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Journal of High Technology Management Research



New economics of innovation: Strategies to support high-tech SMEs

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ARTICLE INFO

Available online xxxx

ABSTRACT

The purpose of this study is to explore the new economic challenge of China with regard to its innovation strategies to support high-tech small- and medium-sized enterprises (SMEs). In particular, the 12th National Economic and Social Development Plan was introduced to revolutionize the financial innovation system—opening border trade zones and increasing credit lending as well as risk capital for innovative businesses. The study has shown that the Chinese government has introduced many policy initiatives (government intervention policies) after the country joined the World Trade Organization (WTO) to catalyze trade expansion. The analyses provide policy insights that can be applied to strengthen Thailand's innovation system. The lessons learned from the study can also be applied to other emerging economies to use as policy guidelines in improving the efficiency of the national innovation system (NIS).

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1. Introduction

China represents the new economic challenge as the country has made dramatic economic progress to become the world's economic power. At present, it is one of the fastest growing economies in the world (the growth rate averaged 10% in the past decade and slowed down to 7% in 2015). China attempts to remodel itself towards an innovation-driven economy after joining the World Trade Organization (WTO) in 2001. After joining WTO, China has adopted trade liberalization policies and various government policies to drive the innovation system. This study will explore the government policies that drive the financial innovation system of China. The practice and lessons learned from the project findings can be applied to drive the innovation system in other developing countries.

The paper is organized as follows. [Section 2](#) reviews the theoretical framework on the national innovation system (NIS) and cluster development model to support innovation development. [Section 3](#) describes the research design and methods. [Section 4](#) analyzes the government policies and strategies to support high-tech small- and medium-sized enterprises (SMEs) and strengthen the financial innovation system of China. The analyses have highlighted the government policies and initiatives to support SMEs that can be applied to the case of Thailand and other developing economies. [Section 5](#) concludes the paper by drawing lessons and practical implications that can be used as policy guidelines to strengthen the innovation system.

2. Theoretical framework

2.1. National innovation system

The concept of NIS stresses the importance of networking among the actors and institutions. In other words, NIS is the interactive system of existing institutions, private and public firms (either large or small), universities and government agencies, aiming at the

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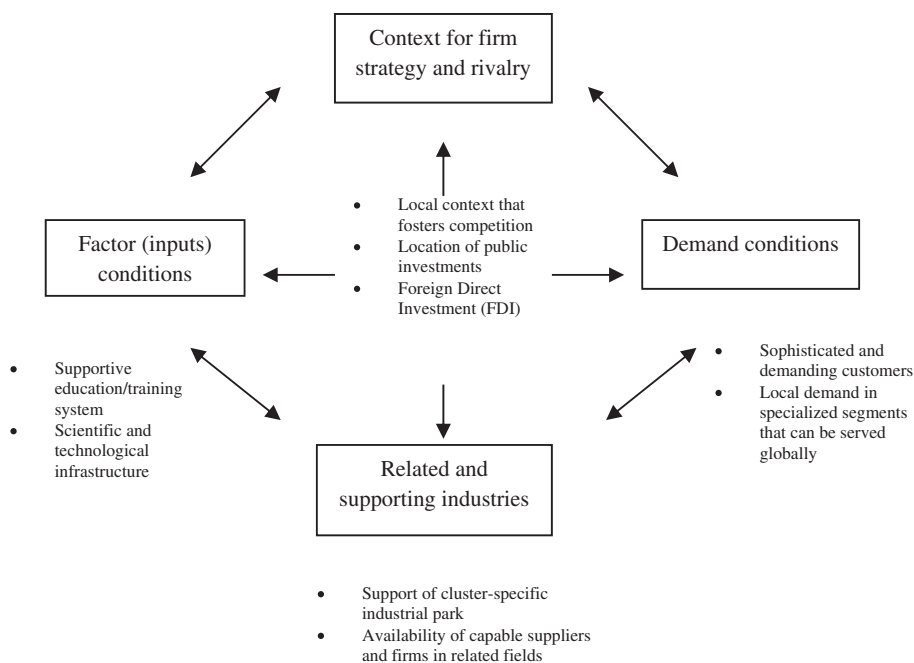
production, diffusion and exploitation of knowledge within national borders (Fagerberg & Srholec, 2008; Freeman, 1987; Guan & Chen, 2012; Lundvall, 1992, 1998, 1999, 2003; Nelson, 1988, 1993). Interactions can be achieved by both market mechanism and non-market mechanisms such as collaboration and long-term network arrangements. The NIS concept is a dynamic tool to investigate, formulate, plan and position the national economic and social development by using technology and innovation as the main driving force (Lundvall, 1992, 1998, 1999, 2003).

