

## **Research on the Development of TechFin and the Economic Growth Effect of the Yangtze River Delta**

**Sun Mengnan<sup>a,\*</sup>, Hu Xueqiong<sup>b</sup>, Zhan Lihua**

School of Economics, Shanghai University, Chengzhong Road, Shanghai, China

<sup>a</sup> smnluck@163.com, <sup>b</sup> 13123520@t.shu.edu.cn

\*corresponding author

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**Abstract:** The endogenous driving force of economic growth is the advancement of science and technology. The development of science and technology industry cannot be separated from the financial boost. The Yangtze River Delta region is trying to become a world-class urban agglomeration with high-quality and integrated development. It is gradually building a TechFin system which is called TechFin in China and the system is aimed to vigorously support the development of technology enterprises. This paper focuses on the financing of SMEs in science and technology area, sorts out the current situation of Techfin in cities in the Yangtze River Delta, and uses the basic financial function model and the Solow Growth model to analyse the indirect promotion of financial innovation to economic growth. The analysis shows that TechFin has promoted regional economic growth. Based on this point of view, this paper makes some suggestions on the coordinated development of TechFin System in the Yangtze River Delta.

### **1. Introduction**

In the long-term economic development process, technological innovation can be said to be the engine of the "fast train" that represents the economic growth and social development. Finance that has the functions of optimizing resource allocation and diversifying risks can be regarded as fuel for this fast train. Every successful commercializing of technological revolution is usually accompanied by innovative financial products or services. If there is a lack of incubation of financial intermediaries in corporate innovation activities, technology is easily trapped in the R&D room. In such an unsound capital market as mentioned earlier, an economy lacking technological innovation will inevitably lack the motivation for long-term development<sup>[1-2]</sup>. Besides, domestic and foreign research has found that a sound financial system has a clear positive effect on regional technology development. In an imperfect capital market, the government's public policies and funds also have a positive impact on S&T progress<sup>[3-4]</sup>. TechFin is an innovative combination of technology and finance. This combination can provide support of financial products for scientific research, transformation of S&T achievements, cultivation of technology enterprises and construction of technology industry chain. TechFin includes a series of financial services, tools, financial institutions and financial policies which are helpful for technological enterprises to grow up, especially for the small and middle size. In the TechFin system, the participating entities are not only financial institutions and technology firms, but also the government, investment companies, banks, insurance companies and other intermediaries such as accounting firms that play a guiding or complementary role. In April 2018, Xi Jinping emphasized the importance of the integrative development there at the symposium on Promoting the Development of the Yangtze River Economic Belt. He clearly stated that this region should be built into an important international gateway to the Asia-Pacific region and become a world-class city group with strong international competitiveness. At a time when the world economic growth pattern is changing, only by combining technology with finance can we gain an advantage in economic competition. Therefore, it is of great practical significance to study the effects of TechFin and economic growth in the Yangtze River Delta region.

## **2. Current status of the TechFin development in the Yangtze River Delta**

The rapid and sustainable development of the future society and economy requires the creation of first-mover advantages and needs to strengthen the driving force of innovation. Enterprises are the main subjects in R&D funds investment, technological innovation and transformation of science researches. This paper hold that the perfect TechFin system is the booster of enterprise innovation, which can accelerate the transformation of S&T achievements into real productivity. In general, the governments of the several cities in the Yangtze River Delta region are beginning to agree with this point, and are now gradually establishing a comprehensive, multi-level TechFin system jointly built by the government, universities, enterprises, financial institutions and other social agencies.

