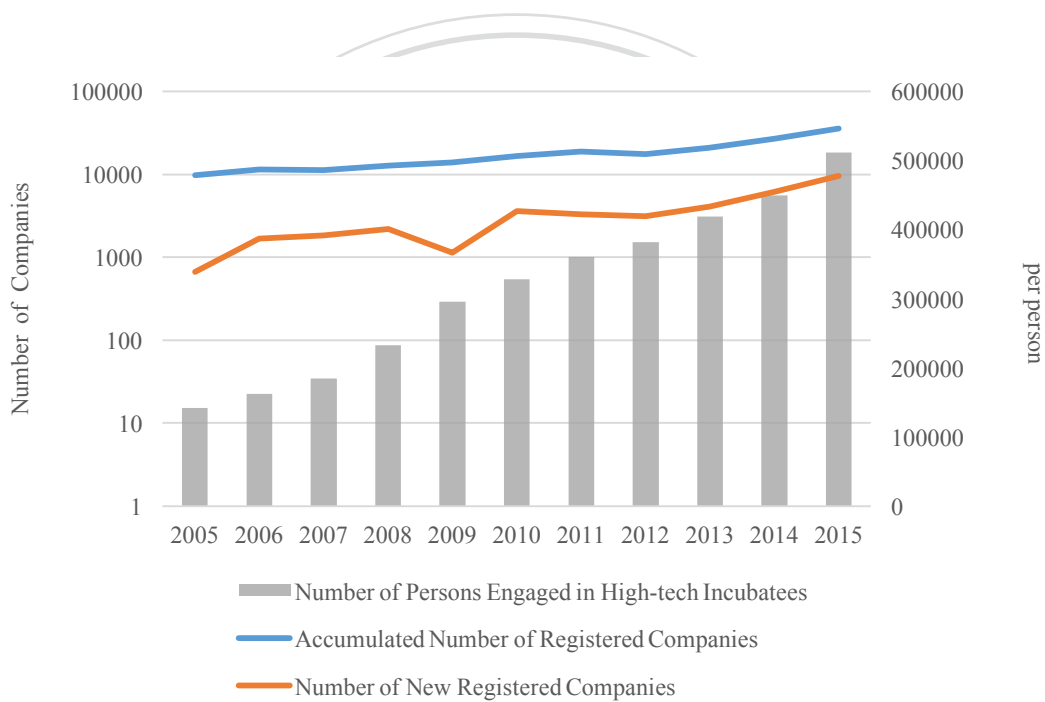


Figure 7. The number of registered companies and high-tech employment in Wuhan EHDZ, 2005-2015.

Source: 武汉东湖新技术开发区政务网 (2017)

The economic outcome of Wuhan EHDZ was mainly due to the government support. Wuhan EHDZ has received four national pilot policies supporting 264 high-tech incubatees, incubating 9,621 new registered S&T enterprises as well as enjoying the income tax deduction of RMB 260 million. The latest statistics also pointed out that

Wuhan EHDZ has 72 BIs and with over 3,000 enterprises are being incubated (Wuhan East Lake High-tech Development Zone, 2016). Additionally, the incubation activities in Wuhan EHDZ are welcomed by young entrepreneurs. Wuhan EHDZ has attracted over 400 university student startups into the incubation process by providing a specific area and an interactive platform to connect young startups and investors since 2013. Among them, 34 projects (innovative ideas transfer to business plans) have raised 570 RMB million. Around 150 venture capital institutions and 15,000 entrepreneurs were involved (Wuhan East Lake High-tech Development Zone, 2016).

Over the past decade (2005-2015), Wuhan EHDZ has been designed to be the incubation of technology-based SMEs. While incubating such enterprises, cultivating entrepreneurs and translating research findings into productivity, Wuhan EHDZ has accumulated a great deal of experience in enterprise incubation. As of 2015, 45 BIs has accumulatively incubated 4,280 technology-based enterprises, among which 3,650 were graduated (武汉东湖新技术开发区政务网, 2017).

According to a newsletter by China International Science and Technology Cooperation (中国国际科技合作网, 2013), some of graduated incubatees coming out of Wuhan EHDZ have become industrial leaders. For instance, in 1993 Kaidi Corporation was established with a registered capital of only RMB 103,000, now it has become China's leading enterprise in energy and environmental protection. In 1989

Wuhan Fingu Electronic Technology Corporation was established with a registered capital of only RMB 30,000, now it has become a listed corporation in the field of communications. In 1989, the Sante Cableway was established with a capital of only RMB 30,000, now it has become China's top company in cableway construction. In addition, Chutian Laser Group is China's largest production base of medical and industrial laser products that made its international presence, while it was established with a registered capital of only RMB 100,000 (中国国际科技合作网, 2013). Obviously, the first Chinese BI of Wuhan EHDZ has the ability to attract more and more enterprises and entrepreneurs to engage high-tech sectors, which not only promotes S&T transfer and commercialization but also upgrades regional economic development.

In a nutshell, the above successful cases demonstrated that the incubation of Wuhan EHDZ plays a significant role to nurture startups in various fields, takes unprecedented steps to support incubatees, and puts resources in place to encourage regional entrepreneurship. The achievement has also attributed to the local government as it attach a great importance to the development of high-tech sectors. It could be observed that the incubation of Wuhan EHDZ was funded by central government and has received continuous support from local government. The Zone takes part in an overall economic development strategy in the region.

3.3.2 Shenzhen: The Technology Business Incubator of China

Shenzhen is another city that surprisingly has developed rather rapidly. It was the first Economic Special Zone of China in 1980, enjoying special economic policies and flexible government measures. It is notable that Shenzhen was the first region where faced the first test of capitalism as the Chinese economy began to liberalize. For the last 20 years, there was a significant increase in their economic growth and industrial success. Transforming from a world factory of light consumer goods to become one of the major innovation and technology hubs of China. Shenzhen was the most competitive city in China in 2016 according to the Chinese Academy of Social Sciences (CSSN, 2016). The statistics from Guangdong Statistical Yearbook of 2016 (2016) pointed out that Shenzhen's per capita GDP has been the highest among all cities in Guangdong province since 2000.

As the cradle of China's manufacturing industry, Shenzhen is seen to be the heart of the hardware community for China. The city has become the country's largest incubators cluster for hardware startups, as well as the center of the global electronics hardware ecosystem. Shenzhen is also viewed as the incubator of technology for China, and so-called “China's Silicon Valley” (Forbes, 2016).

Shenzhen has the most innovation-driven capability among the Pearl River Delta's nine cities in Guangdong province (深圳市科技创新委员会, 2016). According to the local governmental reports and statistics, the number of BIs was less than 30 in 2001, increased to 144 in 2015, including 12 state-level and 78 municipal-level BIs (深圳市科技创新委员会, 2012; 深圳市统计局, 2016). As of the end of 2016, Shenzhen's Patent Cooperation Treaty (PCT) filings received 15,386 PCT applications, which accounted 50 per cent of China's application (深圳市科技创新委员会, 2016). This is due mainly to the local government's great support of BIs construction, considered that BIs have become the city's important carrier in cultivating high-tech enterprises, which are a key force in the construction of S&T transformation and regional S&T development.

Shenzhen is in the top ranks among mainland Chinese cities in terms of comprehensive economic power. In 2007, the primary industry of Shenzhen's GDP was under 1 per cent, while the share of tertiary industry in Shenzhen has accounted for nearly 50 per cent of the city's GDP. The tertiary industry has gradually become the largest industry in the region as well as being the main force to promote regional economic growth. It is clearly that the tertiary industry has gradually replaced the secondary industry, and became the main economic force of Shenzhen since 2007.