An understanding of NIS can help policy makers develop approaches to enhance the nation's innovation performance. The NIS studies explore the interrelations between technological development and the institutional embeddedness of innovative organizations (Freeman, 1987, 1988, 1992; Guan & Chen, 2012; Fagerberg & Srholec, 2008; Lundvall, 1992, 1993, 1998, 1999, 2003; Nelson, 1988, 1993 among others). The level of resources devoted by each nation to research and development (R&D) and innovative activities represents a basic characteristic of the NIS (Lundvall, 1992; Mjøset, 1992; Nelson, 1993). Determinants of national economic performance and technological capabilities are the size of a country, R&D intensity and market structure (Archibugi & Michie, 1997; Freeman, 1987).

Schumpeter (1939, 1967) argues that finance and financial institutions are the mainstream of innovation system as well as crucial determinants of the entrepreneurial ability to develop the new economy. The entrepreneurial firms are seen as playing a crucial role to the economy in terms of creating jobs contributing to economic growth. The financial innovation system provides specific institutional frameworks and interlinkages with financial markets, government agencies, financial institutions, regulatory authorities and research organizations to support innovation activities and strengthen technological capabilities at sectoral and national levels (Archibugi, Howells, & Michie, 1999; Malerba, 2002; Patel & Pavitt, 1994; Pavitt, 1984). The financial innovation system thus provides necessary resources required for financing enterprises to enhance economic performance within the NIS (Hyytinen & Toivanen, 2005; Mani, 2004).

2.2. Cluster model to support innovation development

The cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (Porter, 1990, 2001). It is an economic development model that promotes collaboration among institutions to facilitate the exchange of information and technology. Porter's Diamond Model (Fig. 1) provides a framework for understanding the collaboration/networking between the government sector and the industry sector in the form of clusters (Porter, 1990, 2001). It is argued that geographical concentration enhances interaction processes within the competitive Diamond Model. The four attributes (1. factor conditions, 2. demand conditions, 3. context for firm strategy and rivalry, 4. related and supporting industries) are self-reinforcing and catalyze the process of continuous innovations. The model focuses upon the conditions that support firm competitiveness at the national scale (Fig. 1).



Source: Porter (1990, 2001)

Fig. 1. Porter's Diamond Model: Determinants of regional productivity.

Porter (1998) has pointed to the role of clusters as an important part of the new economics of competition. He argued that the interactions between the various agents of the nation help achieve considerable synergy. Clusters lead to increased levels of productivity, growth and employment (Feldman, 2000; Gnyawali & Srivastava, 2013; Porter, 1990, 2001; Steiner, 1998). The cluster-based policies can help facilitate innovation and support transdisciplinary research networks among academics and entrepreneurs to promote the clusters' regional advantage (Saxenian, 1994, 2006). The national innovative capacity depends on the strength of a nation's institutional factors and infrastructure, and industrial clusters (Furman, Porter, & Stern, 2002). The connections and interactions within the cluster are important in that a set of institutions and financial policies could support the efforts of R&D institutions and industries toward effective technology commercialization, bringing about business creation and economic growth.

The government policies are one of the important determinants contributing to the national competitiveness under Porter's Diamond Model. Arguably, the government financing policies play an important role in driving the innovation system in developing countries (Mani, 2004). Innovation financing policies are among the key operational priorities in developing countries to support investment by local firms, especially SMEs, and transnational corporations investing in these countries. Under the challenge of a knowledge-based society, it is interesting to see that the cluster development (Porter, 1990, 2001) model needs appropriate policy framework to improve the conditions for innovation.

