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Investing for upgrading: the emergence of financial system of science and technology in China's Pearl River Delta

Abstract: This article discusses the recent reform policy in China on setting up new financial system for supporting science and technology innovation. Based on the financial sector development in the Pearl River Delta in China's Guangdong Province, especially Guangzhou, one pilot city of Chinese Science and Technology Financial System Reform, the article analyses the problems in financial system and makes some suggestion on how to restructure the financial system to meet the financial need of local emerging high-tech industry and small and medium-sized enterprises (SMEs).

Keywords: SMEs Finance; Financial System; Science and Technology; Emerging High-Tech Industry; China.

1. Introduction

This study is a preliminary result of the research project Development Mechanism and Path of Emerging Strategic Industries of Guangdong Province: From the Perspective of Science and Technology Innovation Platform (project No. GD12XGL08). The project has financial support from Guangdong Province Humanities and Social Science Fund, and the Innovation Prosper University Programme: Two-way International Talent Flow and Industrial Upgrading, sponsored by Guangdong University of Finance.

Raising money for SMEs is full of challenges. In developed countries, the world financial crisis has damaged the availability of external financing for SMEs. Neil Lee, et al. (2014) find that high-tech SMEs are more likely to be turned down for financing than other firms, and this situation has worsened significantly in the crisis. In economies under transition, such as China, the effect of financial repression and financial crisis together make high-tech SMEs more difficult in getting financial aid.

Although Chinese government always highlights to support high-tech SMEs, until 2006, the Ministry of Science and Technology has used to pay more attention to enterprise's R&D and the commercialization of

new technologies in the market. It is from 2006 that the Chinese Ministry of Science began to emphasize financing SMEs, because their market success needs money to commercialize technologies. Chinese government considers high-tech SMEs as a whole industry to be managed and put forward a new concept of "Strategic Emerging Industry", which in fact refers to emerging high-tech industry in China.

An overall understanding of the change in China's financial environment would help discuss the issue of Chinese high-tech SMEs' finance. Since 1978, Chinese financial reforms could be divided into four stages: An early stage up to 1990 represents the beginning of reform; 1991 to 2005, the Jiang-Zhu era with bold reforms; 2005–2013, the Hu-Wen era with fading reforms; and since 2013, Xi-Li era with new bold reform. In the first stage, the People's Bank of China is designated as central bank and its commercial banking functions were split off into four independent but State-owned banks: the Bank of China, the Agricultural Bank of China, China Construction Bank, Industrial and Commercial Bank of China. In the second stage, with China's accession to WTO, the four state-owned banks were recapitalized and restructured as joint-stock commercial banks. The

other reform included the creation of a national social security fund and the opening of the Chinese bond and stock markets. In the third stage, Chinese government weakened financial liberalization process and the State-owned Banks controlled most of loans to Chinese enterprises. Due to the assessment pressure of appreciation of state-owned assets and the fear of lending risk, the State-owned banks preferred to grant loans to big State-owned enterprises than to SMEs. In fact, most Chinese private SMEs had difficulty to have access to bank credits. In the fourth stage, the new government encourages the development of medium-small commercial banks and internet finance in order to help SMEs. In addition, Chinese government plans to set the "new third board" market for high-tech SMEs, following the example of NASDAQ in the United States.

As a matter of fact, starting from the third stage, the Chinese government has taken substantial actions to remove the access obstacles of finance to high-tech SMEs. The famous action is the launching of the reform of financial system of science and technology. The Chinese concept of science and technology finance is developed by Zhao Changwen et al. (2009) as a series of systematic and innovative arrangement of financial instruments, financial systems, financial policies and financial services in order to promote technology development, technology transfer and development of high and new technology industries. Science and technology finance is a system integrating all players and their activities, consisted of governments, firms, market, social intermediaries. It is one specialized part of a country's national innovation system and provides financial supports and services to innovation. Through the guidance of the theory of Zhao Changwen and other Chinese scholars in finance, the Chinese government launched a series of reform in science and technology finance from the local city level to central government level. Guangzhou, the capital city of Guangdong Province, was selected as one pilot city to implement this new policy. The Chinese central government hopes local government could restructure existing financial system towards a new science and technology finance system in order to support the development emerging high-tech industry.