By contrast, the percentage change of China's GDP presented a different distribution. In 2007, the secondary industry was the biggest one in China. The proportion of secondary industry was much more than tertiary industry. Until 2015, the percentage of service sector has finally become the largest industry in China. The result given in Figure 8. It is no wonder that Shenzhen is one of the fastest growing cities in China, and even in the world.

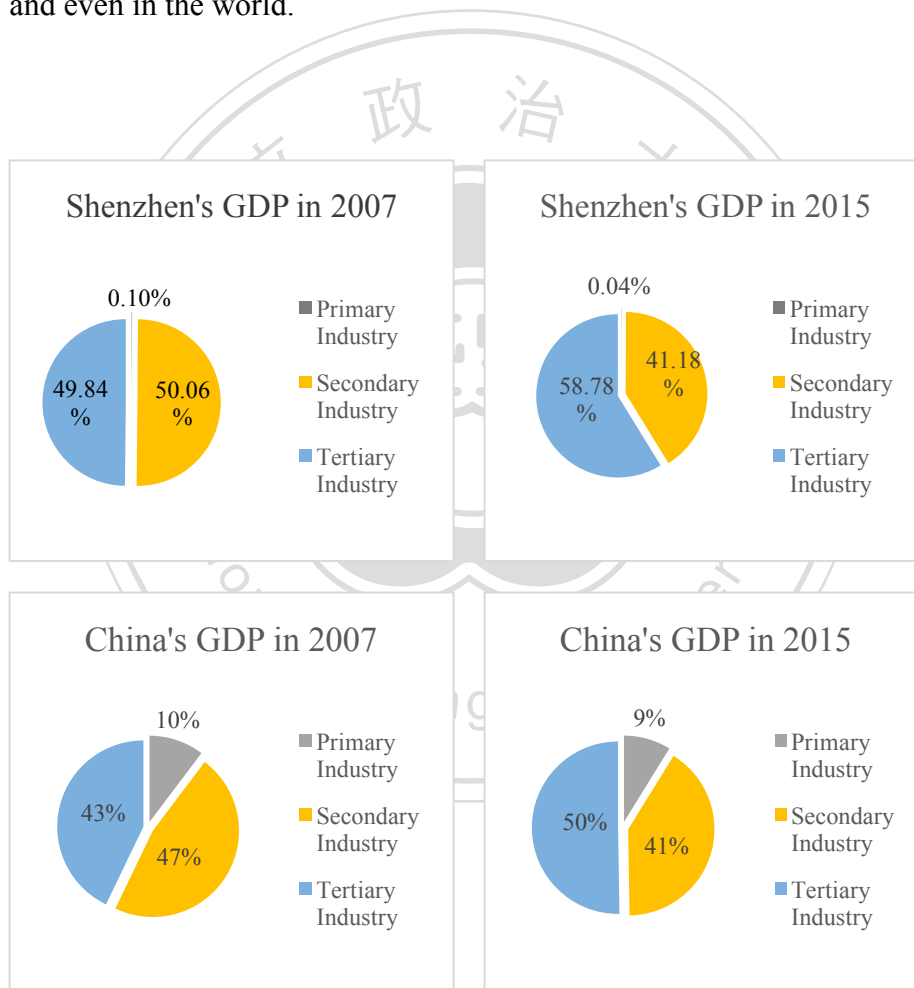


Figure 8. The percentage change of GDP in Shenzhen and China, 2007 and 2015

Source: National Bureau of Statistics of China, <http://data.stats.gov.cn/index.htm> (accessed 1 July 2017)

Shenzhen is so-called China's 'Technology Business Incubator'. Shenzhen's GDP and its number of high-tech enterprises have shown a positive correlation according to the National Bureau of Statistics of China during 2001 to 2011 (中华人民共和国国家统计局, 2016). The positive correlation reflects Shenzhen's gross output value in high-tech enterprises, which grew 6.8 times over the past 11 years (2001-2011). The evidence can be observed from the data of high-tech sectors in Figure 9 and Figure 10.

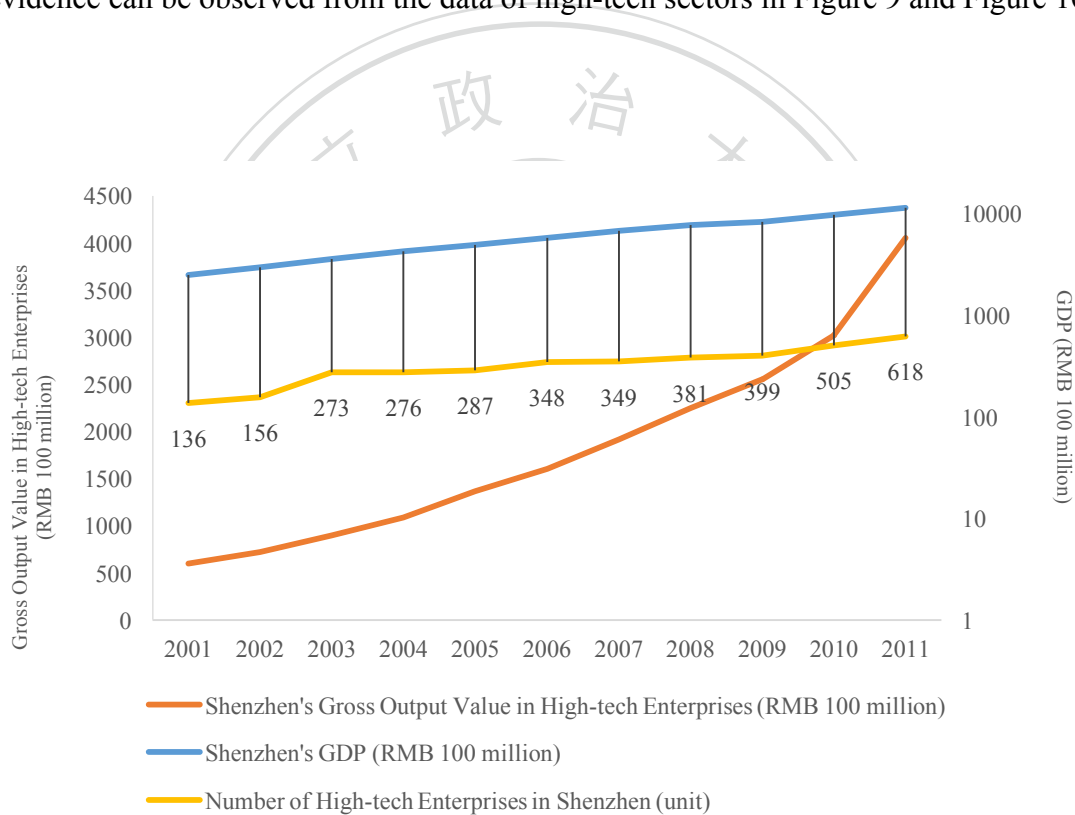


Figure 9. Shenzhen's GDP, gross output, and number of high-tech enterprises, 2001-2011
 Source: National Bureau of Statistics of China, <http://data.stats.gov.cn/index.htm> (accessed 1 July 2017)

Shenzhen is a typical example that proving the innovation capability of BIs can expand the S&T sectors and to promote regional economic transformation. The

contribution of gross output value in high-tech enterprises rose from 24 per cent in 2001 to 35.2 per cent in 2011. Figure 10 reveals the percentage change of Shenzhen's gross output value in high-tech enterprises of GDP in 2001, 2005 and 2011. The results have shown that the high-tech sectors have the most contribution to the tertiary industry.