3. Research methodology

There is a wealth of literature in the NIS (Edquist & Lundvall, 1993; Freeman, 1987; Lundvall, 1992, 1998, 1999, 2003; Nelson, 1988, 1993), but to date only limited research has been carried out with respect to the innovation financing system. Even less is in the area of policies that are essential for strengthening the innovation system. It seems reasonable, therefore, to study this neglected area with a focus on policy perspectives in supporting the innovation financing system in the country case of China, the world's fastest-growing major economy.

This research employs a case study methodology (Eisenhardt, 1989; Yin, 2003). The research is focused on the policy perspectives of China's strategies and policy initiatives to support high-tech SMEs. The research fieldwork and interviews were undertaken in Beijing and Shanghai, major financial centers in China, with the use of semi-structured questionnaire. The research also derives evidence from a collection of documentary investigation. The conduct of fieldwork interviews in the financial sector of China was coordinated by the Bank of Thailand, the Securities and Exchange Commission and the Thai Chamber of Commerce in China. The interviews were carried out with the major institutions in China and Thailand including Bank of Beijing, Huaxia Bank, China Citic Bank, United Overseas Bank (UOB), Bank of China, Bank of Shanghai, Bangkok Bank China Co., Ltd., Siam Commercial Bank Public Co., Ltd., Thai Chamber of Commerce in China, Bank of Thailand and Thailand's Securities and Exchange Commission.

In particular, the research study is focused on the innovation financing policies/programs, policies to reform the banking system, and venture capital (VC) policies. The key questions guiding the research are:

- What are the Chinese government's strategies to support high-tech SMEs?
- What innovation financing policies support the innovation system under the NIS framework in China?

In order to provide a cross-check on internal validity, interview data are supported by an examination of secondary data. The conduct and analysis of the country case studies have enabled the development of conclusions and recommendations for the research. The analyses of China's policy initiatives to support high-tech SMEs provide lessons and insights which would be useful for Thailand to strengthen its innovation system. Other emerging economies can also use the lessons learned from the study to improve the efficiency of the NIS.

4. Analyses of findings

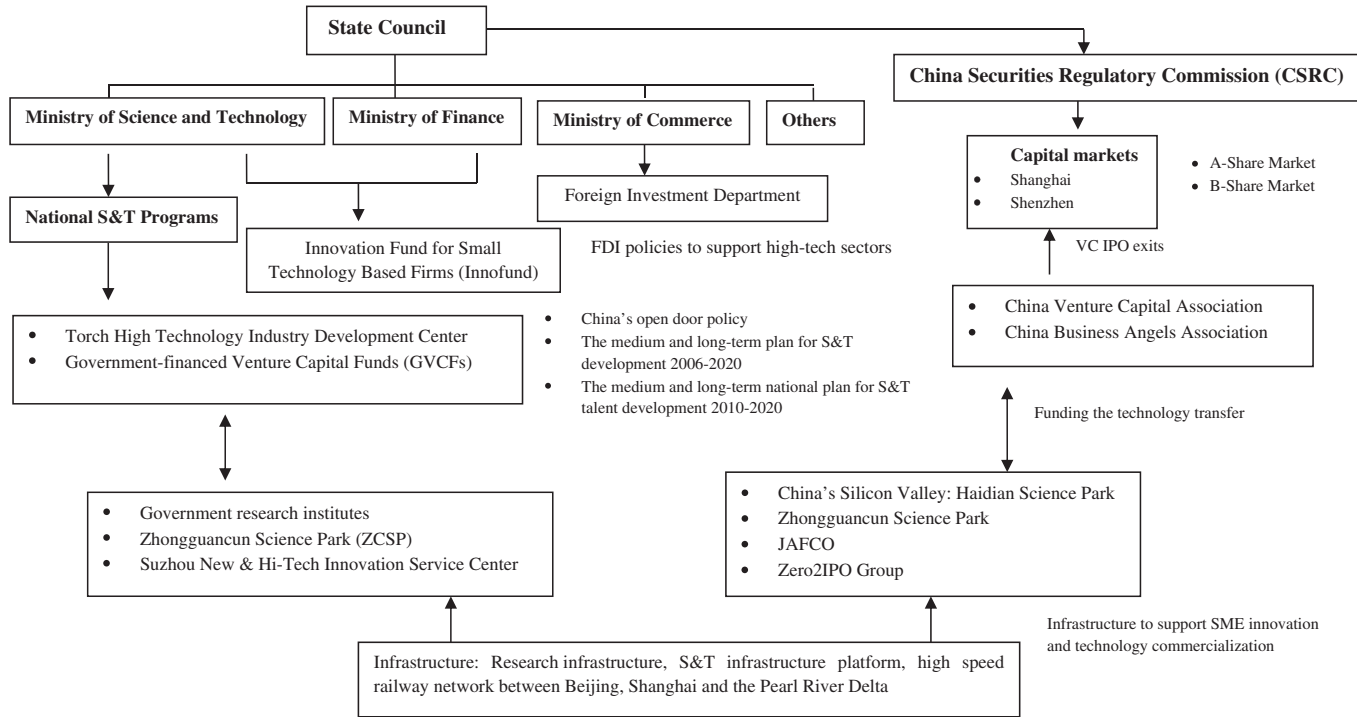
China is the fastest-growing major economy in the world with an average gross domestic product (GDP) growth rate of 10% in the past decade (the economy is slowing down to 7% in 2015). An overview of the economic and innovation performance of China compared with Thailand is shown in Table 1. China was given the 28th position in the International Institute for Management Development (IMD) world competitiveness ranking in 2014. The country was also placed in 28th position by the World Economic