### **2.1. The strong support with policies and financial funds by government.**

Cities in the Yangtze River Delta introduced many comprehensive and targeted government documents to promote the development of TechFin. These documents include the general policy *Implementation Opinions on Promoting Financial Services Innovation to Support the Construction of Shanghai Science*. The document guiding social funds to support technology companies is the policy *Adjustment of Small Loan Companies*. In terms of the managing intellectual property pledge loans, transacting S&T achievements and investing them as capital stock, the document is *Measures for Risk Compensation Management Funds for Transformation of S&T Achievements in Jiangsu*. In terms of fiscal funds, the investment in innovation and entrepreneurship in the three and one city has increased year by year. Besides, the TechFin Guidance Funds set up by the government have attracted a large amount of social capital. There are 8 entrepreneurial guidance funds that are municipal-level FOFs in Shanghai, and the amount of these funds manage has increased to 68.52 billion yuan. In Jiangsu, the first -term investment of Venture Capital Guidance Funds for Emerging Industry was up to 1 billion yuan, and the current fund size is nearly 20 billion yuan. The amount of Guidance Fund for S&T Achievements Transformation set up by Zhejiang government has also exceeded 2 billion yuan.

### **2.2. Universities and R&D institutes cultivate talents and make achievements.**

In the TechFin system, the cradle of S&T achievements is the enterprise's R&D center, universities and research institutes. Universities and scientific research institutions not only carry out commercial cooperation with enterprises through their innovative scientific achievements, theories and other results to promote the upgrading of products and techniques of SMEs, but also cultivate outstanding S&T talents for enterprises. Beyond all doubt, the construction of the TechFin system is inseparable from the cooperation of production, education and research. At present, many enterprises have reached a joint training plan with colleges and universities. Colleges are trying to improve teaching objectives and teaching plans according to the needs of society and enterprises. As college students are the main force of innovation and entrepreneurship in China, many universities have set up supporting organizations to provide incubation help for the technology enterprises in the seed period, such as Entrepreneurial Nursery and Creative Space. Among them, dozens of university science and technology parks in Shanghai Jiaotong University and Shanghai University have become national-level science parks. As a platform for scholars to gather and a carrier for R&D, it is convenient and effective to promote technology innovation and make institution innovation by carrying out TechFin development forums and establishing research bases.

### **2.3. Innovative products and services improve the availability of financing for SMEs.**

Traditional financial institutions such as city commercial banks in the Yangtze River Delta region have introduced innovative credit products based on the characteristics of light assets and high risks of technological SMEs. For example, the amount of China Merchants Bank's technology-based and performance loan is about 1 million to 5 million yuan. The Small Giant Credit Loan that Shanghai Pudong Development Bank introduced provides credit loans of 10-30 million to eligible enterprises, and Nanjing Bank's "Suke loan" provides enterprises with a single low-interest loan. In Hefei, Bank of China and other 10 banks jointly established of innovation loans, providing 450

million yuan low-interest loans for companies. Besides, the government also encourages Shanghai Bank, Shanghai Huarui Bank and other banks to carry out pilot projects of linkage with investment and loan, and provide fund support for enterprises through the combination of equity and claims. Under the guidance of the government, insurance and guarantee companies also carry out innovative products and services to effectively improve the availability of financing for companies. For example, Shanghai United Financing Guarantee Co., Ltd. and Shanghai S&T Commission jointly launched the *Technology Micro-Loan Pass*. And under the promotion of the Zhejiang Government, the first technology insurance company, Taiping Technology, launched two new products, *patent enforcement insurance* and *infringement of patent rights insurance*. Some private equity investment funds and venture capital funds have increased their effective supply. The professional investment institutions' participation has also increased support for the S&T enterprises, especially in their early stages. Some projects in their seed period or growth period therefore get more focus and money, alleviating the source of funds for the first mile of enterprises.

#### **2.4. Other social intermediary organizations serve a full range of technology companies.**

Under the coordinated guidance of the government and platform's management committees, some social intermediaries such as accounting firms, audit offices, asset assessment agencies, law offices, consulting agencies, quality inspection institutions, notary offices, certification authorities and others have established close cooperative relations with the TechFin platform. These intermediaries not only provide relevant financial products and services, but also offer free consultations for enterprises on a regular basis under the unified organization of the platform. These measures are aim to help SMEs establish a sound corporate system. The TechFin service platform adopts a combination of online and offline. In addition to visits and training activities offline, these intermediary service companies also set up web platforms for webs and APPs, including the information sharing, the enterprise credit, talent training. For example, there are Shanghai TechFin Information Service Platform, Shanghai Taxbank Interactive Information Service Platform and Ningbo TechFin Service Center. In response to the characteristics of technology-based enterprises, the government has speed up the construction of technology transfer centres, productivity promotion centres and other specialized technology intermediaries in order to foster technology markets and promote technological outcome transactions.