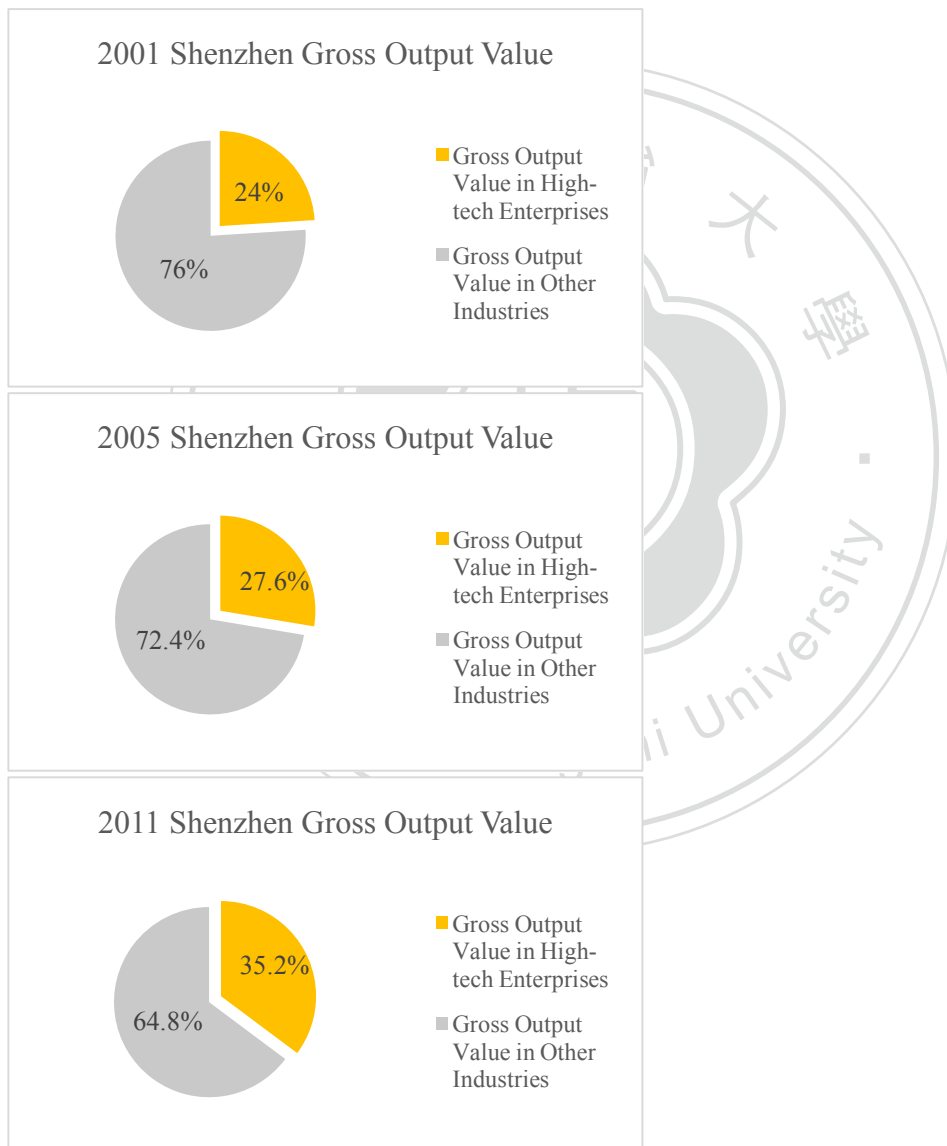


Figure 10. Shenzhen's gross output in high-tech enterprises, 2001, 2005 and 2011

Source: National Bureau of Statistics of China, <http://data.stats.gov.cn/index.htm> (accessed 1 July 2017)

The BIs industry could be a star industry in China as it made a great contribution to Chinese economic growth. Along with the fact that the significant growth of high-tech enterprise and gross industrial output in Shenzhen, attributing to the local government attaching a great importance to the development of high-tech sectors. The Chinese government plays a principal role in facilitating regional development. As the largest S&T manufacturing centers in southern China, Shenzhen has a well-developed incubation service system, and has become one of the most representative areas of high-tech industry and entrepreneurial innovation in China.

In summary, the 'BIs industry' is a promising industry in China as it made a great contribution to Chinese economic growth. The first case demonstrated that the incubation of Wuhan EHDZ plays a significant role to nurture startups in various fields, takes unprecedented steps to support incubatees, and put resources in place to encourage regional entrepreneurship. The second case showed that Chinese BIs have ability to facilitate regional development and economic output, such as the industrial gross value added, high-tech enterprises and new registered companies.

Both of Wuhan and Shenzhen are the typical examples that provide the positive correlation among high-tech enterprises, entrepreneurs and the data of economic growth. It is clearly that BIs have the ability to connect various resources and linkage, particularly in S&T sectors. It can be concluded that the Chinese BIs as the catalyst

accelerate S&T development and provide matching service at technopreneurial functions on the resources of knowledge (high-tech research to patents), communities (high-tech SMEs, universities, and relevant entities), and networks (accessing government, investors, and entrepreneurs).



Chapter IV

The Role of Chinese Government in Business Incubators

Over the past decades, China has been employing various policies to strengthen its innovative capacity through relevant policies and infrastructure construction to enhance BIs capability and functions, such as building the incubators system by launching Torch Program (火炬计划), promoting SMEs by initiating Mass Entrepreneurship and Innovation (大众创业, 万众创新), and announcing guidance related to BIs' construction by implementing a series of Five Year Plans. The Chinese government is placing increasing focus on BIs development as an important engine of growth for economy. This also includes massive financial support and substantive policies direction to the incubation program. This chapter will deliver the key policies and measures which can examine the contribution of BIs in China.

4.1 Overview the Acts of Government in Incubation Development

The Chinese government plays a key role in the history of Chinese incubation development. Some principal policies and initiatives have important influence on BIs system:

Torch Program. China's Torch Program from MOST is one of the most conspicuous entrepreneurial programs which generated a heated discussion in the world, as well as was regarded the largest government-run entrepreneurial program. As a core part of the Torch Program, the goal of BIs is to cultivate technology SMEs and innovative-oriented enterprises.

As one of the most important policy initiatives, the Torch Program was put in place in 1988 with the purpose to reinforce overall environment for technology innovation and to promote high-tech industrialization, and to lead the development of S&T with an orientation toward economic construction (Torch High Technology Industry Development Center, n.d.). Of all the programs initiated by Chinese government, the Torch Program is not only the one program to start China's high-tech innovation but to boost startup companies. BIs are one of the four major parts of the Torch Program in promoting S&T development in China.

The Torch Program is aiming at providing great support of BIs in China, and has made massive investments in BIs through its incubating funds. In order to speed up the establishment of BIs fostering and tutorial system, the government has several lines of dedicated funds to support BIs in the form of construction funds for BIs, seed capital funds for startups and innovation funds for SMEs that are in the growth phase of their life cycle (中华人民共和国科学技术部, 2002a).

Mass Entrepreneurship and Innovation. The concept of “Mass Entrepreneurship and Innovation” was first proposed by Chinese Premier Li Keqiang in his keynote speech at the World Economic Forum (WEF) in Tianjin, 2014 (中国网, 2014). He emphasized Mass Entrepreneurship and Innovation as a new driver of Chinese economic development, and can make China's economy towards high-end level (中国政府网, 2015c). BIs are considered as the carrier of the initiative Mass Entrepreneurship and Innovation and can create an entrepreneurial environment of the regional innovation in China (中华人民共和国科学技术部, 2015b). As mentioned previously, BIs can coordinate to convert technology innovation into productivity. The Chinese government strives to integrate BIs' program into Mass Entrepreneurship and Innovation.

