# Finance and Innovation in Private Firms in China

**Master Program in International Economics with a Focus on China**

by

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**Abstract**

Since the economic reform and open-door policy began in 1978, China's economy has experienced an unprecedented growth, which is underpinned largely by the prosperity of private firms. In a harsh competitive market economy, these private firms are forced to seek for innovation, which is closely-related with financial support. This paper aimed at examining how financial support influences the innovation ability of private firms in China. The relationship was revealed by analyzing data in the World Bank China-Enterprise Survey Manufacturing Module (2012), using the OLS model and Tobit model.

Results showed that firms with a line of credit from financial institution had a better performance in innovation. Results also suggested that private-ownership had a positive and significant at 10% level influence on the firms' access to finance. However, it was found the share of private domestic ownership had no effect on innovation associated with a company's financial constraint.

Innovation need financial support, if Chinese government could provide some polices to support private firms' access to finance. China's private firms could make a new improvement in innovation and further push China's economy development. While, in China, the private firms may have other problem which constrain the firms' innovation ability. Further study is needed to solve this problem.

**Keywords:** innovation, firm performance, financial support, China, private firms

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**Contents**

## 1. Introduction

From its establishment in October 1949 to December 1978, (the People's Republic of) China strictly followed a centrally planned economy, for which the government makes the economic plans, controls firmly all aspects of the economic production, decides allocations of resources and determines the prices of services and all goods. During the period, almost all enterprises in (mainland) China were state- and/or collective-owned. Rarely could private enterprises or foreign invested companies be found that time. All firms then were fully dependent on financial appropriations from the government and largely overlooked the aspects of profitability and competition. As a consequence, the China's economy was stagnant, inefficient and isolated from the global economy for nearly 30 years (Naughton, 2007).

The implementation of the reforms and opening-up policy commenced in late 1978, initiating from agricultural sectors, which immediately led to the breath-taking increase in agricultural production. Along with the establishment of the legitimacy of market exchange, private firms were opened mainly by farmers at the beginning in order to profit from marketing (e.g. including the exchanging of extra agricultural products and services) (Nee & Opper, 2012). Since then, private firms have developed astonishingly, both in quantity (i.e. numbers) and quality (e.g. legitimated as standard business practices), diffusing from Zhejiang Province, throughout the Yangzi delta region, and to all over the country (Nee & Opper, 2012). Before 1978, private companies contributed to less than 0.02% of domestic industrial productions in China. Their share had exceeded 40% by 2007 (Nee & Opper, 2012). The prosperity of private firms has driven and maintained the economic growth of China at an incredible rate for over three decades. In the meanwhile, China has developed into a harsh competitive market economy, in which companies have to innovate to survive (Nee & Opper, 2012). As Rosenberg (2004) argued, innovation is the most important driver in terms of economic growth. On the other hand, according to empirical analysis, innovation needs financial support (Jang & Chang, 2008). This thesis is therefore aimed at understanding how financial support influences the innovation ability of private firms in China.

### 1.1 Research questions

Manufacturers need to innovate not only to profit but also to stay in place and to survive (Nee & Opper, 2012). If not able to innovate, the manufacturers would lose market share to a continuous entry of new start-up companies. The endogenous growth theory

modelled innovations as induced by economic growth and in turn an endogenous cause of growth (Nee & Opper, 2012).

In the last 40 years, the state-owned companies have gradually been replaced by the private companies. Governments in market economies throughout the world have privatized the state firms in steel, energy, telecommunications and financial services. Almost everywhere in the world, governments have put forward a massive of privatization reform programs. The economic policies of developing countries turned to favour a private ownership (Shleifer, 1998). If private ownership gradually plays an important role in the market economies and makes promotion for the economy, in order to promote the development of the national economy, the government would like to provide more convenience for private companies, including for the innovation of the enterprises.

There has been huge equality favouring state-owned enterprises in the allocation of government funding for research and development; however, it becomes increasingly popular to have cooperation interfirm networks among private firms in China (Nee & Opper, 2012). In this context, I am asking the following questions. Do Chinese private firms still face disadvantages in accessing to finance today? To that extent, does financial support really matter for private firms' innovation? If private firms have the obstacle to access to finance in China and if financial support does in fact matter for China's private firms' innovation, then the policymakers should address these problems to better economic growth fuelled by innovation of private firms in China.

## 1.2 Method & Data

In order to examine whether private firms still face shortages in access to finance, data of 2848 Chinese firms from a 2012 Word Bank manufacturing Enterprise Survey were used. The model used the 2012 cross-sectional dataset from the World Bank in order to investigate what type of ownership (POEs or SOEs) effects on human capital quality, and to further study how access to finance affects firm's performance. The ordinary least squares (OLS) regression model and the Tobit model were used to test the hypotheses as these methods give unbiased consistent estimates using the available dataset (World Bank, 2012).

## 1.3 Limitations

There are still some limitations in the survey, even though the dataset might be the most adequate and most recently available one to study the research questions at hand. There are low response rates, long survey length, and missing observations in the survey. The interviewers made a lot of efforts to reconcile these challenges by recruiting professional

teams, performing thousands of callbacks, and pointing out advantages resulting from participation in the survey. The survey only reflects the data in 2012, so that the research can only explain the economic phenomenon around 2012.

It is a limitation to decide the appropriate proxy measures for firm performance. The measure total sales per employee might not capture the whole dimension of performance as more data are needed to account for the growth of a firm. In Nee and Opper (2007), *Return on Asset* (ROA) and *Return on Equity* (ROE) were used to measure for firm performance. But in the 2012 World Bank dataset did not provide the relevant data, so ROA and ROE did not use to measure for the firm performance in this thesis. Another limitation is the measure of ownership, 1 indicates private-owned and 0 indicates state-owned, but more types of ownerships existed in China such as foreign-owned firms. Despite the fact that dataset suffers from these flaws, the problems are of the common ones faced when dealing with enterprise surveys.

## 1.4 Structure

The thesis is structured as follows:

- The thesis starts with a review of existing empirical literature in Section 2.
- Then the data and research design will be explained in Section 3.
- Thereafter, the results will be discussed in Section 4.
- Finally, the conclusion of the paper will be drawn in Section 5 with a brief discussion of some limitations and questions that encountered during data analysis in the thesis.

## 2. Theoretical background and research hypotheses

China's private firms play an important role in nation's economy. Since Deng Xiaoping's Southern Tour in 1992, private business has advanced in leaps and bounds. China's private sector grew from almost zero in the late 1970s to provide nearly 50% of the total employment and 60% of the industrial output by 2004 (Li, Wang, & Zhou, 2008) Financial support is necessary to drive innovations. As a rule of thumb, the firms with more financial support are good in innovation. Over the past four decades, the transformation of the Chinese economic system from a centrally planned to a free market economy has exerted a great impact on the Chinese innovation system (Brockhoff and Guan, 1996; Liu and White, 2001a, b). The Chinese government has made great progress towards a more effective and efficient national innovation system compared to its performance under central planning. The

transformation includes, nonexclusively, the changes in government legislation and its administrative system, reforms of the R&D funding system, updates of the evaluation system and the redistribution of innovative activities among actors (i.e. research institutions, manufacturing firms, universities and government departments). The enterprise reforms and economic reforms over the last 20 years have significantly improved the development, spread, and implementation of technological innovation in Chinese firms (Guan and Ma, 2003).

