

# The Incubators, Venture Capital, and New Ventures in China

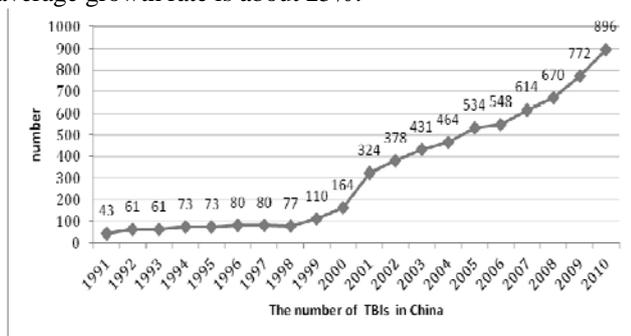
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**Abstract**—This paper reviews the evolution of China’s technology business incubators (TBIs), venture capital (VC) and their interaction in the past 20 years. By using the regression analysis of a sample of 344 TBIs in China, we try to explain how the incubators assist new ventures in obtaining venture capital. The findings highlight the important role of network and government grants in building capabilities for new ventures to obtain venture capital, but the influence of business support of incubators is insignificant. Finally, managerial implications and future research directions are discussed.

**Index Terms**—Incubators, convergence, venture capital, new ventures.

## I. INTRODUCTION

Since the first technology business incubator (TBI) was founded in Wuhan of China, TBIs have been growing rapidly in the recent 20 years. According to a survey by China Torch Program, by 2010, there were 896 TBIs in China. In Figure 1 below, it is obvious that the number of the TBIs had risen from 43 in 1991 to 896 in 2010 and the average growth rate is about 25%.



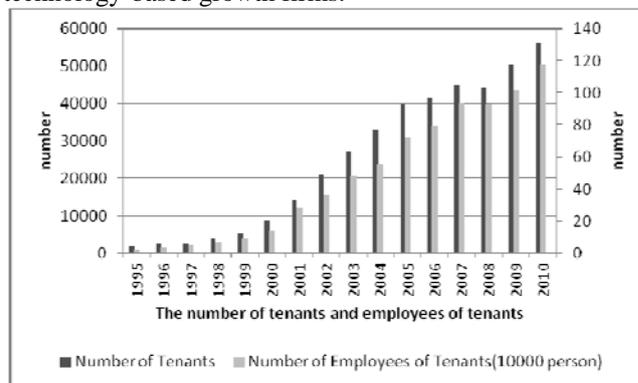
Source: China Torch Statistical yearbook 2011  
Fig 1. The number of TBIs in China.

What’s more important, the business incubators grow not only in quantity but also in quality. The number of tenants in TBIs reached 56,382 in 2010, which provided over 1,170,000 job positions. Among all the 36,485 graduated tenants, 80% companies survived in the intense competition, about 600 companies annual revenue exceeds 100 million, and over 50 companies successfully executed IPO. TBIs have becoming a ubiquitous phenomenon in many parts of

Manuscript received May 15, 2012; revised June 20, 2012. The authors want to acknowledge the support of the National Natural Science Foundation of China (no. 71172213 and 71171183), National Social Science Foundation of China (08&ZD043), and ministry of Education’s Humanities and Social Sciences project (09YJA630153 and 10YJA790260).

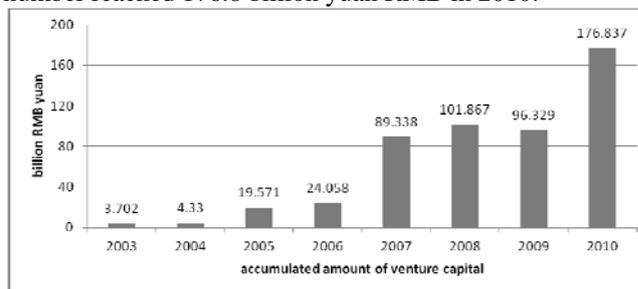
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China and are viewed as a tool for promoting economic development, innovativeness and the emergence of new technology-based growth firms.



Source: China Torch Statistical yearbook 2011  
Fig 2. The number of tenants and employees of tenants.