In the background of China's “new normal”² (新常态) economy, BIs are considered as an important platform for accelerating the activity of Mass Entrepreneurship and Innovation, as well as a driving force to promote regional technological innovation (曾铁城, 2015; 李惠武等, 2016; 杨凯等, 2015; 中国政府网, 2016c). In 2014, benefiting from central government policies' support, more than 1,600 BIs have cultivated 80,000 incubatees, created 1.75 million jobs, achieved nearly

² According to public statements by Chinese President Xi Jinping during 2014, China's “new normal” growth signifies slower but higher-quality and more sustainable growth as the structure of the economy changes.

300,000 items of technology transformation, and reached the turnover in technical contract around RMB 857.7 billion (中国政府网, 2016b).

In 2015, the State Council of China announced four guidelines on Mass Entrepreneurship and Innovation, mentioned the importance of BIs construction and relevant policy reforms. Enhancement of the cooperation among enterprises, universities and research institutes could accelerate to transfer scientific and technological achievements (中国政府网, 2015b; 中国政府网, 2016b).

Benefiting from government support, BIs have been one of the channels that Chinese people can join the tide of Mass Entrepreneurship and Innovation. By 2015, more than 2,500 BIs have cultivated 100,000 incubatees (中国政府网, 2016c). The number of startups reached 443.9 million, and over 12,000 enterprises were born every day, while driving the transformation of industrial structure (中国政府网, 2016d).

A Series of Five Year Plans. China began implementing Five Year Plans (FYPs) in 1953 to align the economy with top policy objectives and communicate this directive throughout the government system. Over the past few decades, FYPs have been designed as overarching roadmaps to guide the numerous ministries and local governments toward priorities set up by the central government. Since the year of 2001, a series of FYPs, the 10th, 11th, 12th and 13th FYPs provided guidance related to BIs'

development. The government believes that BIs can make significant contributions to technology transfer, promote the development of technology-based SMEs, increase the employment opportunities, make sustainable growth of the national economy and construction of a well-to-do society (Zhao, 2002).

During the 10th FYP (2001-2005), the development of BIs was gradually became the nation's priority. A policy guidance of BIs construction (中华人民共和国科学技术部, 2002a) emphasized that supporting and building BIs system is an effective way to promote transformation of scientific and technological achievements, to cultivate tech-based SMEs, as well as to create a platform of innovation and entrepreneurship for scientists and engineers. BIs were considered a crucial carrier in accelerating industrialization of high-tech industry and an important part of building a national innovation system.

It is worth mentioning that a guidance (中华人民共和国科学技术部, 2002a) emphasized that all successful BIs are attributed to the efficient management and market-oriented operation mechanism enforced by local governments. Zhao (2002), a former director of the Torch Center mentioned that the development of Chinese BIs adheres to a principle whereby government takes the lead in providing support. As a result, BIs in China were strongly relied on the top-down governmental funding and directives with the government plays a predominant role. During the period, the MOST

set aside RMB 50 million in annual funding for BIs construction (中华人民共和国科学技术部, 2002b).

In the period of the 11th FYP (2006-2010), the government kept pushing BIs construction. In May 2006, the MOST formally established an office of Incubator Management Office (李志远, 2006). The office is authorized to undertake management, coordination, organization, evaluation and establishment etc. of BIs (中华人民共和国科学技术部, 2013a). This decision reflects that the country has attached great importance to BIs development.

During the period, the construction and development of the BIs was still dominated by the government. Due to the fact that many BIs are not profitable, the adequate finance is important for BIs' survival. The MOST invested RMB 20 million annually to build a platform of integrated incubation information, setting aside annual funding of RMB 40 million on supporting advanced BIs development, such as BIs in high-tech sector, distinctive industries or innovative oriented cluster (中华人民共和国科学技术部, 2006b).

In addition, the MOST (中华人民共和国科学技术部, 2012) initiated a plan “Action of Torch Venture Instructors”, which was a counseling team with more than 3,500 instructors to counsel startups in providing business consulting and training. A total of 896 BIs were established, and more than 56,000 incubatees were in processing.

By the end of 2010, BIs created more than 1 million employment opportunities with nearly 40,000 ventures creation and more than 158 listed companies (中华人民共和国科学技术部, 2013b).

The MOST has compiled the 12th FYP (2011-2015) for state-level BIs, based upon National Medium- and Long-term Scientific and Technological Development Program (2006-2020), National Medium- and Long-term Talent Development Program and the 12th FYP for Scientific and Technological Development (中华人民共和国科学技术部, 2012). The Plan aims to promote a sustainable environment to BIs, including high-tech startups service centers, overseas returned scholars' business parks and international BIs. The goal was to create an enabling environment for innovation and entrepreneurship to flourish, so as to lay a solid basis for shifting China's economic growth pattern and building an innovative nation

During the 12th FYP, one of the principles of BIs development is to strengthen the function of government guidance (中华人民共和国科学技术部, 2013b). In order to strengthen BIs functions and entrepreneurial environment, the government improved BIs construction by launching a program of entrepreneurial mentorship, improving the financial cooperation between BIs and third parties, and building a BIs training system (中华人民共和国科学技术部, 2013b). The number of incubatees reached 102,170 in 2015, which provided over 1,662,000 job positions. In addition, the total income of

incubatees exceeds 400 billion and 74,853 incubatees graduated from BIs system (科学技术部火炬高技术产业开发中心, 2017a). The results are given in Table 2. BIs have becoming a ubiquitous phenomenon in many places of China and are viewed as a tool for promoting economic development and technology-based enterprises.

Table 2. The statistics data of BIs during the 11th and 12th Five Year Plan (2006-2015)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of BIs (unit)	548	614	670	772	896	1,034	1,239	1,468	1,748	2,536
Number of Incubatees (unit)	41,434	44,750	44,346	50,511	56,382	60,936	70,217	77,677	78,965	102,170
Number of Employees of Incubatees (10,000 person)	79.3	93.8	92.8	101.2	117.8	125.6	143.7	158.3	141.7	166.2
Accumulated Number of Incubatees Graduating (unit)	19,896	23,394	31,764	32,301	36,485	39,562	45,160	52,146	61,944	74,853
Space Area (1000 sq.m)	2,008.0	2,269.8	2,315.5	2,901.3	3,043.9	3,472.1	4,375.8	5,379.3	6,877.8	8,679.7
Total Income of Incubatees (RMB 100 million)	1926	2621	1866.2	2000.8	3329.5	3800.6	4147.1	3308.8	3696.4	4810.4
R&D made by current incubatees (RMB billions)	N/A	N/A	N/A	N/A	N/A	221.5	378.8	376.9	271	315.6

Source: 科学技术部火炬高技术产业开发中心 (2017a)

As the first major part of the 13th FYP (2016-2020), which emphasize that innovation is the cornerstone of China's development strategy as it "essentially set the overarching framework from which many of the other areas of the plan flow" (中国政府网, 2015a; Ma, 2016). The government pledges to implement the strategy of innovation-driven development and improve the overall quality and competitiveness of the real economy. The objectives include the implementation of additional tax deductions for their R&D activities and increase tax support for BIs system and high-tech enterprises.

To improve regional innovation capabilities, in the next five years, the government plans to create a sound ecosystem that encourages mass innovation and entrepreneurship, improve the BIs system that serves the real economy. The government expects to level up the value-added chain by using innovation to accelerate the transformation of manufacturing industry, which underscores China's vision to develop itself into an innovative country (中国政府网, 2016a).

According to the annual report of global entrepreneurship, released by Global Entrepreneurship Monitor (Kelley et al., 2016), China is listed third in the ranking of “Government policies in support and relevance” and “Government entrepreneurship programs”. It shows that Chinese government has strong influence on shaping an entrepreneurship environment.