Table 1

Overview of economic and innovation performance of China compared with Thailand.

Indicators	China	Thailand
Population (million), year 2014	1393	67.2
Gross domestic product (GDP) (USD billion), year 2014	17,617.3	985.5
GDP growth (%), year 2014	7.4	0.7
IMD world competitiveness ranking, year 2014	22	30
WEF competitiveness ranking, years 2014–2015	28	31
Knowledge Economy Index, (KEI) year 2014		
KEI Index	4.37	5.21
Innovation subindex scores	5.99	5.95
Percentage of R&D expenditure to GDP, year 2014	1.95	1

Source: The author's design, based on the World Competitiveness Scoreboard by International Institute for Management Development (IMD), World Economic Forum (WEF) Global Competitiveness Report, World Bank, United Nations Conference on Trade and Development (UNCTAD), and International Monetary Fund (IMF).



Source: The author's design

Fig. 2. Policies, strategies and institutional settings to support high-tech SMEs in China.

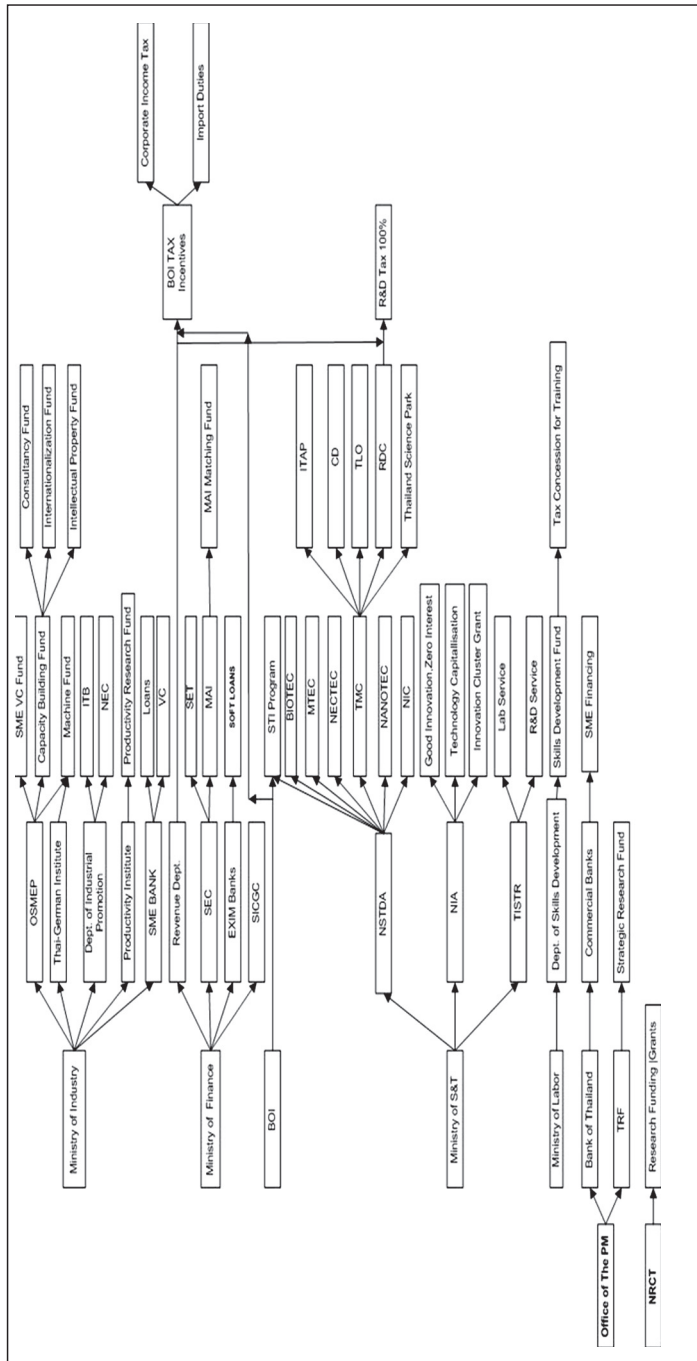


Fig. 3. Policies, strategies and institutional settings to support SMEs in Thailand.

Source: The author's design

Forum (WEF) in 2014–2015. After China joined the World Trade Organization (WTO) in 2001, its government has launched various innovation policies to catch up with leading-edge countries. Realizing the importance of SMEs in economic development (as SMEs account for 90% of the total number of companies in China), the Chinese government has implemented SME policies to revolutionize the financial innovation system.

Taking into account the important role of banks in providing the capital and credits to emerging enterprises in China, one major strategy of the Chinese government was implementing financial sector reforms and establishing national policies to accelerate the development of innovation system. The 12th National Economic and Social Development Plan (5-year plan) is the major government policy that places a specific emphasis on supporting SMEs in terms of creating an environment conducive to entrepreneurship and innovation for SMEs.