This research seeks to identify the main the problems of the reform of financial system of science and technology in the Pearl River Delta region in Guangdong, in relation to the development of its emerging high-tech industries. The practical purpose is to design some concrete financial methods and policies to support emerging high-tech industry in the region. The remaining part of

the paper is organized as follows: Section 2 presents a literature review on financial system of science and technology; Section 3 introduces the development of emerging high-tech industry and the relevant financial system. This section describes the financial system reform of science and technology and its impact on emerging high-tech industry. The empirical data in Section 3 is mainly based on our interviews in Guangzhou and Shenzhen. Section 4 gives some policy suggestions on restructuring the financial system of science and technology. The analysis reveals some problems of the emerging financial system of science and technology in supporting technological innovation.

2. Literature review: what financial system for investing in technological innovation?

In developing countries, the financing problem of high-tech SMEs has long been considered from macroscopic than from microcosmic problem, since the finance is often under tight control of State and capital market is in gradual process of development. For example, the Chinese government carries out the reform of financial system of science and technology in hoping to promote the emergence of the whole high-tech industry rather than specific SMEs. Therefore, it is worth reviewing the relationship between high-tech industry and financial development.

The theories of financial repression and financial deepening systematically explained the relationship between industry and finance. McKinnon and Shaw (1973) argued that the economy of developing countries was characterized of segmentation, imperfect capital market, failure of capital stock regulation, and as a result, SMEs face financial problems when engaged in technological innovation. Thus they suggested that financial liberalization would effectively support the development of SMEs and the whole high-tech industry. Financial system of science and technology only appears at the advanced stage of financial deepening, based on the development of long term capital financing institutions such as investment banks, insurance companies and stock market. Nevertheless, frequent financial crises have seriously harmed developing countries' economy when these countries widely implemented McKinnon and Shaw's theory.

By applying optimization method, King and R. Levine (1993) made some adjustments of McKinnon's theory and proposed a financial development theory based on endogenous growth theory. They argued that transaction costs associated with financial uncertainty and information asymmetry would seriously influence

the economy, and to a certain degree of development, the economy would inherently require to restructure its financial system for reducing transaction costs. As a result, they proposed that developing country should rebuild a financial system for new industry.

At more micro level, the problem of insufficient finance to innovation lies in the fact of risk or uncertainty of innovation. Knight distinguishes between risk and uncertainty on the basis of a taxonomy of “probability situations”. Situations of “risk” are ones in which it is possible to calculate numerically definite probabilities. Situations of “uncertainty” are ones in which only “estimates” can be formulated. While for Keynes, the terms risk and uncertainty describe rather the various degrees of rational belief. The so-called probability of risk is “objective” insofar as it corresponds to what can be logically deduced from the facts, which in turn corresponds to the degree of belief that is “rational” to hold (Feduzi, A., J. Runde and C. Zappia, 2014). Technological innovation is regarded as a process bearing much more uncertainty than risk. On the other hand, since uncertainty means minimal information which impedes the calculation of probabilities, to shift from uncertainty to risk, or from risk to certainty, means having more information. In history, classification of unique objects and events into homogeneous categories was a necessary first step in turning idiosyncratic uncertainties into calculable risks, and rating agencies accomplished this by developing a standardized ordinal category system into which firms were classified (Carruthers, B. G., 2013). However, in technological innovation, such kind of rating system of projects has not yet been fully developed.