As an important part of the policy framework of China's S&T, Chinese BIs have gained strong support since the 10th FYP. Under the direction of the State Council and MOST as well as with strong support from the local governments, BIs have grown into a main policy tool for commercializing scientific achievements, cultivating enterprises and entrepreneurs, and promoting innovation and entrepreneurship.

4.2 Financial Support

Funding is one of the key elements for Chinese BIs sustainability, the incubators and incubatees alike depend to a large extent on government policies and funding. The government financial aid and tax incentives can reflect on the economic output of BIs and incubatees.

(1) Financial Aid to Incubatees

According to the statistics published by Torch Center (科学技术部火炬高技术产业开发中心, 2017a), from 2011 to 2015, the Chinese government has made a massive financial support to incubating enterprises in order to promote the incubating ability to regional innovation and entrepreneurship. The revenue of incubating enterprises has risen with government financial support, while the reducing financial aid led to the decreasing revenue of incubatees. The government financial aid has reflected the revenue of incubatees, which means the more financial aid to incubatees, the more revenue of incubatees received, and the more economic output was created. Figure 11 indicated that the incubated enterprises can create average 26 times of revenue with government investment. It also demonstrates that the financial support has a positive correlation with the revenue of incubatees.

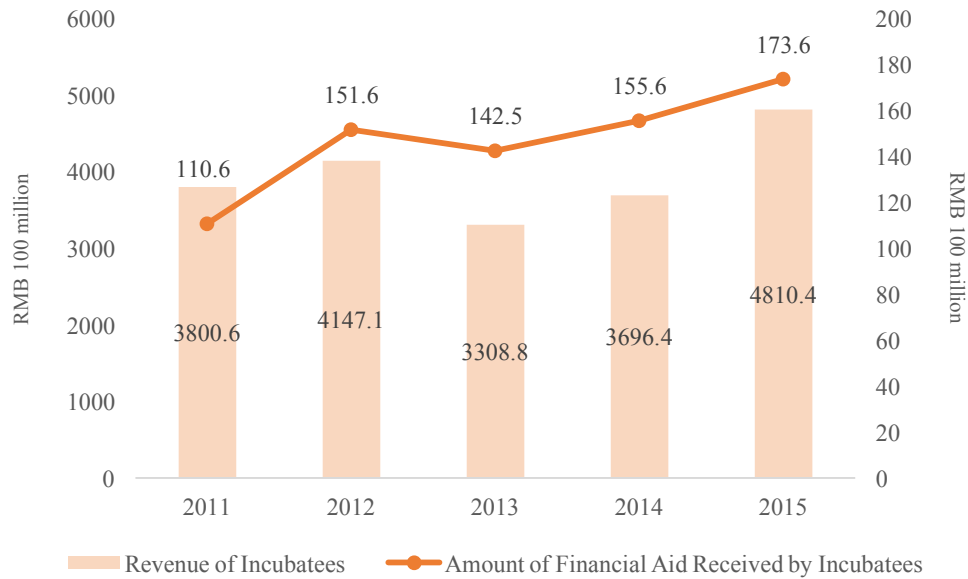


Figure 11. The revenue of incubatees and amount of financial aid received by incubatees

Source: 科学技术部火炬高技术产业开发中心 (2014), (2015), (2016) and (2017a)

In addition, the growing number of BIs have driven the amount of incubatees and its employees. It is notable that the revenue of incubatees was less than RMB 25 million in 1995 went up to RMB 4,810 million, nearly 200 times of growth over the last two decades. It demonstrates that the more entrepreneurs and enterprises engaging in incubation system, the more money that incubatees actually receives during a specific period. Moreover, the increasing accumulated number of graduated incubatees are the significant power in employment marketplace as some of them create direct and indirect employment after leaving incubation system. Their revenues in turn contribute to regional economic growth. The result given in Figure 12.

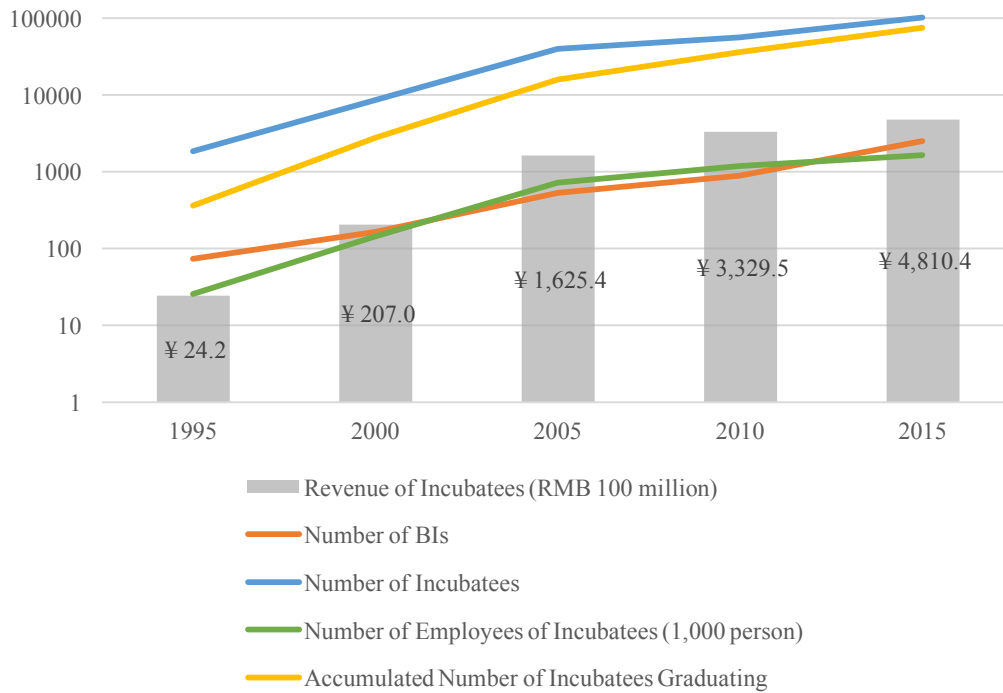


Figure 12. The economic indicators of BIs and incubatees

Source: 科学技术部火炬高技术产业开发中心 (2017a)

(2) Tax Incentives to BIs and Incubatees

It is noteworthy to mention that the Chinese government provides tax incentive and deduction to high-tech enterprises in National High-tech Zones (NHZs) (or referring to S&T parks). The main purpose of NHZs is to incubate the potential high-tech enterprises and to promote technology transfer, as well as to play a key force in Chinese economic growth. NHZs can be seen as a big incubation as they can form an innovative cluster. NHZs are not only enjoying the special tax incentives by government, but offered a range of incentives to attract innovative individuals and teams to start businesses.

Over the decades, Chinese government has been dedicated to promote the development of new and high-tech industries in China by providing tax incentives and relevant policies to High-tech enterprises in NHZs. On March 6, 1991, the State Council of the PRC approved tax incentives and supportive policies, which target at new and high-tech enterprises located in NHZs (科学技术部火炬高技术产业开发中心, 1991).

The following tax incentives are a few measures that reflect the Chinese government's effort to encourage S&T developments:

- To reduce corporate income tax rate to 15 per cent for high-tech enterprises of the NHZs.
- When the output value of export of the NHZs enterprises exceed 70 per cent of its total annual output value, the income tax shall be levied at a reduced rate of 10 per cent.
- The newly-established enterprises could be exempted from income tax in the first two operation years.
- The Chinese-foreign equity joint ventures newly-established in the NHZs are scheduled to operate jointly for a period of 10 years or more can be exempted from income tax in the first two years after it has begun to make a profit.