The Chinese government has intensified its effort to attract foreign direct investment (FDI) to support the industries. To put it another way, the FDI policies have helped the country access foreign capital and technologies. The open door policy has enabled China to remodel itself from an agriculture-based economy toward an innovation-driven economy. Considering the economic and innovation performance of China and the US (Table 1), it can be seen that the percentage of R&D expenditure to GDP is 1.6 compared to the US of 2.8 in 2012. However, China plans to invest 2.5% of its GDP in R&D in 2020. Regarding the innovation indicator of publications, China also has far fewer scientific journal publications than the US.

Fig. 2 depicts the policies, strategies as well as the institutional settings to support high-tech SMEs in China. Interestingly, the government plays an important role in developing policies and strategies to support the innovation system, for example, the Decision on Developing High-Tech and Realizing Industrialization (CCCP) sets forth the tenth plan (2001–2005) to promote S&T based innovation commercialization. The Guideline for Developing National University Science Parks provides a plan to promote the development of university science parks. The government policy in encouraging R&D can be seen as a result of adopting Deng Xiaoping’s open door policy to encourage foreign investments and attract new technologies. The major policy of the Ministry of Science and Technology includes the guidelines on national medium- and long-term program for science and technology development during the period of 2006–2020.

Fig. 3 depicts the policies, strategies as well as the institutional settings to support SMEs in Thailand. The Thai government; through Ministry of Science and Technology (S&T), Ministry of Industry, Ministry of Finance, Ministry of Labor and other institutions/agencies, has established various financing schemes including the financing innovation policies of loan/grant programs, R&D tax incentives as well as capital market rules/regulations to build up an innovative capacity within the NIS.