## 2.1   Innovations and financial support

Joseph Schumpeter proposed a strong connection between innovation performance of an economy and the functioning of the credit and capital markets (Schumpeter, 1912). His discussion of creative destruction is a major contribution to the economic understanding of how companies contribute to economic development and growth. According to Schumpeter, innovations disturb the old economic status so as to induce the economy in various cycles of growth, yet bank credit was the prerequisite of innovations (Schumpeter, 1942). Schumpeter identified at least five different mechanisms for change listed as follows.

- New products introduced in the market;
- The introduction of different production;
- The discovery of new markets;
- The introduction of new types and sources of raw material;
- The introduction of various forms of organization.

Many researchers have supported Schumpeter's idea that innovations have a great significance for the economic development of a society (Rosenberg, 2004; Grossman, Helpman 2001). Ahlstrom (2010) wrote in his article as that the innovation-driven growth should be the goal of any business as it contributes to lasting benefits for the community. Ahlstrom (2010) believes that innovative and growing companies create both economic growth and employment. This can lead to an improvement in people's lives through the productions of new products or services available to a larger part of the population. If a society prevented companies from innovation and growth, it would affect the company negatively in the long run.

All kinds of innovations need financial support. Firstly, firms need financial support to put the new product into production and to sell in the market. Empirical analysis indicates that financial support system has a significant influence on product innovation and process

innovation (Jang & Chang, 2008). For an individual entrepreneur whose company cannot receive financial support, it would become very difficult for them to invest in a new product. The Chinese innovation process is driven by a customer based network, in which customers or clients demand innovation and support it with potential ideas so that they became the most important source of innovations (Nee & Opper, 2012). Based on such an innovation track an increase in sales would lead to an expansion of the network and therefore greater ideas, causing possibly more innovations. These customers orientated network innovation affects mainly the development of new products. Financial support is especially important for small private companies in the early stages.

Secondly, new equipment for improved production processes is necessary for innovations. The optimizations of production processes represent another important form of innovations. However, it has to be balanced with the aforementioned form of innovation, in which new products are developed. Empirical work showed that the form of innovation depends on the stage of the evolution of the firms, where small technology-based firms focus more of their innovation capabilities on the production of new products rather than process innovation. However, it's the high-volume producer that tries to improve the production of its standard goods, process innovation (Abernathy & Utterback, 1978). High-volume sectors are often characterized by products that are well understood, standardized and with low unit profit margins, so that the innovation incentive is to reduce prices in order to increase the profit margin. In the scenario that markets leave little room to grow in absolute size, firms would need to innovate on their production processes in order to increase their profits (Abernathy & Utterback, 1978). In order to buy new equipment for improved processes, the firms often need to invest a large amount of money. In China, informal financing channels and institutions provide security to obtain formal financing and reallocate this to entrepreneurs (Hoff and Stiglitz, 1998). Informal financing is an essential source for many firms in developing countries due to substantial obstacles in obtaining bank loans.

Thirdly, human capital as an important resource to drive firms' innovation also needs financial support. According to Penrose (1959), differences in various corporate resource assets contribute to the difference in competitiveness. If a company has a shortage of resources, it creates an obstacle to the company's ability to develop its innovation (Kirchoff, 1994). Penrose (1959) argues that a company can have two types of resources: previously acquired and the resources a company needs to raise themselves to achieve a competitive business. It is especially the human resource contribution to the company's success emphasized by Penrose (1959), mainly in the form of innovation, motivation, and

management. If private firms have enough money they can hire talented people. In China, private firms often have to provide a high salary for employing the talents.

Fourthly, advanced technology to drive the firms' innovation need financial support. New knowledge and technology, created by the research and development (R & D), are considered the main growth factor of production in the economy. There is evidence that R&D playing a significant role in the catching up and developments of the East-Asian countries (OECD, 2012). Financial support can be crucial for businesses that need a long time to come out to the market, and these are often involving companies that depend on technology. There are some evidences that small and medium enterprises are more likely to be subject to liquidity constraints than larger firms (Acs & Audretsch, 1990). Banks and other financial institutions offer loans to small businesses. It is important that companies have assets that can serve as a guarantee for the loans. Such funds often determine how much debt financing a company can get. Technology-based companies find it difficult to get loans from banks until they have shown any kind of commercial success. Technology-intensive companies often have immaterial assets and for them, it's harder to get loans compared to companies with tangible assets. It may also be a problem to pay interest for the new company before incomes start to come in. On theoretical grounds, one can therefore questionable whether bank loans are an optimal financing solution for start-ups and technology-based companies. Several studies show that bank loans are the primary form of external financings for new and small businesses (Minola, Cassia & Criaco, 2013). Berger and Udell (1998) shows that bank loans account for 45 percent of US small business financing. 40 percent of all newly established US companies have bank loans (Robb & Robinson, 2014). Even for technology-based companies, bank loans account for the most important external financings (Minola, Cassia & Criaco, 2013). Some countries have established specific funds to support companies for technical innovations, such as Australia launched the Innovation Investment Fund (IIF) in 1997 in order to stimulate the financing of small high-tech companies in (Cumming, 2007). The financial support system for technological innovation is about fiscal policies that provide companies with funds to put through technical improvements there have been problems that entrepreneurial companies are not able to raise all the capital they need for technological innovation.

In this project, I will test if financial support influences the private firm's innovations in China and the hypothesis is,

*The Hypothesis1: The private firms with the financial support are more likely to be involved in innovation.*

## 2.2    Private firms and access to finance

Since the reforms in 1978, the state sector gradually decreased as a share of the overall economy while the private sector has become an increasingly important (Naughton, 2007). During the last decades, the private firms have been growing much faster than the state-owned enterprises and gradually become the main growth engine in the Chinese economy (Allen *et al.*, 2005). Nevertheless, private firms in China today still face more constraints compared to the state-owned firms, even though this has been pointed out by Peng and Heath (1996) two decades ago. Since SOEs enjoy a better status than private firms, they are able to acquire state-owned capital goods at a lower cost (Tan, 2003). It is easier for state own enterprise to get the loan from the bank than private enterprise. For most private enterprises, it is very hard to get the loan from the state own bank in China.

Firstly, in China, state-owned enterprises have the government's shelter to get loans from the bank, while private firms do not have adequate political connections. These connections are called as "*Guanxi*" in Chinese, which is a system of social networks and influential relationships facilitating business and other dealings. According to previous studies, such as Fisman (2001), Johnson and Mitton (2003), Faccio (2006) and Claessens *et al.* (2008), the political connections increase values of firms. Johansson and Feng (2016) found that political connections are positively associated with firm performance and access to debt financing. They also pointed out that, comparing firms controlled by state with that controlled by entrepreneurs who participate in politic, it is only the latter that exhibit superior performance in accessing finance. Most of the private entrepreneurs do not have enough *Guanxi* to get the loan from the state owned banks (Johansson & Feng, 2016). It is well known that only some major private enterprise owners having a government background can get the loans easily from the bank. Moreover, some of these entrepreneurs once worked for the government or are the next generations of China's important figures of the governments (He & Liu, 2008).

Secondly, state-owned firms have the priority to get money from banks in China. China is a country with the one-party system. This party monopoly would have a firm control over strong state-owned firms so as to guarantee the control over the nation's economy. Vast literature has focused on Chinese state-owned firms and highlights the challenges that the state-owned firms face due to the so-called policy burden that they bear, i.e. the fact that many government-owned firms in China face several objectives, including not only to maximize firm values but also to fulfil certain state objectives (see, e.g., Lin *et al.*, 1998; Lin and Li,

2008; Lin and Tan, 1999). Because of those state objectives, governments will first make its best to provide money to support the state-owned firms to meet their objectives.