- High-tech enterprises using domestic investments with an annual net income not exceeding RMB 300,000 from technological transfer and consultation, services and trainings related to this transfer shall be temporarily exempted from income tax.
- For all high-tech products developed under the Torch Program, and conforming to exemption and reduction conditions for new products, the amount derived from tax exemption or reduction on products and on the added value of products shall be used specially for the technical development and shall be exempted from income tax.

In addition to tax incentives, taxation deduction policies have also been used as instruments of innovation and entrepreneurship policies in China. As far back as 2008, the Ministry of Finance of the PRC (MOF) published tax deduction for eligible BIs (中华人民共和国财政部, 2007). The eligible BIs can enjoy tax deduction from 1 January 2008 to 31 December 2010, such as the qualifying BIs shall be exempted from real estate tax and urban and township land use tax on properties or land for own use, and provided free or leased to incubated enterprises etc. Since then, the government has never stopped supporting BIs development. The MOF kept implicating tax incentives for BIs from 1 January 2013 to 31 December 2015 (中华人民共和国财政部, 2013). Moreover, the continuance of previous tax incentives for BIs has taken effect again on 1 January 2016 to 31 December 2018 (中华人民共和国财政部, 2016). From 1 January

2016 to 30 April 2016, business tax shall be exempted for income derived by eligible BIs from renting sites or buildings, and providing incubation services to incubated enterprises etc.

The above taxation incentives can reduce the operation cost of BIs to make investments that benefit the community. Benefit from the policies support, the economic output of NHZs has reflected on the growing number of export, tax submitted and gross industrial output value. Firstly, the tax incentives and policies have made an effect by observing the growth trend of tax submitted from NHZs. The amount of tax returns can also present the profitability of incubating enterprises. The more revenue increased, the more tax submitted. Secondly, the business revenue is not only reflecting on the tax submitted, but also showing the growth of export. The amount of export was less than USD 30 million in 1995 surged to USD 4,733 million in 2015, reached 163 times of growth over the last two decades. The results given in Figure 13. The ability to export goods helps an economy to grow, by selling more overall goods and services. Exports are a crucial component of a China's economy. Not only do exports facilitate international trade, they also stimulate domestic economic activity by creating employment, economic output and revenues. It may even present an opportunity to capture significant global market share. Last, the growth of export also adds to the

producing country's gross industrial output value. From 1995 to 2015, the blue line in Figure 13 shows the gross industrial value was growing stably, which indicates the great contribution of the industries' labor and capital to the country. It demonstrates that more and more entrepreneurs and enterprises are attracted by NHZs' resources which gather a competitively cluster that boosting regional economic development.

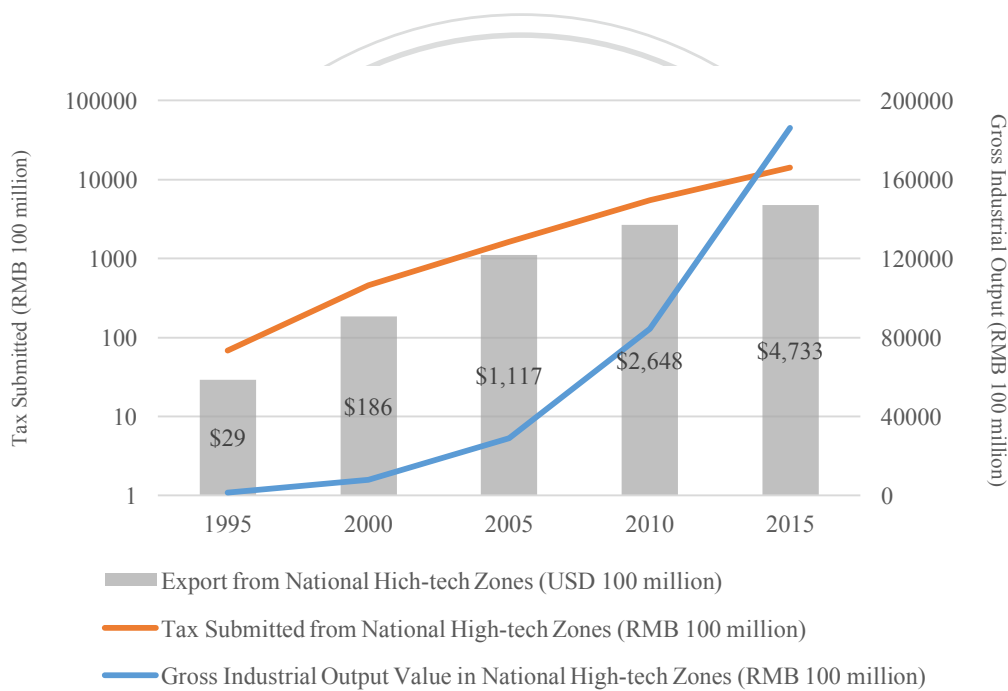


Figure 13. The export, tax submitted and gross industrial output in NHZs, 1995-2015

Source: 科学技术部火炬高技术产业开发中心 (2017b)

4.3 Policies Support

In recent years, China is moving self-reform on many aspects. In 2016 WEF, Premier Li appealed to enhance government efficiency and make it easier for individuals and companies to do business and to startup businesses by reducing government controls (中国网, 2016a). China realized that the burning issue of the time is to further streamline administration, to delegate power to lower levels and to optimize public services. Apart from tax incentives, some policies relaxations are worthy to examine and discuss the role of government in incubation system.

(1) Law of Promotion of Transformation of Science and Technology

Achievements

BIs in China have particularly emphasized providing technological services in promoting transformation of S&T achievements as Chinese government views BIs as a strategic asset. In light of this, the government believes that the criteria for measuring BIs performance is their ability in commercializing S&T achievements, incubating technology ventures, and cultivating innovation and entrepreneurship (中华人民共和国科学技术部, 2002a).

Some studies (Peters et al., 2004; OECD, 2010b; Lesáková, 2012) pointed out that BIs are designed to help bridge the gap between knowledge and innovation, and have

the ability to transfer the knowledge from universities to industries in order to let the research result to the marketplace.

The MOST kept emphasizing the importance of perfecting the incubation system (中华人民共和国科学技术部, 2017b) as the Chinese government views that patent counts are an important indicator of a country's output capacity of S&T, which reflects a country's independent innovation ability (中国政府网, 2011). Patents are widely recognized as providing a reliable and unbiased indication of the innovation effort in a country (Hu & Mathews, 2008).

On 1 October 2015, the new Law on “Promotion of Transformation of Science and Technology Achievements” (中华人民共和国科学技术部, 2015a) has taken effect. This Law was first established in 1996, enacted for the purpose of promoting the transformation of S&T achievements into real productive forces, standardizing such transformation, hastening S&T progress and facilitating economic and social development.

The Amendment allows state-owned research institutes and universities to transfer or license the use of their discoveries or invest in them. In the absence of an agreement or contract between the parties who make the discoveries, at least half of the value of the invention would be paid to the contributing persons. In the past, any gains would have gone to the Chinese treasury (中国人大网, 2015).

In the end of 2015, with the enactment of the revision of Law, the number of domestic application for patents have immediately increased in the following months. Table 3 illustrates that the monthly growth rate in November and December were significantly went up from negative rate to 30.4 per cent and 36.3 per cent respectively. It shows that the Law of Promotion of Transformation of Science and Technology Achievements that made it possible to stimulate the domestic patents application. In addition, the annual applications for total patents received in 2016 was increased two times since 2011, and the annual growth rate of total patents application received grew to 25 per cent in 2016. The result is given in Table 4. The increase of domestic filings of patent applications can reflect the growth of local innovation. The Amendment is not only facilitating technology transfer, but strengthening BIs function in a positive effect.