4.1. Innovation financing policies/programs towards high-tech economy of China

The innovation policies and strategies under the political leadership of President Hu Jintao can be seen as a continuation of using an open door policy to improve financing mechanisms and provide financial funds to support SMEs. The Chinese government provides grants, loans and other incentives (such as tax incentives for R&D, low income tax rates for high-technology enterprises) to drive innovation and growth. The innovation financing policies can be seen as a result of government intervention in the financial market to fill the SME financing gap.

The Ministry of Science and Technology plays a significant role in the design and implementation of the national innovation policies. The special economic zones (SEZs) and science parks were established to foster new technology development. In particular, the Torch Program was developed to support the creation of industrial clusters. The national Science & Technology Industrial Parks (STIPs) were established to support high-technology enterprises. Up to now, there are 54 national STIPs established by the Torch Program to promote the development of innovation clusters and advance upgrades in high technologies. Although China has introduced various policies to support technology development, the process of technology transfer and commercialization is not very successful due to the weak links and interactions between the university and industry.

The policies to develop the financial centers, particularly the policies to reform the banking system, were guided by the central government. The reform of banks is aimed at providing the newly emerging enterprises with the needed capital. The Big Five banks providing a major source of credit for SMEs in China are the Industrial and Commercial Bank of China, Agricultural Bank of China, China Construction Bank, Bank of China, and Bank of Communications. Table 2 shows the performance of the Big Five accounting for 47.3% of total market share.

Table 2
Performance of the Big Five (USD million).

Bank	Total assets		Operating income		Total loans		Growth rate per annum	
	2010	2011	2010	2011	2010	2011	2010	2011
Industrial and Commercial Bank of China	2,195,534	2,524,775	62,124	76,770	1,107,750	1,270,619	22.68	23.32
Agricultural Bank of China	1,686,363	1,904,988	47,676	61,950	781,078	880,728	22.23	20.26
China Construction Bank	2,003,562	1,763,510	52,771	64,778	901,472	1,031,842	22.45	22.36
Bank of China	1,706,340	1,929,864	45,158	53,534	903,387	1,011,931	18.68	18.10
Bank of Communications	644,632	752,231	17,004	20,711	364,915	417,904	20.08	20.49

Source: China Securities Regulatory Commission.

Please cite this article as: Wonglimpiyarat, J., New economics of innovation: Strategies to support high-tech SMEs, *Journal of High Technology Management Research* (2015), <http://dx.doi.org/10.1016/j.jhitech.2015.09.006>

Table 3

Comparison of policy mechanisms and government programs in China and Thailand.

	China	Thailand
1. Major organization regulating the financial institutions	China Banking Regulatory Committee (CBRC)	Bank of Thailand
2. National policies/programmes to support SMEs	The 12th National Economic and Social Development Plan which emphasizes credit lending and financing to SMEs	The 10th and 11th National Economic and Social Development Plans (years 2007–2016) which emphasize SME innovation and competitiveness
3. Major bank providing funding supports to SMEs	China Minsheng Bank (non-government controlled bank)	Small and Medium Enterprise Development Bank of Thailand (SME Bank) under the supervision of the Ministry of Finance and the Ministry of Industry
4. The establishment of stock markets for technology-based firms	Shanghai Stock Exchange is a NASDAQ-equivalent stock market to support high-growth technology-based businesses	No particular stock market to support technology-based firms in Thailand
5. Main organization supervising and administering the capital market	China Securities Regulatory Commission (CSRC)	Securities and Exchange Commission (SEC)
6. Major banks in the financial system	The 'Big 5' comprises the Industrial and Commercial Bank, Bank of China, China Construction Bank, Agricultural Bank of China and Bank of Communications accounting for 47.3% of the market share	The major commercial banks comprise Bangkok Bank Public Co., Ltd., Krung Thai Bank Public Co., Ltd., Siam Commercial Bank Public Co., Ltd., Kasikorn Bank Public Co., Ltd., with total market share of 63.4%
7. Specialized banks providing credits according to the government policy	China Agricultural Development Bank, China Development Bank, The Export–Import Bank of China, China Postal Savings Bank	Small and Medium Enterprise Development Bank of Thailand, Bank for Agriculture and Agricultural Co-operatives, Export–Import Bank of Thailand, Government Savings Bank, Islamic Bank of Thailand, Government Housing Bank, Secondary Mortgage Corporation, Thai Credit Guarantee Corporation
8. Venture capital (VC) system to support SMEs	China's VC industry is in an early stage of development. Zero2IPO Group is a major VC fund in China.	Thailand's VC industry is not yet developed. The VC industry is not well supported by the government.