In the fall of 2008, China government launched an ambitious program involving 4 trillion and a basket of policies in order to increase domestic economic activity to fend off the sharp drop in external demand following the financial crisis that engulfed the USA and Europe. Johansson & Feng (2016) showed that state owned enterprises had better access to both short-term and long-term debts after the introduction of such a stimulus program. Ho *et al*. (2012) made a case study on the loan business of a large state-owned bank, which showed that loans to state owned enterprises increase relatively more than that to private firms. According to Huang (2011), as much as 90% of the stimulus funds have been estimated to direct towards state owned enterprises. One important component in the concept of *Guo jin min tui* in the first decades after 1978 was that state owned enterprises had preferential access to debt financing from the state-controlled banking sectors and thus had more resources to undertake mergers and acquisitions (M&A) projects, to make larger investments and to crowd out private firms.

According to these empirical analyses, it could be much harder for Chinese private firms to access to finance when compared to state-owned firms. In the project, I will test the following hypothesis.

*Hypothesis 2: Chinese private firms today still have disadvantages in accessing to finance when compared to the state-owned firms.*

Thereafter, I will also try to investigate the interaction between finance and private ownership on innovation. By this means, I will be able to identify whether finance constraints of private firms constrain their ability to innovate. The hypothesis is written as below.

*Hypothesis 3: The larger the share of private domestic ownership the stronger the negative effect on innovation is associated with a company's financial constraint.*

## 3. Data and research design

The World Bank 2012 China Enterprise Surveys Manufacturing module covers country-specific questions regarding Chinese firms. It is useful to get information about the business environment in China. The dataset contains responses of 2700 privately-owned or mixed firms and 148 state-owned firms in China. This dataset suits to test various factors influence on the innovation, growth, and performance of Chinese firms.

## 3.1 The dataset

The data which were used to create the dataset was collected during the period between December 2011 and February 2013 and collections of data were accomplished by face to face interviews. The specific items of the survey include characteristics of establishments, infrastructure and services, sales and supplies, competition, capacity, land and permits, innovation and technology, security, finance, business and government relations, firm performance, labor, and business environment. The questions on specific financial years are referencing to the fiscal year 2011.

The geographic coverage of the survey consisted of 25 cities namely: Beijing (municipalities), Hefei City, Chengdu City, Dalian City, Jinan City, Luoyang City, Qingdao City, Shenyang City, Shijiazhuang City, Tangshan City, Wuhan City, Yantai City and Zhengzhou City and the cities in the east coastal regions: Dongguan City, Foshan City, Guangzhou City, Shenzhen City, Nanjing City, Nantong City, Suzhou City, Wuxi City, Shanghai (municipalities), Hangzhou City, Ningbo City, Wenzhou City. I divided the types of firms into four different sectors: the Manufacturing, Retail, other Services, and Government owned.

## 3.2 Model specification and methodology

In order to examine the relationship between financial support and the private firm's innovation ability, this study employed the following two models to test the Hypothesis 1, one is ordinary least squares (OLS) model and the other is Tobit Model. The OLS model and Tobit model were tested using White-robust standard errors to account for issues that might bias the estimates, in particular, standard errors.

*OLS Model*

$$Yi = \alpha + \beta 1 \text{financial support} + \beta 2 \text{ Private firm} + \beta 3 \ X' + \delta 1 \text{ industry} + \delta 2 \text{ regions} + \varepsilon i$$

The dependent variable Yi is the percent of annual sales accounted by new products or services (CNo2). The main independent variable is financial support. A private firm is a set of dummies that indicate whether a firm is private or not. X is a vector of control variables, including size, age, sales, human capital, and foreign technology. Additionally, two sets of dummy variables, industry and regions, complete the set of independent variables.

*Tobit Model*

Some values regarding new products or services are missing in the dataset. Therefore, we also used Tobit Model to test the Hypothesis 1.

$$Y_i^* = \alpha + \beta_1 \text{ financial support} + \beta_2 \text{ Private firm} + \beta_3 X' + \delta_1 \text{ industry} + \delta_2 \text{ regions} + \varepsilon_i$$

If $Y_i > 0$, $Y_i = Y_i^*$

If $Y_i < 0$, $Y_i = 0$ (There is no new products and services in this establishment)

The dependent variable and independent variables selected in the Tobit Model are the same as what were chosen in the OLS model.

For the Hypothesis 2, I investigated the effect of the type of ownership (POEs or SOEs) on firms' financial support using cross-sectional dataset. The ordinary least squares (OLS) regression model was used. It is the most suitable method for hypothesis alike the Hypothesis 2 in which independent variables are exogenous and if there is no perfect multicollinearity. To check for the possibility of multicollinearity, the variance inflation factor (VIF) was calculated. Multicollinearity seemed not be a problem in this study as the VIF range was from 1.02 to 3.01. Table 1 in Appendix 2 shows values of the VIF derived from the OLS regression. Table 2 in Appendix 2 shows the correlation matrix for the variables. As no correlation among the variables exceeds 0.4, the possibility of high correlation is ruled out. The effect of ownership type on accessing to finance as portrayed in the following equation to test hypothesis 2:

$$\text{Financial support} = \alpha + \beta_1 \text{ ownership} + \beta_2 X' + \varepsilon_i$$

Financial support as the dependent variable used the data on whether the firm have a line of credit or a loan from a financial institution (k8). Also, $\alpha$ is a constant, $\varepsilon_i$ is an error term, and $X'$ is a vector of control variables which include size, age, sales, industry, and region.

Again, OLS model was used to test the Hypothesis 3. In the model, I included the interaction effect of financial support and private firm.

Yi* = $\alpha$ + $\beta$1 financial support + $\beta$2 Private firm +$\beta$3 financialsupport*privatefirm + $\beta$4 $X'$ + $\delta$1 industry + $\delta$2 regions + $\varepsilon$i

Yi* is the innovation proxies which include NTE, PTT, NPS, NF, MRP and IPF. $\alpha$ is a constant, $\varepsilon$i is an error term, and $X'$ is a vector of control variables which include size, age, sales. Industry and region are also considered as the control variables.

### 3.3 Variables choice

*Dependent Variables*

For Hypothesis 1, the dependent variable Yi is the percent of annual sales accounted for by new products or services (CNo2). In this thesis, I used it to proxy the innovative ability of a firm. Innovation is often seen as a key to survive in a highly competitive market (Nee and Opper, 2012). The companies with a higher percentage of annual sales accounted for by new products or services therefore seem to be more successful in innovation. A similar approach can be also found in Love et al. (2009), where an innovator was defined as the company that introduces a new product or service.

For Hypothesis 2, the dependent variable was set as financial support (k8), denoting whether the firm has a line of credit or a loan from a financial institution.

For Hypothesis 3, dependent variables were estimated using six different variables, including NTE, standing for the introduction of new technology and equipment for the product or process improvements (CNo14a); PTT for the provision of technology training for staff (CNo14d); NPS for the introduction of the new product or new service (CNo14e); NF for the addition of new features to existing products or services (CNo14f); MRP for means to reduce production cost (CNo14g); and IPF for means to improve production flexibility (CNo14h).

*Independent Variables*

Main independent variables

For Hypothesis 1, the main independent variable is financial support (k8), in this thesis, measured as whether the firm has a line of credit or a loan from a financial institution. If this private firm has a line of credit or a loan from a financial institution, this firm has money to

support the firm's development. This firm has money to make innovation; otherwise, the firm did not access to credit and may not have money to do innovation activity.