Table 3. Monthly domestic applications of patents in 2015

	Invention	Utility Model	Design	Total	Monthly Growth Rate
January	66,415	87,542	36,511	190,468	
February	37,648	50,859	19,845	108,352	-43.1%
March	48,208	63,870	26,965	139,043	28.3%
April	63,087	83,854	40,075	187,016	34.5%
May	70,598	90,870	48,456	209,924	12.2%
June	74,719	90,656	48,752	214,127	2.0%
July	87,168	109,439	58,267	254,874	19.0%
August	76,537	95,807	46,925	219,269	-14.0%
September	86,147	100,144	48,933	235,224	7.3%
October	84,303	89,071	42,605	215,979	-8.2%
November	115,480	106,467	59,606	281,553	30.4%
December	157,941	151,135	74,541	383,617	36.3%

Source: 中华人民共和国国家知识产权局 (2016a)

Table 4. Annual applications for total patents received

	Total Patents Received	Annual Growth Rate
1985-2010	5,995,367	
2011	1,504,670	
2012	1,912,151	27.1%
2013	2,234,560	16.9%
2014	2,210,616	-1.1%
2015	2,639,446	19.4%
2016	3,305,225	25.2%

Source: 中华人民共和国国家知识产权局. (2016b) & (2016c)

For the past few years, with the formulation and implementation of a series of policy tools, China's innovative capacity has improved. According to an annual report

(2016) by the World Intellectual Property Organization (WIPO), China ranked top in the world for patent applications, receiving over one million applications in 2015. Chinese government is trying to transform the country from a manufacturing nation to an innovative economy. All of this means that China's innovative capacity will become more important and influential around the world.

(2) The Company Law

In 2013, the Chinese government launched the program of “Mass Entrepreneurship and Innovation”. The program is not only to dedicate the technology innovation but also to support the startups. The Chinese Premier Li Keqiang stressed the role of Mass Entrepreneurship and Innovation in fostering a new engine of economic growth (中国网, 2014). The program is an initiative that shows China's determination in employment creation. A great deal of studies as well as Chinese government considered BIs as an important platform for accelerating the activity of Mass Entrepreneurship and Innovation (曾铁城, 2015; 李惠武等, 2016; 杨凯等, 2015; 中国政府网, 2016c). As discussed in previous chapters, BIs are agencies that provide business resources to help entrepreneurs set up their companies. They are hotbeds of SMEs as they have the ability to nurture micro and small businesses in their early stages. And the growing number of SMEs can reflect the growth of new registered companies in the region. Both of them are strongly related to the change of employment.

The Chinese Company Law has played a critical role in promoting new companies' growth.

China's Company Law adopted in 1993, revised for the first time in 1999 and revised for the second time in 2004. On 1 March 2014, the third Amendment of Company Law was approved and taken effect in order to improve entrepreneurship environment by enhancing administrative efficiency (FDI, 2013). The law includes eliminating minimum capital requirements, simplifying capital registration procedures, establishing an annual reporting system to replace the annual inspection system, and relaxing the requirements in relation to premises used for registered offices of enterprises etc.

As the Amendment removes the current minimum registered capital requirements including RMB 30,000 for limited liability companies, RMB 100,000 for one-person limited liability companies, and RMB 5 million for limited liability companies by shares (FDI, 2013), which can greatly help entrepreneurs to start their businesses without capital. It means the more startups opening, the younger generation (such as millennial entrepreneurs) involving. As mentioned previously, more and more Chinese university and college students tend to join startups before they leave school, the incubation-form of University Science Park from the number of 44 in 2002 to 100 in

2015 (凤凰新媒体, 2015). It is clearly that the Amendment not only can stimulate entrepreneurship, but also support the role of Chinese government in a positive effect.

The number of new registered companies were in a downturn before the Amendment of Company Law has taken effect. With the enactment of the revision of Law, on March 2014, the number of new registered companies has surged from 130,000 in February to 367,000 in April. The results are given in Figure 14. Since then, the new companies established in China has increased significantly. The number of newly registered enterprises grew by 52.44 per cent in the first three quarters of 2014, average more than 10,000 new companies registered a day (中国政府网, 2014). This is due mainly to exponential growth since late 2013, when the government recognized the emergence of new companies as the new impetus to economic growth.

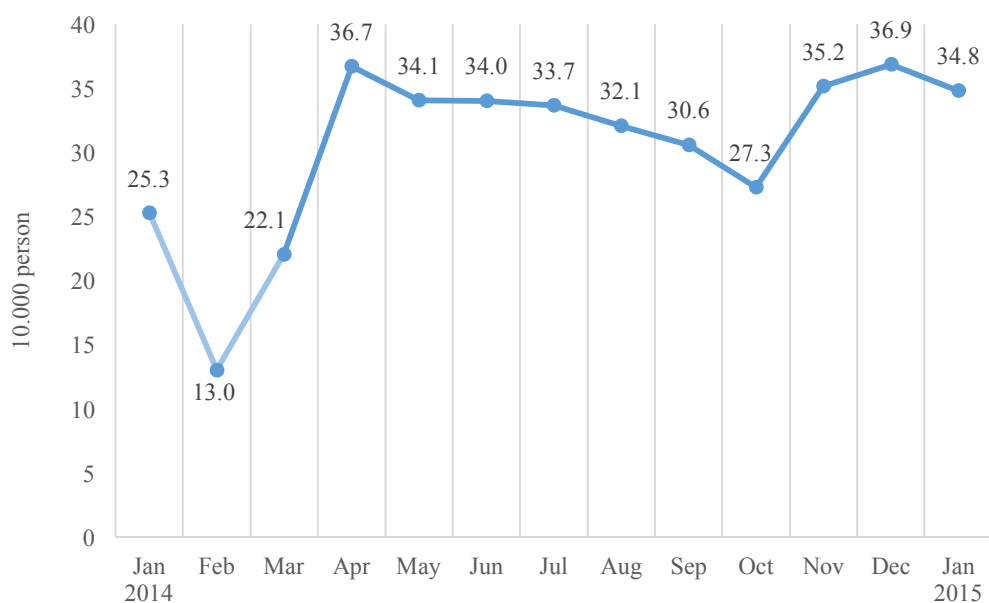


Figure 14. The monthly change of new registered companies since Jan 2014 to Jan 2015.

Source: 中华人民共和国国家工商行政管理总局 (2014a), (2014b) and (2015)

Implementation of the Amendments of Company Law can reduce the bureaucratic procedures and cost of market entry to stimulate investment, supported by a strengthened corporate regulation environment with fairer and more transparent processes. The relaxation of the policies and regulations can also help to rebuild a flexible business environment, particularly in facilitating startups in incubation ecosystem.

Upon observing the relationship between the Chinese BIs and Chinese government, it could be concluded that the greater the government involvement in BIs funding and operations, the greater the interdependence of the BIs and the government. The visible hand of Chinese government is common everywhere in BIs system. As interdependence is a dynamic process and ever changing, there is an inseparable relationship between Chinese BIs and the government. The activities of Chinese BIs impact other activities in society, and actions by government continuously affect BIs development.

Chapter VI

Conclusion

5.1 Summary of Research Findings

The impressive performance of entrepreneurship and innovative capacity of Chinese BIs have inspired a number of scholars to explore the phenomenon behind the accomplishment. In order to understand the implication in the overall landscape of BIs in China, this research has thus attempted to answer the following questions: firstly, what is the main role of BIs in Chinese economic growth; and secondly, what is the role of the Chinese government in leading the emergence of the Chinese BIs and its performance.