Source: The author's design.

As a result of the 12th National Economic and Social Development Plan, the Beijing Municipal Government supports Chinese financial institutions in setting up SME credit departments. The policies of the Beijing municipal government put greater emphasis in upgrading small scale financial institutions into commercial banks so as to facilitate SMEs' access to finance. Table 3 shows the granted credits in China. As a result of the implementation of this credit policy, it can be seen that the total loan amounts granted to SMEs account for approximately USD 3.53 billion (from total credits granted of USD 7.06 billion in 2011).

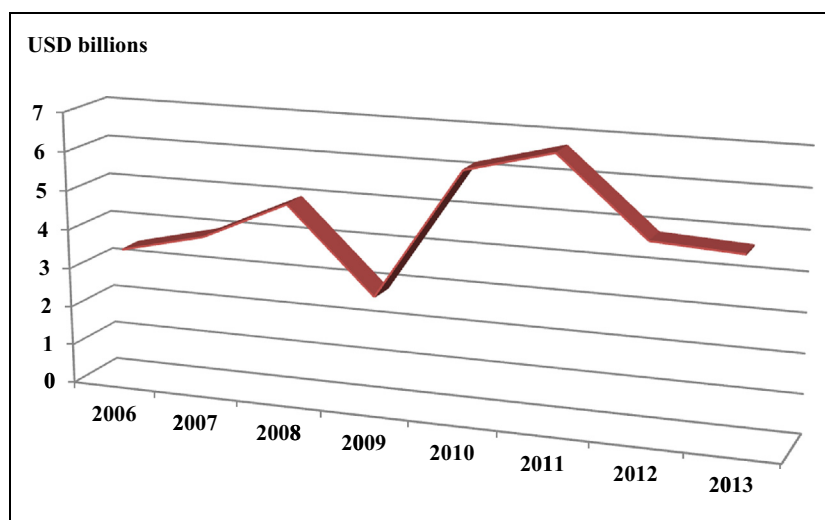
Taking into account the VC financing, the VC industry in China is not well developed and limited in scale due to the regulatory restrictions of fund-raising. The China Venture Capital Association (CVCA) was established in 2002 to promote government policies conducive to the development of VC industry. The government-financed venture capital funds (GVCFs) was established in 1993 in Guangdong, Jiangsu, Zhejiang and Shanghai together with the formation of University-backed venture capital funds (UVCFs) to provide university incubating services and encourage the process of technology commercialization. At present, the VC industry is dominated by international VC funds. The international VCs have helped build the high-tech industries of internet and networking as can be seen from the successful enterprises like Lenovo and Huawei Technologies.

Fig. 4 shows VC investments in China during the years 2006–2013. Most of the VC investments are in the sectors of internet, clean technology, electronics and optoelectronic equipment, telecom and value-added services. The centers of VC industry are Beijing, Shanghai, Chengdu and Shenzhen. Zero2IPO Capital is the major VC corporation among others (such as Accel Partners–Beijing, Redpoint Ventures–China, Sequoia Capital–Beijing, CSR Ventures–Beijing–China, Eastern Bell Venture Capital, Walden International–Shanghai–China, Warburg Pincus–Beijing–China, VantagePoint Venture Partners–Beijing–China, Vivo Ventures–Chengdu–China) targeting investments in high-potential an high-growth companies.

4.2. New economics of China and the lessons for Thailand

At present, Thailand has tried to make the transition from a middle-income country to an innovation economy. The government has realized the importance of supporting SMEs to build innovative capabilities of the nation. The analyses of China's policy initiatives to support high-tech SMEs provide important lessons that can be applied to strengthen Thailand's innovation system. Interestingly, the case of China's innovation system represents the country-specific configuration of interacting institutions and government policies to support high-tech SMEs. The case of China provides useful practice and lessons that can be applied to other developing countries. In the developing country like Thailand, the government has set direction and gained commitment through the National Economic and Social Development Plans and phased programs. Table 3 compares the policy mechanisms and government programs to drive the financial innovation system in China and Thailand.