For Hypotheses 1 and 2, the main independent variable is the private firms as the percentage of this firm is owned by private domestic individuals, companies or organizations (b2a). Private firm ownership type is labeled "Private firm", if the b2a>=50, it is domestic private firm. A firm has more than or equal to 50 percent of state-owned shares is certainly a state-owned firm. When the percentage of state-owned share is between 0 and 50, the firm is possible to be a state-owned firm. Because of the shares of the state-owned remain the largest shareholder; the firm is state-owned firm. It is difficult to distinguish these groups of firms are private firms or state-owned firms, so the mixed firms are generated. The mixed firms are not the main research objectives of this paper. So mixed firms will not be considered. There may be some problem here, the separation of state-owned firms or private firms is not very precise. It may be a disadvantage that leads to the final model specification.

For Hypothesis 3, the interaction of financial support and private firms' ownership (fs*privatefirm) was used as an independent variable.

**Control variables**

To decrease the possibility of confounding effects on the variables of interest and to factor out the possibility that the results are driven by the exclusion of certain other variables, I control for the following set of variables in the regression.

*Size*

Firm size (a6b) can be used to control for property right effect, as specified in Nee and Opper (2012). There are three sizes in a6b, the number of the employee between 5 to 19 is small size, the number of the employee between 20 to 99 is Medium size, the number of the employee is equal or over 100 is large size. The state owned enterprises naturally have a greater volume than the private one, which can only find the niche market left by the state owned enterprises. Therefore, the characteristics of size are controlled by the variable size in the model. As argued by Schumpeter (1942), innovation is positively influenced by the size of a firm. Empirical research has confirmed the Schumpeterian argument that the size of a firm indeed has a positive influence on the size of its innovative ability (Pianta & Vaona, 2006). Large firms tend to invest more in R&D than do small ones.

*Age*

In order to capture the private firms' innovation, the firm's own characteristic, age (b5), hence should be controlled. In the survey, the question is "In what year did this establishment begin operations?" The survey investigated in 2012. Hence, the firm age is "2012-b5". China established the reforms since 1978 and as a result, there is no private enterprise has a history longer than that year. It has been stated that younger firms underline the innovative dynamics as a way to stay competitive and generate relative growth (OECD, 2010). I assume the younger firms will innovate more and logged the age. Figure 1 shows that age is not normally distributed. For this reason, I will use logged values, as shown in Figure 2.
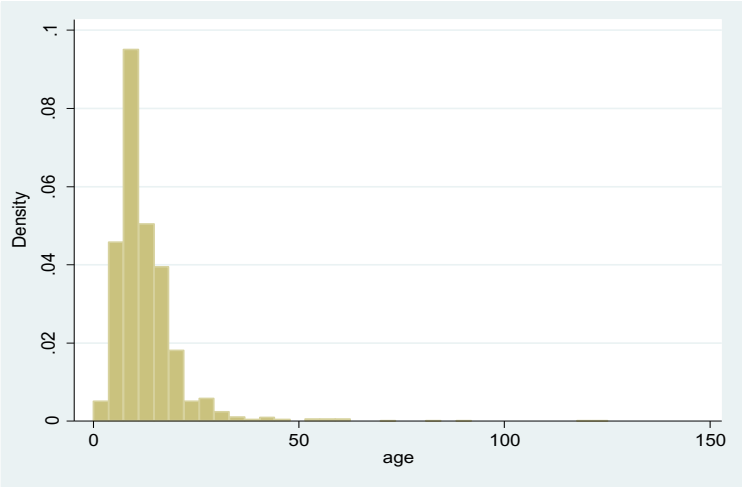


Figure 1. Histogram of *age*



Figure 2. Histogram of log transformed *age*

*Sales*

The total annual sales (d2): This variable shows the total annual sales for all products and services in a firm, which is a key element to measure the earnings performance predictability. Earnings predictability is an essential component of firm valuation (Ashbaugh, & Pincus, 2001) as well as a determinant for innovation ability. Firms with more annual sales have better ability at innovation. Hence, the total annual sales should be controlled. Figure 3 shows the sales are not normally distributed. For this reason, I will use logged values, as shown in Figure 4.
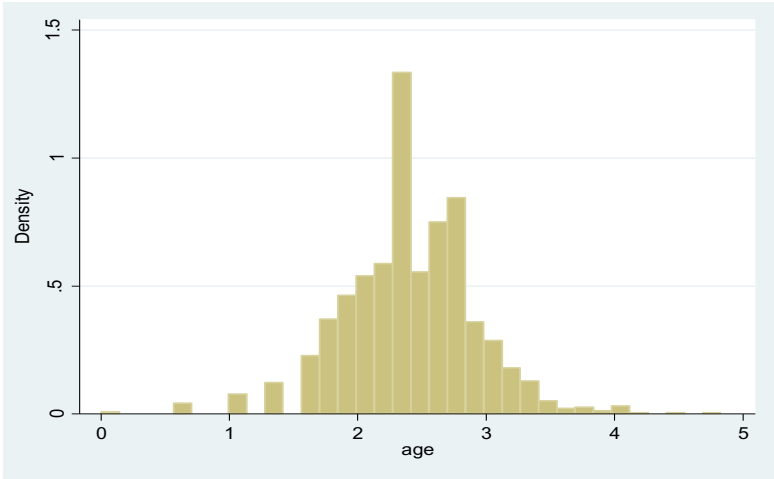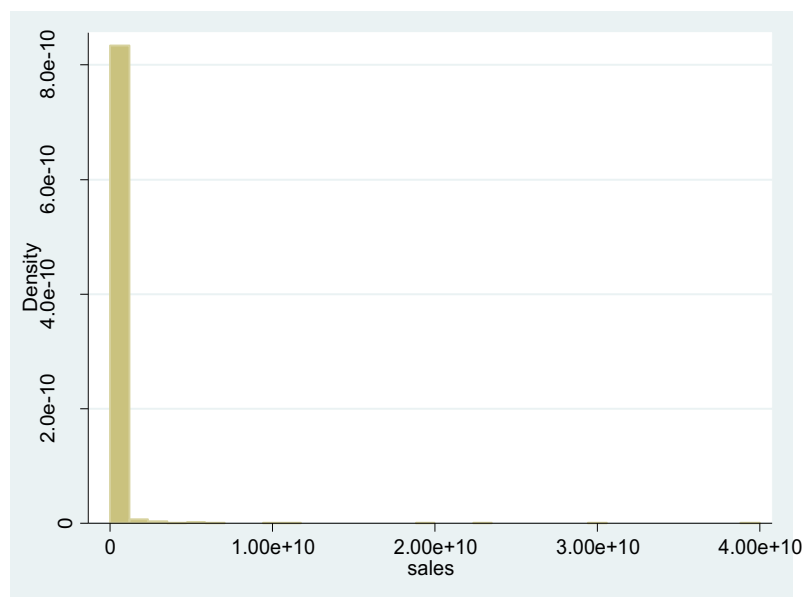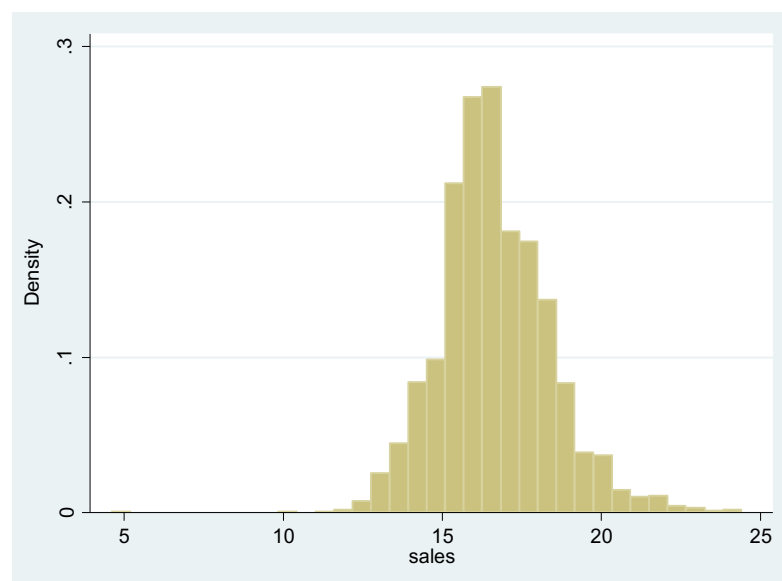