The first question is to explore the main role of BIs in Chinese economic growth. Upon observing the two cases of Wuhan and Shenzhen with the different backgrounds and purposes, as well as the relationship among BIs, tertiary industry and high-tech sector, it could be concluded that Chinese BIs a catalyst to accelerate S&T development and to provide matching service at technopreneurial functions on the resources of knowledge (high-tech research to patents), communities (high-tech SMEs, universities, and relevant entities), and networks (accessing government, investors, and entrepreneurs).

In terms of building the regional innovation capability, BIs have been one of the most important instruments of economic development in China over the last 20 years. As a magnet to attract high-tech skilled individuals, Chinese BIs have the ability to gather local innovation, help startups to adapt, grow and expand in the marketplaces, and form into the innovative oriented clusters with the radiation expansion. Along with a more open business environment in China, the number of technology-related enterprises, including technopreneurial ventures engaged in technological innovation, has increased significantly in the last couple of years. The two typical cases of Wuhan and Shenzhen demonstrated that the BIs system is indispensable ingredient in building a regional S&T cluster.

Since the concept of BIs system introduced to China, the patenting and innovation activities have been flourishing in the country. Patent counts is an important indicator of a country's output capacity of S&T, which reflects a country's independent innovation ability. The increase of domestic filings patent applications directly reflect the growth of local innovation as Chinese government strongly develops BIs system and promotes S&T transformation. It is proved that BIs are an indispensable element in facilitating a country's innovative capacity, economic growth and sustainable development.

In terms of SME employment, Chinese BIs encourage high-growth and innovation-based SMEs as well as focus on offering professional high technology resources to technopreneurs. Chinese BIs have the ability to attract more and more enterprises and entrepreneurs to engage high-tech sectors, and BIs are not only to promote S&T transfer and commercialization but also to upgrade regional economic development. BIs in China experienced the evolution of the past few years, gradually became an essential part of Chinese innovation systems as they provide services with more distinctive features and objectives.

Most importantly, BIs activities can stimulate economic transformation, which greatly changed the composition of the three broader sectors: the primary, secondary and tertiary industry. Over the past decades, China has seen a transition from a manufacturing based economy to the preponderance of service sector or tertiary industry. There is a consensus that the growing service sector is a sign of increased living standards in a country. Today, Chinese government is trying to transform China from a manufacturing nation to a service-based economy. The emergence of Chinese BIs serves as a catalyst tool to accelerate China from a manufacturing nation to a service-based economy.

For the second question, this study has systematically analyzed the role of Chinese government by observing a series of principal policies, initiatives, and activities leading

to the emergence, changes and enhancement of Chinese BIs, then continuing by examining and analyzing the supportive policies in financial support and legal reforms that highlight the critical role of Chinese government.

The role of Chinese government can be seen as a policy guidance in advancing BIs program. The government guides the process of BIs, directs the path and steps of BIs development. By channeling resources and policies supports, such as launching various programs and initiatives, as well as offering financial aid and tax incentives to stimulate economic growth, BIs system have shown positive impact in the community and regional economic development. The contribution of BIs have reflected the government's goal -- aiming to improve China's competitiveness in S&T development.

Firstly, in China, the government involvement in BIs establishment and operations is usually quite high. The government subsidizes incubator construction as well as ongoing operations involved in operational decision. Funding is one of the key elements for Chinese BIs sustainability, while the majority of Chinese BIs heavily dependent on ongoing subsidies from the government to support operations. In the process of the development of socialist market economy with Chinese characteristics, the government is deeply involved in the economy and has a tremendous impact on resources allocation. The Chinese policymaker can decide which industries will be promoted. As a key component of the innovation and entrepreneurship system, BIs are unavoidably market-

oriented by following the law of market economy. But with the public sector direct or indirect intervention in BIs operation by offering resources allocation, BIs have to assume more public and social responsibilities and are required to follow the government guidance.

Secondly, to enhance government efficiency and balance the relationship between relationship between government and market, the Chinese government began to streamline administration, to delegate power to lower levels and to optimize public services. By taking various measures to advance the process of streamlining administration and delegating powers, including providing financial support, reforming laws regulation, and reducing government intervention in microeconomic activities, the government brought a positive influence on raising the new registered companies and S&T achievement. Streamlining administrative procedures will not only reduce operational costs for enterprises, but also create sound environment for SMEs. The relaxation of the policies and power can also help to rebuild a flexible business environment, particularly in facilitating start-ups in incubation ecosystem. A series of policies and initiatives have shown that BIs can be an effective tool for supporting local innovation and new business creation, and can improve SMEs competitiveness in S&T sector.

From this perspective, China is moving self-reform on economic aspects. The core of economic reform is the proper relationship between government and market. To let the market decide the allocation of resources, the primary task is to build an open market with orderly competition. While strengthening the role of the market, the Chinese government could transform government functions and improve the governance. Some cases discussed in this study demonstrated that the less the government direct intervention of relevant policies regulation, the better performance of SMEs. It would become a sound cycle in incubation ecosystem.

The findings highlight the importance of this study in the academic area and generating practical contribution, particularly examined and discussed the role of Chinese BIs and Chinese government. To conclude this research, BIs are part of the Chinese innovation systems as well as a catalyst of government governance and economic transformation. There is an inseparable relationship between Chinese BIs and the government. The greater the government involvement in BIs support, the greater the interdependence of the BIs and the government. The actions by Chinese government continuously affect BIs development, and the activities of Chinese BIs impact economic and development in the country. Meanwhile, BIs are driving sustainable economic growth and building technopreneurship ecosystem. As an important part within the policy framework of China's innovation and S&T development, BIs'

contribution in Chinese economic growth is essential. BIs system are one of the important factors to facilitate the self-reform of the government, and remodeling relations among the government, market and society.

5.2 Suggestions for Future Research

This research has systematically reviewed, examined, analyzed and synthesized important existing studies and secondary data in order to provide the overall landscape of BIs in China. Upon observing a series of principal policies, initiatives, and activities leading to the emergence, changes and enhancement of Chinese BIs, it can be found that Chinese BIs are viewed as a public good entity with a social mission, and tended to operate under a government mandate of economic development. The emergence of BIs come from the needs of the times. The mission of Chinese BIs is strongly linked to the government's vision and public responsibility, and its unique ecosystem has a high flexibility and adaptability in the community development.

On the foundation laid by this research, there are various interesting issues for further studies especially for the innovation capability of BIs sustainability. In China, the rate of success for BIs are low. According to the Xinhua news (新华网, 2015), there was only 30 per cent of startups can be sustained in the first 3 years, while dropped to 16 per cent within 5 years. The reasons of success and failure behind the Chinese BIs

are worthy of further exploration. The capability of innovation is regarded as one of the biggest challenges faced in running the BIs. As innovation is inherently dynamic, the lack of innovation capability of sustainability is when BIs cannot maintain and sustain itself, not to mention to support their incubatees. Successful innovation should be an in-built part of BIs strategy, where incubators create a value of innovation and give incubatees the competitive advantage to grow and adapt their businesses in the marketplace.

From this perspective, the government bureaucracy may be one of the inevitably challenge faced in the innovation capability of Chinese BIs. The government subsidizes incubator construction as well as ongoing operations involved in operational decision. Although the government involvement could sustain BIs operation, it may cause BIs' own profitability highly dependent on government's support. It is conjectured that that the bureaucracy may affect the autonomy and creativity in BIs system, and further impact the innovation capability of BIs sustainability. To in-depth understand the overall picture of China's rapid growth economic development, the innovation capability of BIs sustainability is worthy of further investigation and discussion.

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