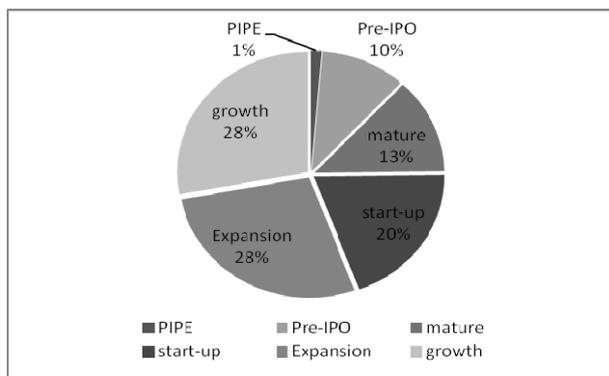
Although the scale of new ventures expands unceasingly along with the incubators, getting access to external capital is still a difficult task for new ventures, particularly in high-tech and high-growth business areas. For solving this problem, as another important tool for promoting enterprises, venture capital (VC) also has developed rapid in recent years. As Figure 3 shows, the accumulated amount of venture capital rose by almost 48 times in 7 years, and the number reached 176.8 billion yuan RMB in 2010.



Source: China venture capital research institute 2011  
Fig 3. The accumulated amount of venture capital.

According to the current studies, venture capital funds can provide a vital help to enterprise development, which by definition is complementary to that of incubators. Therefore, many prior studies increase understanding of the roles of incubators and venture capital in the development of new ventures [1] [2] [3] [4] [5]. In China, venture capital gave more help for new ventures in the start-up and growth stage, as Fig 4 shows, nearly 50% of venture capital flows to the ventures which are in the start-up and growth stage.

Accordingly, this study mainly reviews the evolutionary process of TBIs and venture capital and their correlation in the past 20 years, and examines how the incubators assist new ventures in obtaining venture capital. The next section reviews the previous literature. Then, the paper presents the empirical analysis. The last section provides discussion of the findings and the managerial implications.



Source: China venture capital research institute 2011

Fig 4. The proportion of the venture capital for stages.

## II. LITERATURE REVIEW

New ventures, especially the science and technology (S&T) new ventures face greater problems more than other firms, including lack of adequate knowledge of their environments, new product development experience as well as financial resources [6][7][8]. Rouse and Keeley provided evidences that few new ventures make themselves through their early years mainly due to management problems and under-capitalization [9]. S&T new ventures are highly vulnerable and easy to fail with less than half of them lasting for five years [10][11]. Owing to the increasing importance and high failure rate, managers and scholars show considerable interest in discovering a recipe for successful high-tech new ventures [8].

Incubators and venture capital represent two popular and controversial intervention approaches to assist new start-ups to solve these critical problems. Many prior studies investigated of the roles of incubators and venture capital firms on promoting new ventures. These include studies by Mian [5] on performance analysis of six typical university-based technology incubators. The result shows that by the benefit from the promotion of incubators' capacity on the human resource, incubation fund and technical expertise, new ventures can achieve higher performance in enterprise processes. Colombo [3] warns that there is a significant gap of input and output between the in-incubator firms and off-incubator firms, by a comparative study of Italian regions. Similar results were obtained by the researches on venture capitals. Macmillan [4] introduces the different decision model of venture capital, and Barry [2] indicates the venture capital has a positive impact on the competence of firms.

While the incubators and venture capital are both important, their interaction is becoming a more durable source of firms' competence and a flurry of scientific research on this question were induced. An international survey [12] of business incubation and venture capital published by Institute for Industrial Promotion (IPI) and International Organization for Knowledge Economy and Enterprise Development (IKED) indicated that, a good and fruitful relation between business incubators and venture capital can possibly guarantee a vital and fertile economic environment, in which entrepreneurial ideas can grow easily and financial, material and immaterial help is available at each and every development stage. Followed the conceptual

model built by Bergek [13], establishing the connection system between Incubators and venture capital became a prerequisite for firms' further development.

From the point of research methodology, researchers usually adopt the questionnaires. These studies include the survey conducted by Bergek [13] and Zhao [14] to explain the syncretism of incubators and venture capital. Chen [15] chose 122 minor enterprises in Taiwan, and used questionnaires. The international survey of IPI&IKED chose the incubators in 16 countries as the sample.