Figure 3. Histogram of *sales*

Figure 4. Histogram of log transformed *sales*

*Human Capital*

The variable for human capital is obtained from WB Survey section 19a, the average number of years of education of typical production worker employed in this establishment. This term was included as a proxy for the level of human capital because it had received a good response rate. To be more specific, employees that do not have a certain level of education and knowledge may have less incentive and ability to innovate. Furthermore, a higher level of human capital may imply a more profitable business and the firms may do more investments and innovation. Jane Jacobs notes that local environment that attracts talented people and the cities would be more opened and creative. Following Jacobs, this paper argues that innovation is a joint product of human capital and creativity (Lee & Gates, 2010). Figure 5 shows the histogram of education, which is normally distributed. Figure 6 shows the fraction of education, the average number of years of education of a typical permanent full-time production worker employed in this establishment. Most of the average years of education are nine years and twelve years.
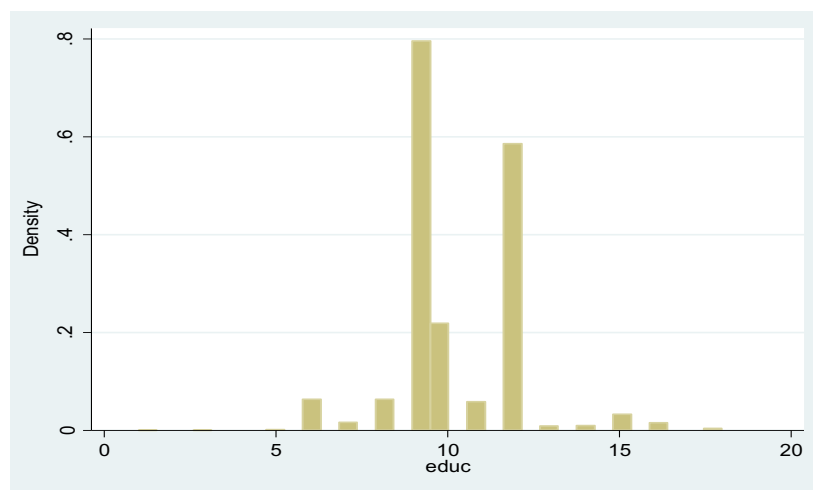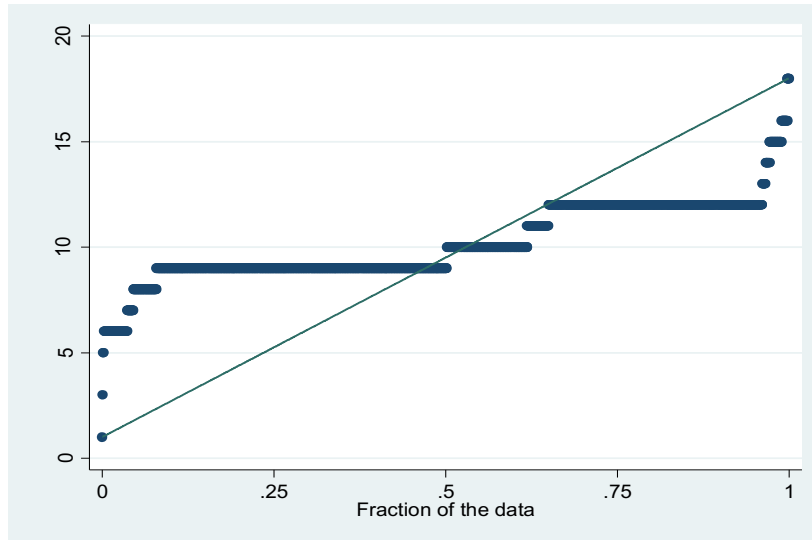


Figure 5. Histogram of *education*

Figure 6. The fraction of *education*

*Foreign technology (e6)*

Additionally, I create a dummy variable to see whether the company had received some form of technological foreign support or not. In China, the eastern coastal cities got the priority to establish the first special economic zones. They benefited from large Foreign Direct Investment and at the same time, new and advanced foreign technology has been introduced by foreign companies to the eastern coastal region. Empirical study shows that FDI has a positive effect on innovation activity via spillover channels such as the introduction of new equipment and new technology, skilled labor turnovers and so on (Cheung & Ping, 2004). Therefore, I choose to control for it in our model.

*Industry (a4b)*

The same approach is applied to all industries. Dummies are created for each industry to capture the industry specific effect. Industry dummies are commonly used in the literature in papers such as Wagner and Graf von der Schulenburg (1992) and Bourdet and Persson (2011). In the context of China, the authors Nee and Opper (2012) as well control for industry effects. The firms in the WB Survey operate in twenty-six different industries, as depicted by a4b, which range from industries producing final consumer products to industries producing intermediate goods and raw materials. There is a large variety of different industries. The reason for including industries as control variables is because of some industries, such as

electronics, for example, have the higher level of technology. In China electronics is the state monopoly. Furthermore, investments in R&D are likely to vary between industries; for example, "light industry" may have higher levels of R&D investments. IT industry may change more quickly and has a faster speed in innovation.

*Region*

To control for regional differences, two dummy variables are constructed, dividing our sample into coastal and inland regions. The region variable a3a from the World Bank survey was used to construct the dummies. There are 25 cities in this survey, some of the cities are proximity to the coast, some of the cities are inland cities, and some of the cities are municipalities. As described in chapter two of Nee and Opper (2012), coastal and inland regions have not been equally successful in innovation. The level of development and competitiveness differs highly in the different regions. There are a lot of private companies in the Pearl River Delta regions (Nee and Opper, 2012). Thus the region should be controlled in this model. The cities of Guangdong, Jiangsu, and Shanghai, Zhejiang province are tacitly approved as coastal cities. Including Dongguan City, Foshan City, Guangzhou City, Shenzhen City, Nanjing City, Nantong City, Suzhou City, Wuxi City, Shanghai (municipalities), Hangzhou City, Ningbo City, Wenzhou City. Others of the 25 cities are tacitly approved as inland cities. The variables used in the model are defined in more details in Table 1.