The research of Chinese scholars are more oriented to answer the policy question on what kind of financial system shall be established to effectively choose and incubate projects of high-tech industry development. Gu Haifeng conducted a survey on Chinese financial system reform to support Chinese emerging high-tech industry (2013, 2012, 2011a, 2011b). He mentioned that the capital market restructuring should cover the whole development stages of emerging high-tech industry, i.e., from incubating, culturing to upgrading. He suggested that government should set up policy institutions of finance, while private financial institutions should actively develop new business. Only by relying on the strength of capital market and policy financial institutions can the emerging high-tech industry be boosted greatly. Guangdong Science and Technology Department and Guangdong University of Finance (2014) identify different financial institutions and financing instruments for dif-

ferent stages of newly created firms based on technological innovation. For example, incubators, micro-credits and IP financing for seeds stage; angel investment, investment-lending-guaranteeing combination, financial leasing, financialization of technology products, SME bonds issuing, trust and OTC market for start-up stage; securitization of assets, VC, commercial notes financing for development stage; PE, IPO, corporate bonds and acceptance of drafts for the stage of maturity. Other Chinese scholars discussed the issues on the cooperation between emerging high-tech industry and various financial institutions such as banks, venture capital firms, private equity firms, guarantee companies, etc. (Yao Yi, et.al, 2012; Hu Bin, et.al, 2014). The main implication was to coordinate the policy financial instrument and capital market together for promoting emerging high-tech industry.

The above research demonstrates that developing countries shall restructure its financial system in order to promote emerging high-tech industry. But how to restructure the financial system depends on specific country's industrial characteristics and general environment of firms (for instance, risk sharing, talents, and information sharing, et.al). These factors can determine the different paths of development of policy financial institutions, and the ways that lead funds, technology banks, or venture capital firms lever private financial resources for supporting emerging high-tech industry. Specifically, Chinese regional economic differences are enormous and the characteristics of regional financial systems and emerging high-tech industries can be entirely different. So if a regional government wants to reform its financial system for science and technology, it has to first of all a deep knowledge on local financial systems and local industrial characteristics.

3. Restructuring regional financial system of science and technology: effect on emerging high-tech industry in Guangzhou

Guangzhou is one of the pilot cities of science and technology financial reform in China. 200 km away from Guangzhou, the city of Shenzhen is the center of capital market in southern China. Although these two cities lie in the same province- Guangdong province, they have different local financial systems. Guangzhou has stronger fiscal budget rights as administrative capital of Guangdong, which, in 2014 had fiscal revenue surpassing RMB 726 billion, ranking the first in the all provinces of China. All the State-owned bank branches are concentrated in Guangzhou. Thus the financial system of Guangzhou has an obvious advantage in terms of policy banks. As

for Shenzhen, it has much bigger influence in Chinese capital market. Nearly all big companies in Guangzhou have listed in capital market of Shenzhen. Most of equity investment institutions in Southern China are concentrated in Shenzhen. Comparatively, the capital market of Guangzhou is under-developed.

We take the emerging high-tech industry in Guangzhou as an example to highlight the effect of financial system of science and technology on local industrial development. In 2012, the added value of Guangzhou's emerging high-tech industry reached RMB 128.7 billion. Guangzhou's emerging high-tech industry includes sectors of new generation information technology, biology and health, new material, fashion, new energy and environmental protection, new energy vehicles. Among these sectors, the new generation information technology industry is boosted by the rapid development of new generation communication network, internet of objects, light-emitting diode, and new flat panel display. This sector is composed fully of private enterprises. The scale of the new material sector in Guangzhou is also large. It has formed industrial clusters with several big joint-stock companies of mixed ownership and a swarm of SMEs. The scale of biology and health sector is comparatively small and it has no much advantage. In this sector, there are foreign invested firms, State-owned firms and joint-equity enterprises. The fashion sector of Guangzhou is most distinctive, ranking just after Beijing and Shanghai in China. In the fashion sector, there are some famous local cartoons and animation brands. The new energy and environmental protection sector is still in its early development stage with a comparatively low consumption level. The new energy vehicles sector is facing the technical bottlenecks of battery performance and cost problem.