Despite the above attempts to study the role of incubators and venture capital, or their relatedness on the performance of new ventures, most studies have focused on the microcosmic description in some specific regions. Little progress has been made in macroscopical area, especially in Emerging Economies. In order to extend what so far has been only limited research on incubators and venture capital, this study establishes an evaluation method, applied in the empirical analysis of econometrics, to examine the effect of incubators service innovation on the venture capital of incubated firms.

## III. EVOLUTION ANALYSIS: THE PHASES OF TBIS AND VENTURE CAPITAL IN CHINA

Data collected on the two popular intervention approaches has been analyzed in terms of the different dimensions on their evolutions. The paper uses a general framework to analyze the different phases, namely emergence, growth and transition. For each phase, we examine the time phasing, the hallmark event, actors, dominant actors, and their linkages between incubators and VC.

### A. Emergence Phase

*China TBIs 1987-1996.* The establishment of Wuhan Donghu New Technology Innovation Center in 1987 could be regarded as the starting point of China's TBIs. Owing to the strong support of Chinese government, the number of incubators went from being virtually non-existent to 80, the tenants rose to 2670 and the total income of tenants rose to about 40 million yuan RMB in 1996. In the emergence phase, Policy and fund financial support was proposed as the main tools to promote TBIs by China Science and Technology Commission. The TBIs were viewed as an agency of Chinese government.

*China capital market 1990-1999.* China capital market started in 1990, with the opening of stock markets of Shanghai and Shenzhen. In 1992, China Securities Regulatory Commission (CSRC) was established to govern and regulate the market. In 1999, the 'PRC Securities Law' was issued, which symbolized the normative development of China capital market. In this period, many actors such as securities agencies, accounting firms, bonding and venture companies were emerging and increasing gradually. Along with the similar situation of China's TBIs, the earlier capital market was totally dominated by government in the emergence phase.

Actually, the different targets determined the separation between the capital market and TBIs system in the early period. TBIs system was established for assisting Medium

and small enterprises (SMEs) which was built by scientific researchers, while the early members of capital market were mainly the large enterprises. In this period, there was almost no linkage between TBIs and capital market.

TABLE I: THE EMERGENCE PHASE OF TBIS AND CAPITAL MARKET

	TBIs	Capital market
<b>Time period</b>	1987-1996	1990-1999
<b>Symbolic event</b>	The establishment of the first incubator in China	the opening of stock markets of Shanghai and Shenzhen
<b>main features</b>	project incubator, to place service first and development second, offer policy and funding	Attempt for the commercialize with standardization
<b>dominant</b>	government	government
<b>actors</b>	government, SMEs, few intermediary	government, large enterprises Securities Agency, accounting firm, bonding company and Venture Company
<b>linkage</b>	Almost Nonexistent	

B. Growth Phase

*China TBIs 1996-2009.* Because of the explosive growth of TBIs in China and corresponding challenges, the Congress of Hi-tech Innovation Service Center was held by China Science and Technology Commission in 1996. The development experience and future development planning of China’s TBIs were summarized and formulated in the conference, which marked a significant shift of incubators from quantity expansion to quality improvement. Following the strategy of indigenous innovation initiated by Chinese government, China’s TBIs were transformed from providing funding and policy supports only to engaging in commercialization of technology. Some incubators turn to be commercial institutes. In this period, the number of incubators increased from 80 to 772, and the business incubators have accelerated since 2000, as the average growth rate is 24.8% during 1999-2000 while it was only 9.6% during 1991-1998.

*China capital market 2000-2009.* With the rapid development of 20 years, there are splendid achievements in China capital market. But the immature market produced some serious problems, which resulted in the prolonged bear markets in 2000. In 2001, China’s WTO accession resulted in further improvement in its investment environment. To encourage the development of the capital market, the State Council issued the ‘advance on the capital market reform, opening up and stable development of a number of opinions’, commonly known as the ‘National 9’ in 2004. China capital market was already lifted to country-level strategy in this period.

Furthermore, the burst of the dotcom bubble in 2000 provided the opportunity for the interaction of TBIs and capital markets. Because of the lack of adequate knowledge of management, new product development experiences as well as financial resources, new ventures, represented by Internet enterprises, were difficult to survive in the crisis. Venture capital market gradually arisen as the supplements to traditional capital market.