Table 1. Definition of Variables

| *Variable* | *Definition* |
|---|---|
| *H1: Dependent Variables* | |
| Innovation (CNo2) | the percent of this firm's total annual sales was accounted for by products or services that were introduced in the last three years. |
| *H1: Independent Variables* | |
| Financial support (k8) | this firm has a line of credit or a loan from a financial institution, =1, yes; =0 No |
| Private firm (b2a) | if b2a>=50%, this firm is owned by private domestic individuals, |

| | |
|---|---|
| | companies or organizations |
| *H2: Dependent variables* | |
| Financial support(k8) | this firm has a line of credit or a loan from a financial institution,=1,yes; =0 No |
| *H2: Independent Variables* | |
| Ownership (b2a) | If b2a>=50%, this firm is owned by private domestic individuals companies or organizations |
| *H3: Dependent variables* | |
| NTE (CNo14a) | Introduce new technology and equipment(s) for product or process improvement, =1, yes; =0 No |
| PTT (CNo14d) | Provide technology training of staff, =1, yes; =0 No |
| NPS(CNo14e) | Introduce new product or new service,=1, yes; =0 No |
| NF (CNo14f) | Add new features to existing products or service, =1, yes; =0 No |
| MRP(CNo14g) | Take measures to reduce production cost, =1, yes; =0 No |
| IPF (CNo14h) | Take actions to improve production flexibility, =1, yes; =0 No |
| *H3: Independent variables* | |
| Financial support(k8) | This firm has a line of credit or a loan from a financial institution, =1, yes; =0 No |
| *Private ownership* | If b2a>=50%, this firm is owned by private domestic individuals companies or organizations |
| *Financial support* *Private ownership* | The interaction of financial support and private ownership |

| | |
|---|---|
| *Control variables* | |
| Firm size (a6b) | 1 Small, 2 Medium, 3 Large |
| Age (b5) | Age of the firm until 2012 measured |
| | by subtracting b5 from 2012, a log of the age |
| Sales (d2) | Log of the firm's total annual sales |
| | for all products and service |
| Human capital (19a) | Average number of years of education of a typical permanent |
| | full-time production worker employed in this firm |
| Foreign technology (e6) | this firm at percent use technology licensed |
| | from a foreign-owned company |
| Industry (a4b) | industry include 28 industry dummies |
| region (a3a) | Region include coastal cities and inland cities |

## 3.4   Descriptive statistics

According to the descriptive statistics presented in Table 2, the main variables of interest have more than 1180 observations each. The dependent variable is the percent of this firm's annual sales accounted for by new products or services is from 0 to 100 percent. More than 50 percent of these firms are owned by private domestic individuals, companies or organizations are approved as private firms. The Maximum of the firm age is 125, while the mean of firm age is only 12.72; it means most of the firms are very young.

Table 2. Descriptive statistics of the variables

| Variables | Obs | mean | Std,Dev, | Min | Max |
|---|---|---|---|---|---|
| **dependent variable** | | | | | |
| NTE | 1683 | 0.6244801 | 0.4844008 | 0 | 1 |
| PTT | 1683 | 0.7070707 | 0.4552415 | 0 | 1 |
| NPS | 1677 | 0.4269529 | 0.4947829 | 0 | 1 |
| NF | 1678 | 0.4952324 | 0.5001263 | 0 | 1 |
| MRP | 1679 | 0.7522335 | 0.4318441 | 0 | 1 |
| IPF | 1678 | 0.6406436 | 0.4799548 | 0 | 1 |
| **independent variables** | | | | | |
| financial support(dummy) | 2588 | 0.312983 | 0.4637971 | 0 | 1 |
| privatefirm(dummy) | 2491 | 98.53673 | 6.842267 | 50 | 100 |
| **control variables** | | | | | |
| size | 2700 | 2.185185 | 0.7673901 | 1 | 3 |
| age | 2627 | 12.72021 | 7.911288 | 0 | 125 |
| sales | 2694 | 16.67262 | 1.734479 | 4.60517 | 24.41215 |
| education | 1657 | 10.17924 | 1.887501 | 1 | 18 |
| industry (dummies) | 2700 | 36.18667 | 15.96771 | 15 | 72 |
| foreigntechnology(dummy) | 1676 | 0.2416468 | 0.4282091 | 0 | 1 |
| Coastal cities (dummies) | 2700 | 0.4611111 | 0.4985777 | 0 | 1 |

## 4. Results and discussion

The OLS model and Tobit model were run with Huber–White -robust standard errors to account for issues that might bias the estimates, in particular, standard errors. The robust tests of OLS model and Tobit model showed that the results did not change. The standard errors did not change much, indicating the models were robust in this thesis. Every regression was also tested for robustness.

## 4.1 The result for hypothesis 1

The results from a robust fixed effects regression of OLS model and Tobit model are presented in the Table 3.

Table 3. Regression results and Tobit results

| VARIABLES | (1) Model OLS | (2) Model Tobit |
|---|---|---|
| Financial support | 6.339*** | 6.379*** |
| | (1.675) | (1.656) |
| Private firm | -0.0580 | -0.0577 |
| | (0.0930) | (0.0911) |
| Medium firm(20,99) | 11.01*** | 11.07*** |
| | (2.234) | (2.201) |
| Large firm(>=100) | 7.567*** | 7.587*** |
| | (2.636) | (2.586) |
| age | -0.105 | -0.106 |
| | (0.102) | (0.100) |
| sales | -1.619*** | -1.630*** |
| | (0.567) | (0.557) |
| education | 0.272 | 0.286 |
| | (0.403) | (0.399) |
| Foreign technology | 8.091*** | 8.065*** |
| | (1.689) | (1.657) |
| Coastal cities | -1.137 | -1.159 |
| | (1.622) | (1.603) |
| Constant | 40.44*** | 40.43*** |
| | (13.54) | (13.26) |
| | | |
| Observations | 631 | 631 |
| R-squared | 0.129 | |
| Industry dummies | YES | YES |

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Breusch-Pagan test, correlations matrix, VIF test and Ramsey Reset test are shown in the Appendix 1. The data were checked for omitted variable bias by performing the Ramsey Reset test, indicating that the data does not suffer from omitted variables. The variable inflation factor test (VIF) shows there is no potential problem of multicollinearity. VIF value for financial support is 1.16, which are not over 4.

Financial support was found to positively and significantly influence the private firms' innovation. Therefore, the Hypothesis 1 should be accepted as *"The private firms with the financial support are more likely to be involved in innovation"*. With the access to finance support, companies can introduce new products using new types and sources of raw materials and sell them into the market; they can also employ talented to manage the company or to design new products or to improve productions etc. All of these possibilities have been defined as innovation by Schumpeter (1912).While access to finance has been described by Chinese firms as the biggest problem in China's business environment. The majority of businesses are left out of the formal financial system. China's financial system is considered the least market-oriented institution of the Chinese economy. The financial sector has remained under a strict control by the Chinese government. Ownership must not be relevant in regards to being able to get a loan or a line of credit. The only thing relevant to look for should be the company's future profitability. But in China ownership affect how loans are given in the formal financial system. China's formal financial system is primarily dominated by the state rather than private firms. Most banks are commercially oriented but they also give loans on the basis of the government's policies and have a tendency to favor SOE and COE (Naughton, 2007). That is a big obstacle for Chinese private firms' innovation and development.

Private firm does not show a significant influence on firms' innovation. According to Shleifer, the public manager has relatively weak incentives to make any investment and innovation, because this manager is not the owner and hence gets only a small part of the return. While, the manager in private firms have stronger incentives because as the owner of the firm, they get more returns on the investment and innovation (Shleifer, 1998). Therefore, the ownership may influence the firms' innovation ability. While, in this model, only private firms are measured because this essay only wants to test if financial support influences the private firms' innovation. A medium and large firm sizes have significantly positive effects on a firm's innovation process, which once again supports the argumentation of Schumpeter

(1942). The company's age shows a negative and not significant effect, I expected a negative influence based on Utterbacks (1994) arguments of increasing tendencies to conservative business strategies, once a firm becomes older. But the age has not a significant influence on the innovation; the reason behind the results might be that Chinese private firms are relatively young compared to international firms, since private companies were strictly forbidden until 1978. Sales show a negative and significant influence on innovation. Because the dependent variable the percent of annual sales accounted by new products or services, the firms with larger sales, the percent of annual sales accounted by new products or services will be smaller. In reality, if a firm has large sales per year, the firm may also have larger new products and new services. Further research is needed. The education is a positive correlation but not significant effect innovation. I expected a positive significant influence, based on Jacobs' argument that innovation is a joint product of human capital and creativity, but the result did not show that. It may be the problem of the data. The data are not precise when people answer "what is the percentage of full-time permanent workers who completed secondary school?" Foreign technology has a positive effect on innovation and is therefore in line with our expectations.