### **3. The promotive effect of TechFin on the national economy**

The essence of TechFin is mainly composed of a series of financial policies and financial instruments that serve innovation and technology enterprises. The most important function of finance is to optimize allocation of capital. This configuration can naturally make capital flow into more productive R&D items. Therefore, the marginal productivity of capital will be higher and technology will progress. Technological progress is the inexhaustible motive force for national economy. So, finance flows capital to the real economy and indirectly promotes economic growth.

#### **3.1. Financial innovation makes scientific and technological progress.**

The development of technology is often accompanied by financial innovations. For example, during the industrial revolution in the UK, modern banks were created to meet the funding needs of rapid technological development. Similarly, the initial financial support for modern 3D printing, new energy technologies, artificial intelligence and other technological revolutions must has come from venture capital institutions. The intangible assets such as talent intelligence, intellectual property and patents are their core value. For financial institutions, this kind of value is difficult to measure, because of the information asymmetry between enterprises and financial institutions. In the TechFin system, the combination of technology with finance can promote a large number of financial and social capital to be falsified and promote the further development of technology enterprises, especially for SMEs. This process can be explained by the basic functions of the financial system proposed by Robert Morton, who won the Nobel Prize in economics, including resource allocation, risk dispersion and information provision.

First, from the perspective of resource allocation, the main role of TechFin is to optimize the allocation of technological resources and financial resources, and to guide the accumulation of social capital to the technology industry. Governments of these cities in this region have attached great importance to TechFin and provide manpower and material resources to the technology industry in the new stage of economic development. All actions above have further stimulated the accumulation of capital to technology enterprises. In this process, the participation of social capital can play a better role in the survival of the fittest than the government's financial support. Because market, the invisible hand can more effectively regulate the specific allocation of resources, determine the research's direction, and avoid research institutions to study in the overcapacity industry which would waste social resources. With the continuous improvement of the TechFin system, technical institutions began to financialize. For example, Ali and Tencent respectively established online merchant banks and micro-banks. From this perspective, the development of technology can bring better financial services[5].

Second, from the perspective of risk diversification, the emergence of new technologies is often full of uncertainty. Therefore, high risks of the investment in technology often discourages investors. The improvement of financial systems and instruments can play a role in diversifying investment risks. Under the traditional financial system, technology-based SMEs with high risk and high yield usually have difficulties in financing or face high interest rate when they loan. The development of TechFin brings various new financial instruments, enabling investors to reduce risks through investment portfolios. Therefore, it is possible for people to invest in high-risk technology projects.

Finally, the development of TechFin is to solve the problem of information asymmetry between technology companies and financial institutions and other intermediaries that serve technology-based SMEs. The main assets of these kind of companies are intangible assets. How much profit can be created in the future? It is hard to judge. Information asymmetry arises between technology companies and financial institutions. The government set up a special S&T enterprise management department to establish a bridge for information communication between enterprises and financial institutions. Commercial banks set up subsidiaries to conduct investment and loan linkage and serve technology enterprises can also alleviate information asymmetry.