TABLE II: THE GROWTH PHASE OF TBIS AND CAPITAL MARKET

	TBIs	Capital market
<b>Time period</b>	1996-2009	2000-2009
<b>Symbolic event</b>	The congress of ISC in Chongqing	China’s WTO accession and ‘Nation 9’
<b>main features</b>	Industrialization, the nature of some incubators turns to enterprise	governance listed companies, opening up and reform of the capital market, The rise of the venture capital market
<b>dominant</b>	Government and market	Government (CSRC)
<b>actors</b>	government, SMEs, intermediary,	government, large enterprises Securities Agency, accounting firm, bonding company and Venture Company
<b>linkage</b>	Primary convergence, financing platform	

C. Transition Phase

*China TBIs 2009 and onwards.* Due to the excessive dependance on the governmental support, TBIs and their tenants may face the predicament of high-risk and capital shortage. To solve this problem, China’s TBIs have shifted from providing funding and policy supports to constructing resource sharing network since 2009. Some new patterns of TBIs emerged in China. Representative patterns include (1) *Xiaguang model*, which refers to the collaboration networks involving ‘Incubators-Research institutions-Enterprises’ in Chongqing. (2) *SBI model*, which refers to the collaboration networks involving ‘Incubators-Real estate enterprises’ in Wuhan. (3) *Zhongguan Village model*, which refers to the collaboration, networks involving ‘Incubators-Venture Partners-Enterprises’ in Beijing. All these incubators focus on providing better conditions for firms to obtain business consulting, venture capital and customers.

TABLE III: THE TRANSITION PHASE OF TBIS AND CAPITAL MARKET

	TBIs	Capital market
<b>Time period</b>	2009-Now	2009-Now
<b>Symbolic event</b>	new patterns of TBIs emerged	China’s Growth Enterprise Market (GEM) board entered into force
<b>main features</b>	constructing resource sharing network with actors	The gradually matured of venture capital market, more attention to SMEs
<b>dominant</b>	Government and market	Government (CSRC)
<b>actors</b>	government, SMEs, intermediaries,	government, SMEs, accounting firm, venture investment company, bonding company and Venture Company
<b>convergence</b>	More Integrated	

*China capital market 2009 and onwards.* On March 31, 2009, with the approval from State Council, CSRC issued the China’s Growth Enterprise Market (GEM) board would enter into force on May 1, 2009. It means the start of Chinese growth enterprise market after 10-year preparation and also the new development stage of China capital market. The growth enterprise market will not only help the enterprises would listed in the growth enterprise board but

also will stimulate various venture capitals to invest in start-up enterprises in new industries with innovation and potential growth to support economy and upgrade China's industry structure. Up to now, there are 308 new ventures listed on the GEM, and realizing net profit about 23 billion yuan RMB.

Because of the transition of China's TBIs and the opening of the GEM, the TBIs and capital market becomes more integrated. The patterns of 'investing + incubating' resulted in widespread adoption, for marking up the weakness of operating independently.

IV. FACTORS ANALYSIS: HOW THE INCUBATORS ASSIST NEW VENTURES IN OBTAINING VENTURE CAPITAL?

Based on the statistical data for 344 state level TBIs in 2010 which from the China torch statistical yearbook 2011, we construct a regression model to evaluate the influencing indicators on the new ventures in obtaining venture capital, concluding the level of network, government grants and business support.

A. Regression Model and Assessment

This article considers the venture capital which obtained by new ventures influenced by three important factors, namely the level of network, government grants and business support, considering some other control variables like the size of the TBI, the capacity of the regional innovation where the TBI located, and the industry structure where the TBI located. The function expression of venture capital obtained by every incubator is shown as follows:

$$I_i = f(N_i, S_i, G_i, P_i, MSration_i, Size_i) \quad (1)$$

Where  $I_i$  is venture capital obtained by new ventures,  $N_i$  represents the level of network,  $S_i$  is the business support,  $G_i$  is the government grants,  $P_i$  is the invention patent numbers of the province which TBI located in, which indicated the capacity of the regional innovation.  $MSration_i$  is the ration of the secondary and tertiary industries, which indicated the industry structure.  $Size_i$  is the area of the TBI, which indicated the scale of the TBI. The logarithmic form of the equation allows heteroscedastic data to be avoided and improves the accuracy of the model estimation. This basic model is shown as follows:

$$\ln(I_i) = \alpha + \beta_1 \ln(N_i) + \beta_2 \ln(S_i) + \beta_3 \ln(G_i) + \beta_4 \ln(P_i) + \beta_5 \ln(MSration_i) + \beta_6 \ln(Size_i) + \varepsilon \quad (2)$$

Where  $i$  represents the  $i$ th incubator, and  $\alpha, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$  is linear coefficients of the estimations,  $\varepsilon$  is the error term.