It is a surprise for us that the area dummies for the East Coast of China had not significant effect on innovation and the correlation is negative. I expected the firms in the east coast of China are more likely to be involved in innovation and positive and significant effects on innovation are based on an argumentation by Rosenberg (2004). In this paper, Rosenberg states that innovation has been in general and from a long-term perspective the most important driver in terms of economic growth and Chinas East Coast is the most developed area (Brun et al., 2002). An explanation might already be in the argumentation, since it is about long-term growth, while our data reflects only 2012. This fact opens room for further research in which a study could run a similar regression but with a panel data instead of overcoming the potential threat of outlier years. Such an outlier lower innovation in coastal areas might be explained by adjustments due to overproduction capacities that China had and that might occur in other years, in other regions. Another potential reason is that the areas outside of the East coast saw the development of the East Coast and the rise of wealth so that they increased their innovation efforts to start a catching up process. Some researcher may on the other hand argue that our results could be seen as the first sign of a middle-income trap, in which the Chinese growth rates would slow down and one of the determines behind it might be a decreasing innovation, which could potentially be affected by poor institutions (Aiyar et al., 2013). It would be reasonable to see such a middle-income trap to occur first in more

developed areas since they already used the paths of easy economic growth, while the less developed areas of the hinterland can still benefit from those. These are all potential influences behind our results. However, there is no empirical evidence behind it, so that further research is needed in order to answer that question.

## 4.2   The result for hypothesis 2

Table 4 showed the estimation results for the second hypothesis testing the effect of ownership type on the firms' access to finance ability. In contract to some reports in the literature, there were few differences. Ownership shows a positive significant influence at 10% level of firms' access to finance ability. I expect a negative significant influence. According to previous literature, the state-own enterprise has the advantage at access to finance from China's bank or financial institutions. The result did not support the second hypothesis: *Chinese private firms today still have disadvantages in accessing to finance when compared to state-owned firms.* Johansson & Feng (2016) tested that SOEs had better access to both short-term and long-term debt after the introduction of the stimulus program in 2008. The 10% significant negative estimate shows that private-owned firms did not have a disadvantage in accessing to finance in 2012. Compared to state-owned companies, private-owned companies have slight advantages to have a line of credit or a loan from a financial institution. In 2012, Chinese government already provide some fiscal policy to support the private companies to access to finance (Chen, F., Hope, O. K., Li, Q., & Wang, X. 2011). The control variables also show some interesting outcomes. Medium and large firms have a positive significant influence on firms' access to finance ability. The firm age seems to have a negligible effect on firms' access to finance ability as the result shows an insignificant effect. Sales have a positive significant influence at 1% level of the firms' access to finance ability. The other estimates did not show any significant influence.

Table 4. The regression result for the effect of ownership type on financial support

| VARIABLES | Financial support |
|---|---|
| Private ownership | 0.0703* |
|  | (0.0379) |
| medium | 0.105*** |

|  |  |
|---|---|
|  | (0.0328) |
| large | 0.163*** |
|  | (0.0409) |
| age | -0.000801 |
|  | (0.00141) |
| sales | 0.0549*** |
|  | (0.00932) |
| education | 0.00763 |
|  | (0.00619) |
| Foreign technology | 0.0185 |
|  | (0.0294) |
| coastal | -0.156*** |
|  | (0.0240) |
| Constant | -0.760*** |
|  | (0.16) |
|  |  |
| Observations | 1,552 |
| R-squared | 0.124 |
| Industry | YES |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

## 4.3    The results for hypothesis 3

Table 6 shows the interaction of private ownership and financial support effects on the firm innovation ability. It shows the six dependent variables, (1) NTE is the establishment introduces new technology and equipment for product or process improvements. (2) PTT is the establishment provides technology training for staff. (3) NPS is the establishment introduces the new product or new service. (4) NF the establishment adds new features to existing products or services. (5) MRP is the establishment takes measures to reduce production cost. (6) IPF is the establishment takes actions to improve production flexibility. Compared the table 5 with table 6, after adding an interaction term to a model drastically changes the interpretation of all of the coefficients. Private ownership influences the firms' financial support on the firms' innovation ability. Table 5 shows financial support has a

positive significant influence on NTE, PTT, NPS and NF. Both sales and foreign technology show significant influence on the firms' innovation activities.

The firms have money they would use the money to introduce new technology and equipment for product or process improvements. The firms would also use the money to provide technology training for staff. Introduce the new product or new service also significantly influenced by the financial support. Financial support also has a significant influence on the firms' innovation. The firms would use the money to add new features to existing products or services. The firms' innovation activities need financial support.

Table 6 shows the interaction between finance and private ownership on innovation, financial support only has a significant influence on providing technology training for staff. The financial support*private firm has a negative significant influence on the firms PTT. It is interesting that both sale and foreign technology show a positive significant influence on the firms' innovation activities.

It rejects the hypothesis that financial constraints of private firms constrain their ability to innovate. Financial support influence on the private firm innovation but even the private firms have money, the private firms do not provide technology training for their own staff. It is very expensive to train a staff in the company rather than provide high salary to attract experiential worker. Private ownership has a negative significant influence on the IPF. China's private firms did not take actions to improve production flexibility. State-owned firms would take actions to improve production flexibility. The fs*private firm did not show any significant influence on NTE, NPS, NF, MRP and IPF. In China, the financial support did not influence the private firms' innovation activities, such as introduce new technology and equipment for products or process improvement; Introduce the new product or new service; Add new features to existing products or services; Take measures to reduce production cost. In the 2012 World Bank data, the private firms are not big. These private firms did not take actions to introduce new technology and equipment for product or process improvement. It shows China's private firms' innovation abilities are still very poor in 2012. Furthermore, the shortage of access to finance ability does not influence on the private firms' innovation. There may exist some other reason which causes China's private firms have the shortage in innovation. According to Peneder (2008), China's private enterprises lack incentives to invest and lack of means to invest. It is the China's private enterprises' merits which cause the lack of innovation ability. It proves the hypothesis 3 is not correct.