From 2008, Guangzhou municipal government tries makes efforts to attract equity investment institutions and builds a local center for equity transaction. By tapping on capital market, local emerging high-tech industry develops quickly. In 2012, Guangzhou's emerging high-tech industry has achieved 9.5% share of GDP, with a growth rate of 15.4%. The reform of financial system of science and technology, including the development of equity investment institutions of science and technology, the multilevel capital market, and the new services of traditional financial institutions, all has positive effect on the emergence of high-tech industry of SMEs in Guangzhou.

First, equity investment institutions start to invest in emerging high-tech SMEs. With the help of policy seed

fund (The Angel Investment Fund of Guangzhou), local equity investment funds, such as Guangzhou Pulin Industrial Investment Venture Fund, Guangzhou Yuexiu Biology Industrial Venture Fund, and Red Earth Technology & Information Venture Fund, were launched respectively. Now these investment funds have invested in a large number of SMEs in new generation information technology sector and new material sector.

The construction of local capital market helps the development of SMEs in emerging high-tech industry. Guangzhou has 26 local companies in emerging high-tech industry listed on the main board markets (Shanghai stock exchange and Shenzhen stock exchange), 8 SMEs listed on NEEQ (National Equities Exchange and Quotations), 682 SMEs listed on Guangzhou local Equity Trading Center. Firms of emerging high-tech industry in Guangzhou have got total equity financing amount of RMB 2.33 billion. Guangzhou local corporate bond market also develops rapidly. 19 enterprises in emerging high-tech industry have issued corporate bonds of RMB 7.28 billion. Guangzhou built its local Intellectual Property Rights Trading Center, which has 39 records of completed transaction.

Another aspect of system reform consists of traditional financial institutions who begun to provide new services for financing SMEs in emerging high-tech industry. Local government sets up risk compensation fund as subsidy for the loans to SMEs, for the insurance of SMEs, and for loan guarantee. The Bank of China Guangzhou Branch, one of the Stated-owned banks, has established its specialized science and technology bank for serving firms in high-tech industry zone. So far, this science and technology bank has provided credit of RMB 6 billion to SMEs. Several insurance companies offered new special insurance products for innovation, for instance, new product insurance, key testing and detection equipment insurance, fault bankruptcy insurance et.al. Since 2008, these insurance companies have cumulatively issued 15 insurance products, and provided RMB 9.4 billion-worth insurance for more than 100 SMEs. After 2008, more than 30 private micro-credit companies were initiated as well and they have given cumulatively 9.9 billion RMB loans to SMEs. During the same period of time, more than 20 guarantee companies have been initiated, and they also have helped SMEs, to some extent.

As a result, the reform of financial system of science and technology in Guangzhou has led to a very structured picture of the matching between financial institutions and their instruments with the specific sectors in emerg-

ing high-tech industry. Just like the success examples of Facebook, Apple and other famous IT companies, the new generation information technology sector is favored by capital market, but does not become main client of the State-owned banks. The new material sector has step into steadily developing stage with a good industrial cluster formation, thus State-owned commercial banks and private equity firms are eager to cooperate with it. Due to higher risk, commercial banks don't have enough incentive to cooperate with the biology and health sector. This industry is mainly dependent on financing from venture capital. The fashion sector has a rather small scale and is full of SMEs and studios. Thus, commercial banks and equity investment institutions have no strong interest on them. New energy and environmental protection sector as well as new energy vehicles sector are still in their infancy. Only angel investment and venture capital are attracted by the opportunities that they provide.