This paper chooses the accumulated amount of venture capital for tenants as the indicator for measuring the new ventures obtaining venture capital. As the indicator of level of network is difficult to quantify, we choose the indicator of accumulated investment of the public service platform as the indicator for measuring the level of network. The indicator of comprehensive service income was chosen to measure the business support. Meanwhile, the indicator of the total incubator fund which provided by Chinese

government was chosen to measure the government grants. We use data from the China Statistical Yearbook 2011 and China torch statistical yearbook 2011.

Then we apply ordinary least squares (OLS) to estimate model. Table 4 shows the estimation results.

TABLE IV: REGRESSION ANALYSIS OF THE INFLUENCING FACTORS

Independent Variable	Standardised Coefficients	Significance	t	Std. Error
$\ln(N)$	0.195**	0.01	2.584	0.102
$\ln(S)$	-0.009	0.904	-0.121	0.098
$\ln(G)$	0.369***	0	5.252	0.120
$\ln(P)$	0.287***	0.002	1.685	0.302
$\ln(MSration)$	0.134**	0.031	2.223	0.027
$\ln(Size)$	-0.023	0.811	-0.169	0.097
R2	0.785			
Observations	344			

Note: \*, \*\*, \*\*\* represents 10%, 5% and 1% significance levels respectively.

B. Analysis of the Evaluation Results

The government grants and level of network seem to play important roles in achieving venture capital for new ventures. The business support has been commonly believed an efficient indicator to enhance the venture capital in developed country according to other scholars' researches [16] [17] [18] [19]. However, this is not supported by empirical evidence in China. Meanwhile, the capacity of the regional innovation and industry structure has a positive influence for new ventures' achieving venture capital, but the influence of the TBIs' size is not significant.

The enterprise-oriented reform has been pursued in China's TBIs since 2004. But compared to other countries, the governmental support is still the unique characteristics of China's TBIs. For instance, the pattern of 'Institution managed as enterprises' still played an important part in China's TBIs. However, it is worth noticing that with the emergence of the new patterns of TBIs, flexibility became more important for China's TBIs. The management system reform should be promoted for TBIs in the future. The result also shows that emergence of network has become a remarkable indicators for TBIs. The accumulated investment of the public service platform increased from 2.06 billion yuan RMB in 2008 to 4.07 billion yuan RMB in 2010, doubled in 2 years, which results in the resource sharing among different actors. Meanwhile, the results also show the weakness of the business support impeded China's TBIs development. For instance, the comprehensive service income is only 1.3 billion yuan RMB in 2010, only 35% of the total income of TBIs. Compared with developed countries, this proportion generally reaches about 85% to 90%. Rent business and property management is still the prime operating revenue of China's TBIs. This deficiency of business capacity may be the obstacle for new ventures obtaining the venture capital.

The capacity of the regional innovation and industry structure has a positive influence for new ventures' achieving venture capital. This indicated that the close connection between the venture capital and technological

innovation. TBIs' size has no significant effect on the new ventures achieving venture capital, which is indicated that the venture companies are more tend to the new ventures' prospect and advanced technique than the scale of the TBI.

#### V. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

Reviewing the evolution of incubators, venture capital and their correlation in China for the past 20 years, the paper divides China's incubators and venture capital into three phases: the emergence phase, the growth phase and the transition phase and the different features are discussed. The paper showed that the incubators and venture capital are getting increasingly connected; possibly guarantee a fertile economic environment for the development of new ventures. The research further explored the factors influencing the venture capital obtained by new ventures. The finding highlight the role of network and government-related of Chinese incubators in capacity building for new ventures to obtain venture capital. The empirical evidence indicates that the influence of business support of incubators is insignificant.

Relative to previous researches on single or regional incubators, this paper attempts to analyze the problem in terms of both macroscopic and evolution. There are however some insufficiencies in this paper, such as the ignoring of the influence of different scale, region and human resource. These are topics for subsequent researchers.

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