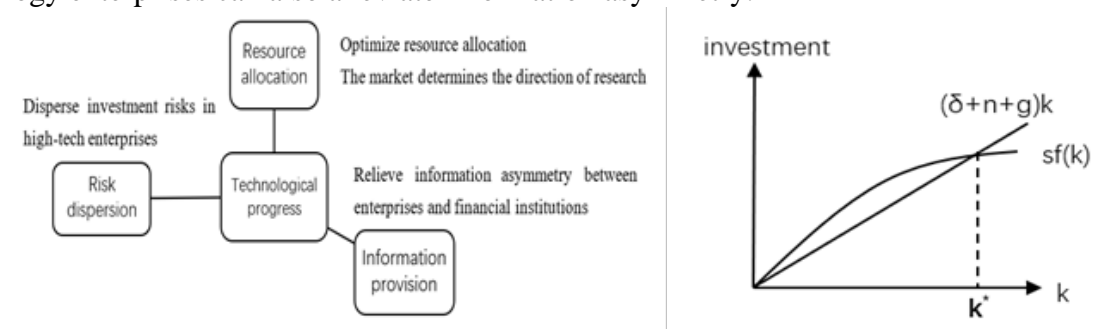


Figure 1 Financial innovation makes scientific and technological progress

### 3.2. Scientific and technological progress promotes economic development.

First, scientific progress is an endogenous driving force for economic development. This paper tries to use the Solow Growth Model to explain. Assume that the production function is as follows:  $Y=F(K, L)$ . Where  $K$  is the total amount of capital,  $L$  is the total amount of labour, and  $Y$  is the total output. Assuming that TechFin promotes continuous technological advancement, production efficiency will continue to increase. Suppose that technology promotes labour efficiency,  $A*L$  represents the number of efficient workers. Then the new production function is as  $Y=F(K,AL)$ . Let  $k=K/(AL)$  and it denotes the capital of each efficiency worker. Let  $y=Y/(AL)$  and denote the output of each efficiency worker. The formula will be:  $y=f(k)$ . The change of capital stock  $\Delta k=sf(k)-(\delta+n+g)k$ , where  $\delta$  is the depreciation rate,  $n$  is the labour growth rate, and  $g=\Delta A/A$  is the technological progress rate. When  $sf(k) = (\delta+n+g)k$ , then  $\Delta k=0$  and the economy is in a steady state. At steady state, the per capita output of the efficiency worker is  $y$ , the per capita output of the labour is  $y*A$ , the growth rate is  $g$ , the total output is  $Y=y*A*L$ , and the growth rate is  $n+g$ .

Table 1 Solow growth model

variables	symbol	growth rate of steady state
Per capita capital of effective workers	$k=K/(AL)$	0
Per capita output of effective workers	$y=Y/(AL)$	0
Per capita output	$Y/L=y*A$	g
Total output	$Y=y*A*L$	n+g

Second, technological advancement is conducive to transform the pattern of economic growth. Under the impetus of TechFin, the S&T contribution rate of GDP in the region will be increased, and the regional economy will be transformed from intensive development mode of high input, low output and low efficiency to intensive development. The problems of rapid expansion of foreign population, resource shortages, and environmental pollution will be solved and TechFin can accelerate the construction of an environment-friendly society. In recent years, the contribution rate of S&T progress in this region has increased year by year. In 2017, the contribution rate of S&T progress in Jiangsu, Zhejiang and Shanghai has exceeded 60%. The contribution rate of S&T progress in Anhui to economic growth has also increased to 56%.