4. Concluding remarks: problems of financial system of science and technology and policy implications

Financing technological innovation needs financing from long term capital. Even reform of financial system resulted in an increasing number of equity investment institutions, the quantity of such financial institutions is still not enough. For example, Guangzhou's State-owned economy takes up approximately 60% of the GDP and the commercial banks' assets account for more than 80% of the total financial assets of the whole city. Compared with other cities such as Shenzhen, Suzhou and Hangzhou, whose equity investment institutions effectively boosted the local emerging high-tech industry, Guangzhou's equity investment is still lagging behind. Another problem is the quality of the equity investment institutions. By now, the reform of financial system of science and technology is still focusing on financing rather than investing. Taking the most advanced venture capital firms in Shenzhen as example, the basic logic of their fund raising, target searching, due diligence, investing, risk control, profit & loss sharing, and exit strategies is how to minimize the calculable risk. However, what is most needed in the invested project of innovation is often a kind of management integration function of market, organizational and technological change for innovation. This kind of strategic innovation management input, or added-value service in terms of venture capitalist, is still in big shortage in China.

System reform brought about establishment of equity exchange market. But the link between local equity exchange center and local intellectual property rights trans-

action center is weak. Guangzhou's intellectual property rights trading turnover is very small. Most enterprises are used to copy others intellectual property, even the local government have strengthened the punishment of offenders. The local intellectual property rights transaction can't reflect the equity prices.

Beside, commercial banks have not fully adapted to new operation method to serve SMEs of emerging high-tech industry. Nearly all commercial banks are lack of specific service channels, specific risk control method, and specific working team for SMEs of emerging high-tech industry. The complement guarantee system such as relevant intellectual property pledges, technological insurance and SMEs' credit rating is not enough developed so commercial banks' product innovation is lack of complementary support. There is no consumer credit service for the new product of emerging high-tech industry. For example, Guangzhou government only provides direct subsidies to SMEs, seldom financing aids to consumers and financial institutions. There is not enough consumer credit for new energy vehicles, light-emitting diode lamps, and mobile medical equipment buyers. For this reason, these new products cannot be marketed easily.

To support new technology development and commercialization of new products, government shall continue the on-going restructuring of financial system. Equity investment institutions shall still be encouraged. Government can make tax cuts for equity investment institutions. Local rich citizens can be guided to form associations of angel investment to invest in early projects in emerging high-tech industry. Government should encourage M&A among SMEs and big enterprises and widen exit channels of equity investment. Different equity investment institutions shall cooperate through the whole life-cycle of newly created high-tech firms: angel investment alliance finding and investing in earlier projects; VC investing in start-up stage after angel investment; PE investing in the pre-IPO stage after VC. However, in the Pearl River Delta region, there is little angel investment. VC and PE are crowding in the pre-IPO stage when projects are matured and the concerned SMEs are going to be listed on capital market.

Another implication of the research is setting up policy investment fund to guide investment of equity institutions. Although many local governments have established some policy industrial funds to invest directly in the SMEs of emerging high-tech industry, this practice crowds out private investment in a certain range. Current government policy funds of industrial investment are generally lack of enough professional competencies.

Sometimes, there exist the risks of moral hazard and corruption of benefit transfer. To avoid such situation, government should set up leading fund to guide the investment orientations of equity investment institutions, instead of directly investing in SMEs.

In China, the corporate bonds system has not completely established. Because the credit rating system of SMEs is very poor and asset securitization is in a blank, SMEs seldom issue bonds. Commercial banks, small loan companies, and guarantee companies are reluctant to undertake various kinds of bond financing tools for SMEs, such as short term financing bonds, medium-term notes, and documentary collection of notes, etc. Government shall encourage commercial banks, small loan companies, and guarantee companies to undertake debt financing services for SMEs.

The new financial system of science and technology was built up in a very short period of time without a long history of evolution. There is not enough cooperation among different kinds of financial platforms and institutions. Government can facilitate the cooperation among these platforms and institutions. Only by this way, the local multilevel capital market could function properly. For example, government shall encourage inter-platforms cooperation among local equity exchange center, intellectual property rights transaction center, and exchange of carbon emissions and so on.