Table 5. Regression result of the effect of financial support on innovation

| VARIABLES | (1) NTE | (2) PTT | (3) NPS | (4) NF | (5) MRP | (6) IPF |
|---|---|---|---|---|---|---|
| FS | 0.090*** | 0.060** | 0.058** | 0.073** | -0.020 | 0.035 |
| | (0.027) | (0.026) | (0.028) | (0.029) | (0.026) | (0.028) |
| privatefirm | -0.000 | -0.002* | -0.002 | 0.001 | 0.000 | -0.002 |
| | (0.002) | (0.001) | (0.002) | (0.002) | (0.002) | (0.002) |
| medium | 0.040 | 0.161*** | 0.038 | 0.087** | 0.147*** | 0.127*** |
| | (0.043) | (0.042) | (0.042) | (0.041) | (0.042) | (0.042) |
| large | 0.028 | 0.171*** | 0.014 | 0.049 | 0.167*** | 0.101** |
| | (0.049) | (0.049) | (0.049) | (0.049) | (0.047) | (0.049) |
| age | -0.000 | -0.001 | -0.001 | -0.000 | 0.001 | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| sales | 0.043*** | 0.041*** | 0.035*** | 0.046*** | 0.017* | 0.031*** |
| | (0.009) | (0.009) | (0.010) | (0.010) | (0.009) | (0.010) |
| education | -0.008 | 0.004 | -0.001 | -0.012 | -0.014** | -0.005 |
| | (0.007) | (0.006) | (0.007) | (0.008) | (0.007) | (0.007) |
| foreigntechnology | 0.253*** | 0.126*** | 0.326*** | 0.274*** | 0.091*** | 0.180*** |
| | (0.027) | (0.028) | (0.029) | (0.031) | (0.027) | (0.028) |
| coastalcities | -0.143*** | -0.126*** | -0.132*** | -0.136*** | -0.158*** | -0.177*** |
| | (0.026) | (0.026) | (0.027) | (0.027) | (0.024) | (0.027) |
| Constant | 0.009 | 0.093 | 0.114 | -0.301 | 0.455** | 0.226 |
| | (0.224) | (0.197) | (0.240) | (0.250) | (0.217) | (0.226) |
| Observations | 1,404 | 1,403 | 1,397 | 1,399 | 1,400 | 1,399 |
| R-squared | 0.136 | 0.113 | 0.137 | 0.126 | 0.075 | 0.109 |
| Industry dummies | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6. Interaction between finance and private ownership on innovation

| VARIABLES | (1) NTE | (2) PTT | (3) NPS | (4) NF | (5) MRP | (6) IPF |
|---|---|---|---|---|---|---|
| FS | -0.282 | 0.608*** | 0.135 | 0.405 | 0.101 | -0.421 |
| | (0.309) | (0.221) | (0.316) | (0.360) | (0.324) | (0.311) |
| Private firm | -0.002 | 0.000 | -0.001 | 0.002 | 0.001 | -0.004** |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| FS*private firm | 0.004 | -0.006** | -0.001 | -0.003 | -0.001 | 0.005 |
| | (0.003) | (0.002) | (0.003) | (0.004) | (0.003) | (0.003) |
| Medium | 0.041 | 0.159*** | 0.038 | 0.086** | 0.146*** | 0.128*** |
| | (0.043) | (0.042) | (0.042) | (0.041) | (0.042) | (0.042) |
| Large firm | 0.027 | 0.172*** | 0.014 | 0.049 | 0.167*** | 0.101** |
| | (0.049) | (0.049) | (0.049) | (0.049) | (0.047) | (0.049) |
| age | -0.000 | -0.002 | -0.001 | -0.001 | 0.001 | 0.002 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| sales | 0.042*** | 0.042*** | 0.036*** | 0.047*** | 0.017* | 0.030*** |
| | (0.009) | (0.009) | (0.010) | (0.010) | (0.009) | (0.010) |
| education | -0.008 | 0.003 | -0.001 | -0.012 | -0.015** | -0.005 |
| | (0.007) | (0.006) | (0.007) | (0.008) | (0.007) | (0.007) |
| Foreign technology | 0.255*** | 0.122*** | 0.326*** | 0.272*** | 0.090*** | 0.184*** |
| | (0.027) | (0.028) | (0.030) | (0.031) | (0.027) | (0.028) |
| Coastal cities | -0.142*** | -0.128*** | -0.132*** | -0.137*** | -0.158*** | -0.175*** |
| | (0.026) | (0.026) | (0.027) | (0.027) | (0.025) | (0.027) |
| Constant | 0.161 | -0.131 | 0.083 | -0.436 | 0.405* | 0.412* |
| | (0.250) | (0.229) | (0.284) | (0.288) | (0.245) | (0.235) |
| | | | | | | |
| Observations | 1,404 | 1,403 | 1,397 | 1,399 | 1,400 | 1,399 |
| R-squared | 0.137 | 0.115 | 0.137 | 0.127 | 0.075 | 0.110 |
| Industry dummies | YES | YES | YES | YES | YES | YES |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

## 4.4    The summary of results

The first OLS and Tobit regression results show the financial support have a significant influence on the enterprise innovation ability. The results are what I expected which prove the hypothesis is right. The second regression results show an unexpected result, I expect negative significant results for the private ownership and financial support. But the results show that private ownership has a positive influence at 10% level of the firms' access to finance ability. It means private enterprises do not have much problem with access to finance in 2012. The results reject the hypothesis 2. The third results are the interaction of private ownership and financial support effect on the firms' innovation activities. There are six dependent variables in the third regression: NTE, PTT, NPS, NF, MRP and IPF. The interaction of financial support and private ownership only have a negative significant influence on the dependent variable PTT: provide technology training for staff. The results mean that China's private firms have money but do not use the money to provide technology training for their own staff. The results also reject the hypothesis 3: financial support does not influence on the private firms' innovation activities. There are some other reasons which influence on the private firms' innovation.

## 5.    Conclusion

In conclusion, innovation as an important engine for economy and society development may not achieve without the financial support. Innovation is the most important element for the establishment of new demands and thus economic prosperity of a society (Schumpeter, 1942). An innovation is a new product or service that is launched in the market in which consumers find products or services so satisfying to increase its own request to include the new product or service. Business-driven businesses, small or large, are launching a successful innovation contributes to the creation of a new demand and thereby the increasing prosperity of a society.

To put a new product into production and to sell it in the market, introducing new equipment, attracting talent manager or technologist, using technology to drive the firms' innovation could not achieve without financial support. Borrowing money from the financial institution as the firms' main formal financing method may play an important role in private firms' innovation. To test the hypothesis that the private firms with sufficient financial support are more likely to be involved in innovation, OLS Model and Tobit Model are used.

The result shows the financial support (the establishment have a line of credit or a loan from a financial institution) shows positive and significant influence the private firms' innovation. This is what I expected and the result also proves our hypothesis is right. If the Chinese government can provide more convenience for private firms to access to loan or credit from financial institution, the private firms' innovation ability and profit earning ability would be improved. Then China's economic development would get benefit from the convenience of accessing to finance.

The result for the second hypothesis shows the ownership has a significant influence on the firms' access to finance ability. While it shows private firms have a positive association with the firms' access to finance ability. The result rejects the hypothesis. The firm has a line of credit or a loan from a financial institution as the dependent variable has response firm could get the loan from the bank or other private financial institution. In 2012, it is easier for Chinese private firms to get the loan from the private financial institution. On the other hand, it is easier for the private firms to get the loan from the bank than before. In 2012, The Chinese government may start to provide some policy to support the small private firms' access to finance.

According to the results of the third hypothesis, there may have other reason which causes the private firms innovation activities. The private firms in China may lack innovation do not matter the private firms' access to finance or not. Further research is needed to find what is the problem of China's private firms are under-investment in innovation.

The research has some limitations. Firstly, since the data set only reflects the year 2012, the regression results of some variables are not as what I expected. On the other hand, the data limitation also opens room for further research for instance by running a comparable regression with a panel data set. Panel data set can reflect every year's data change. It can show the innovation activities change as the year pass by. In China, the government provides new policies on the financial markets. These new policies would influence the private firms' financial activities and innovation activities. However, a problem is that these datasets are rare and that it will be difficult to find such an existing panel data for China. While, further work is a challenge and needs to be spent more energy and time to search more data for the research. Secondly, the result of the first hypothesis shows the observations is 631 which is a small amount. According to the descriptive statistics presented in Table 2, the main variables of interests have more than 1180 observations each. More observations should be included in the further research.