The challenges of Thailand entail the development of science, technology and innovation capabilities. Strategically, the government should take a more active role to drive the VC industry via effective financing programs and tax incentives for R&D (the lessons from China's policy—the central government of China has stimulated the growth of VC and high-tech clusters via offering special policies and tax incentives for firms in Beijing's Zhongguanchun Science Park as part of the 12th National Economic and Social Development Plan). In driving the growth of VC industry in Thailand which is in an initial stage, the policies should emphasize the interactions among institutions within the innovation system whereby the government policies and programs should be defined more precisely to fund and promote new ventures. Other emerging economies can also use the lessons and policy insights from the case of China as policy guidelines to improve the efficiency of their innovation systems.



Source: Dow Jones VentureSource

Fig. 4. VC investments in China from 2006 to 2013 (in USD billions).

Table 4

Policy aspects and characteristics of the innovation system—China.

	China policy initiatives to support high-tech SMEs
Characteristics of innovation system	<ul style="list-style-type: none"> • Innovation system driven by government policies (state intervention) • Entrepreneurship style of using imported goods and ideas to create innovations • At present, China has incorporated the aspect of innovation as its culture. It is part of the Chinese dream according to President Xi Jinping's policy initiatives of (i) Patriotism (aiguo), (ii) Innovation (chuangxin), (iii) Inclusiveness (baorong) and (iv) Morality (houde).
Culture of innovation	
Basis of innovation	<ul style="list-style-type: none"> • Commercial copying and replication • The central government has introduced the 12th Five-Year National Economic and Social Development Plan to support innovative SMEs through bank financing
Intellectual Property (IP) policies	
Productivity factor	<ul style="list-style-type: none"> • Insufficient protection of intellectual property rights (ineffective government policy to punish piracy and infringement of IPs) • Cheap labor costs enable the capability to undercut prices in market competition
Capital market operation	
Business angel and venture capital (VC) industry	<ul style="list-style-type: none"> • The operation of Shanghai Stock Exchange and Shenzhen Stock Exchange to provide money-raising channel for SMEs but their functions are not NASDAQ equivalent • China has the formal business angel market but its business angel community is still small • The Chinese VC industry is growing but still needs incentive programs to foster the developing economy

Source: The author's design.

5. Conclusions

This study explores the new economic challenge of China with regard to its innovation strategies to support high-tech SMEs. The study also explores the institutional settings within the financial innovation system of China. The analysis is based on the NIS approach. The results show the country-specific configuration of interacting institutions to promote industrial technological capabilities. It is interesting to see that the public policy plays an important role in building an innovation system in China (government intervention policies). The analyses have shown weak links and interactions among institutions underlying the innovation system in the case of China. The study has also shown that the Chinese economy is mainly driven by the government intervention policies.

The analyses of findings provide interesting insights on policy aspects and challenges of China's innovation system as shown in Table 4.

Building innovative capabilities of the nation is highly regarded as a very important factor for increasing and sustaining the national competitiveness. The present government headed by President Xi Jinping has emphasized the aspect of innovation strategy (President Xi Jinping statement on the Chinese dream focusing on patriotism, innovation, inclusiveness, morality). However, it is argued that dynamic interactions within China's innovation system should be further strengthened. The development of the innovation system needs incentives to support SMEs as there is a lack of finance to support high technology industries and VC mechanisms are not fully developed in China. Further, the government policies should encourage the private sector to take up more VC investments to build high-tech SMEs for improving national competitiveness.

Acknowledgements

This work was supported by Thailand Research Fund (contract no. RDG 5510019). The author is thankful to Dr. Pravit Khaemasunun, Mr. Yanathip Techawiset (Thammasat University), Professor Shufen Dai (University of Science and Technology Beijing) and Miss Kesrin Ariyaponges (Thai Chamber of Commerce in China) for all research advice and support.

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