The current financial system of science and technology is short of professional financial service agencies and the separated services of these agencies are aggravating the problem of information asymmetry. Government shall encourage all kinds of financial service agencies to cooperate deeply. Furthermore, government should attract high level international financial service agencies and promote

rapid development of local agencies. The professional intermediate services such as credit rating, accounting, auditing, taxation, and evaluation of assets, should be integrated geographically in the high-tech industrial zones. Agencies should provide innovative financial services, for instance, "credit rating + guarantee + listed counseling", "financial service supermarket", and "investment and financing information service platform", etc.

Subject to traditional financial regulation, most Chinese companies can't set up financial holding group. Now the constraint is eased gradually. Chinese financial supervision authority would like to support State-owned banks in establishing financial holding groups. Commercial banks and industrial enterprises in emerging high-tech industry shall join their efforts together to establish mixed ownership financial holding groups. Beside the advantage of mix property rights, this new form of financial holding group could effectively integrate the industrial chain of emerging high-tech industry and financial activities for innovation.

Finally, government should encourage the development of all forms of private financial institutions, including science and technology banks, leasing companies, finance companies, consumer finance companies, commercial factoring companies, guarantee companies, on-line financial firms, P2P, crowd funding, etc. On the other hand, Government should give subsidies to financial institutions and consumers in order to incentive financial institution to provide consumption credit and stimulate consumers to buy new products. Especially for new products like new energy vehicles, light-emitting diode lamp, and mobile medical equipment, etc. Financing the users of new products is usually an efficient way for boosting emerging high-tech industry.

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Directions of improvement of agricultural enterprises lending system in Ukraine

Abstract: In the article problems of farm loans are considered, as well as tendencies of bank lending are analyzed. An improvement of the possible directions of agricultural enterprises crediting are drawn.

Keywords: credit, bank lending, agricultural enterprise.

Ukraine has long been considered a predominantly agricultural country, therefore farm crediting objectively requires special government regulation and financial support. The functioning and development of the agricultural sector is largely dependent on its credit support, because lending is a source that stimulates its development. Agriculture, by its nature, require particular consideration of the objective requirements of the industry and a proper organization of its crediting services. Current trends indicate a problem in providing loans for agricultural enterprises. On the one hand, banks are not able to cover the needs of enterprises in crediting to full extend, on the other hand - these businesses are classified as enterprises of high risk, hence it increases interest rates and create difficulties of opportunities for credit usage.

Given problem was investigated by many scientists, including O.Hudz, N. Demyanenko, P.Layko, P. Sabluk and many others. However, improvement of crediting system still does not play a proper role in agricultural production financing, that is why topical research issues of development and development of scientific suggestions to improve the provision of farm credit resources remain crucial.

There is a number of internal and external factors affecting the efficiency of agricultural enterprises, and thus - their ability to repay loans. The internal factors in-

clude the following: lack of real enterprise restructuring; low level of enterprise management; lack of marketing strategies; focus on production, not profit; lack of motivation to improve efficiency of employees work in the company. The external factors include: the absence of a competitive environment in the acquisition and sales resources; moratorium on sale of agricultural land; high interest rates on credit; adverse conditions of agricultural exports and imports of resources for the countryside; interference of local authorities into industrial and financial activities of enterprises. In this respect, studying the formation and development of both traditional and alternative forms and mechanisms of financing may be interesting.

As far as volume of bank lending industry is concerned, according to the National Bank of Ukraine for 2010-2015. Farms had received 244,470 mln. UAH. commercial bank loans, including 109,337 mln. UAH. (44.7%), short-term 109 172 mln. USD. (44.6%) of medium and only 25 961 million. UAH. (10.7%) of long-term loans. It should be noted that the provision of agricultural enterprises short-term loans is much higher than the medium and long term. Due to the short-term credit, only part of the ongoing costs of technological operations can be financed, mainly soil preparation, planting spring and winter crops, purchase seeds and