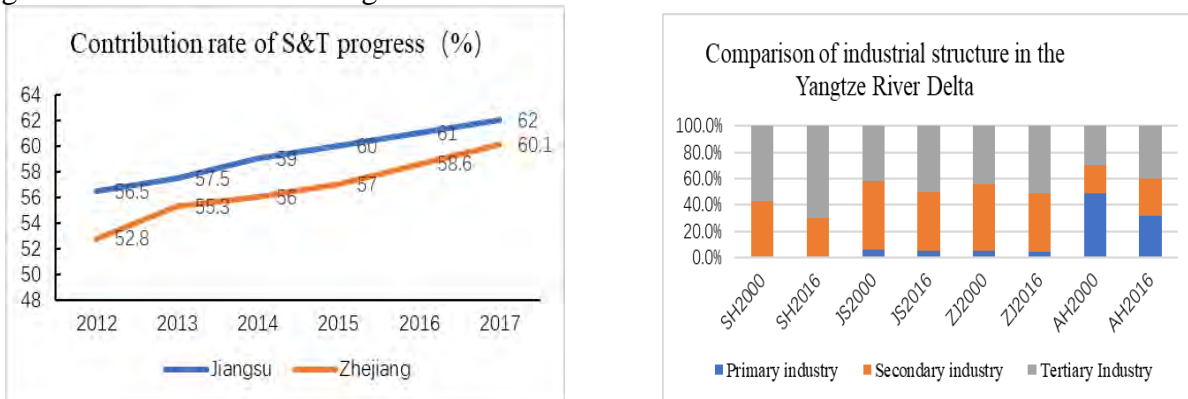


Figure 2 Scientific and technological progress promotes economic development

Third, technological innovation is the fundamental driving force to promote the optimization and upgrading of the economic structure. In the early stage of development, it relied on the model of industrial clusters, and the economy here has grown rapidly. However, with further development, the resource endowment in the past is no longer prominent. Therefore, the Yangtze River Delta region should vigorously develop the technology industry, implement innovation drives economy policy. Then, the industrial structure can be optimized. Compared with 2000, the industrial structure of these cities in 2016 has undergone a huge adjustment. As a whole, the proportion of the primary industry has generally decreased, and the proportion of the secondary and tertiary industries has generally increased. At present, the industries in the emerging fields such as biotechnology, industrial internet and artificial intelligence in the Yangtze River Delta region are in a leading position in China. The added value of strategic new emerging industries accounts for 16.4% of GDP in Shanghai, up 1.2 percentage points. The output value of strategic emerging industries in Jiangsu, Anhui and Zhejiang increased by 13.6%, 21.4% and 12.2% respectively.

#### 4. Summary and recommendations

It is gradually building a comprehensive and multi-level TechFin service system in The Yangtze River Delta region, which makes multi-dimensional linkage come true between the government, universities, financial institutions and enterprises. In essence, TechFin is composed of a series of financial systems, financial policies and financial instruments that serve science study and technology enterprises. Through the basic functions of financial resource allocation, risk dispersion

and information provision, capital flows to most projects with higher production efficiency, so that it achieves the purpose of technological progress. In order to further promote the construction of the TechFin system in the Yangtze River Delta region, this paper proposes the following suggestions:

Establish a TechFin Information Platform in the Yangtze River Delta to promote information sharing and data interaction. At present, the problem of information asymmetry still exists. So, it is still not conveniently or easily to search information and make comparison. Therefore, it is recommended that major cities in the Yangtze River Delta region build a cross-regional and comprehensive TechFin information platform, which is beneficial to integrate information and then disseminate it. The scattered information includes corporate's development, credit products of commercial bank, investment institution, TechFin funds and TechFin support policies of local governments. Information sharing and data interaction make it easy for enterprises to quickly connect with financial institutions and intermediary service organizations, saving business docking time, reducing social transaction costs and improving market operation efficiency.

Improve the bank's review mechanism for technology companies' loans and strengthen post-event supervision and tracking services. The requirements for loaner are still strict. For example, intellectual property rights must be in the stage of substantive implementation. Some enterprises over-exaggerated the gross proceeds to get a large amount of loan. Even the phenomenon of borrowing new debts to repay old debts appears, resulting in an increase in non-performing assets of financial institutions. That is why financial institutions need to strengthen real-time supervision and tracking services for enterprises after they provide financing services for enterprises. If they obtain the company's transaction prompts in the first time, they can take timely measures to help technology-based enterprises avoid risks and tide over the difficulties.

Strengthen the cultivation of compound talents and explore the mechanism of international talent introduction. At present, the composite talents who grasp knowledge both of finance and technology are indeed very scarce. It is not only a matter of unilateral efforts of colleges and universities. It also needs the strength of politics, production, schools and research to cultivate talents that meet the needs of the industry. Besides, it is necessary to connect with the international finance centre and the S&T innovation centre to attract international talents, jointly promoting the development of TechFin in the Yangtze River Delta. Establish databases of talents and enterprise, ease information asymmetry, reduce the costs for recruitment and job search, improve the talent service system, and optimize the talent flow environment.

Make more cooperation between cities and build a community of science and finance. The close cooperation between the cities is the basis for achieving high-quality development. The degree of synergy is not flexible enough and the existence of administrative barriers and standard interests will restrict the development of integration, leading to serious homogenization competition among cities and have difficulty in transforming or upgrading industry. The development of TechFin can be deployed in seven key areas such as industrial synergy, rapid information ubiquity, and open market order, etc. It is beneficial to form a world-class city group with global competitiveness.

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