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Innovation in China

-Market Failures in a Copycat Nation

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Abstract

Since the Chinese innovators suffer from unfair competition from imitators, the thesis identifies three obstacles facing the entrepreneurs. First, the entrepreneurial environment lacks networks and collaboration between industries and research institutions. Second, weak property rights and government interventions generate a vague and insecure legal system. Third, SOEs enjoy soft budget constrains and government guaranteed bank loans. Due to the three market failures, it is stated that the inefficient and unfair market environment is more expensive to the entrepreneurs, whose progress is a wider process than the imitators'. Thereby, the imitators enjoy unfair advantages.

The thesis argues that to help the innovators overcome the copy-cats; the national innovation policies ought to implement an efficient and competitive market-environment for the innovators. The hypotheses claim that more networks and collaboration; a more trustworthy legal system; and less government ties, would improve the Chinese innovation output.

The result shows that more collaboration and networks within research, and a more established trustworthy legal system is vital to improve the Chinese innovation output.

Keywords: China, innovation, imitators, collaboration, networks, legal system, government ties.

List of Abbreviations

FDI	Foreign Direct Investment
ICS	Investment Climate Survey
NBV	Net Book Value
NIS	National Innovation System
R&D	Research and Development
RIS	Regional innovation System
S&T	Science and Technology
SME	Small and Medium-sized Enterprise
SOE	State-Owned Enterprise
WTO	World Trade Organisation

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1. Introduction

The Chinese economy is growing rapidly, yet as many developing economies China is an efficient copycat and a low-cost producer. When the Korean Company LG Electronics introduced a Chinese version of a new cell phone, an imitator had already developed and sold a perfect copy to the Chinese market. As a result, Chinese consumers believe that LG fabricates the counterfeit (The Chosun Ilbo, 24 Nov 2006). To the imitator, replications can be extremely lucrative. If the cost of imitation is considerably lower than the cost of innovation a significant share of the potential innovators will choose to imitate instead of develop new products (Freeman (ed.) 1990, p.335). Furthermore -inspired by Joseph Schumpeter- it is nowadays acknowledged that evolution and thereby growth come from real innovation (Fagerberg 2003, pp.152, and OECD 2002, p.13). Therefore an innovation is most likely, more long-run rewarding than an imitation (Fagerberg 2003, pp.146).

As innovation theory is a relatively small field of economics it varies more in time than by ideology. Hence, it is suggested that the governments' innovation programs widely are founded upon a universal innovation theory. In the case of China, well-known innovation theories support the government's R&D policy. Yet, in fact this is merely to a certain level since China suffers from e.g. resource-consuming and inefficient state-owned enterprises, weak property rights and a lack of business networks. Additionally since the innovation process is wider than the imitation procedure, the cost in time and money is lower to the imitator than to the innovator (Freeman (ed.) 1990, p.339). Consequently the ratio imitation costs to innovation costs decreases as the market failures affect the wider innovation process to a lager extend. Hence the thesis argues that the Chinese transformation face severe problems as the innovation policies maintain a dissatisfactory environment to the entrepreneurs. To enhance the innovation capabilities the national innovation system, NIS, must advance to a more favourable manner of the innovators. This is of importance since the transformation occurs as the world face advanced technological and organizational challenges. Thus, all governments need to find further policies to improve the innovation output and thereby maintain the real economic growth (OECD 2002, p.13).

As innovation is of great importance to the growth of a firm, a region and a nation, it is essential to support the innovators and their necessities. Therefore the Chinese government has declared that China should increase their efforts to become an innovation-oriented country. According to

the statement, innovation is made by a supportive role of the government, next to a capital allocating function of the market, and a technical innovating role by the enterprises (Chinese Government's Official Web Portal, www.gov.cn, 23 Jan 2007). To help the innovators overcome the copy-cats, the NIS should implement an efficient and competitive market-environment for the innovators. That is including a trustworthy legal system, liberal market forces, and well-functioning information flows and networks.

More in detail, the thesis identifies three major problems that are facing the Chinese innovators. First, Lack of collaboration. Guan et al. (2005) argue that it is central for efficient research and innovation that collaboration between industries and universities work smoothly. Otherwise, Guan et al., claim that found knowledge will not diffuse and identical innovation processes might take place at two different plants simultaneously. Second, Potter (1999) argues that instead of rule of law, China is governed by rule through law. Therefore the environment of Chinese entrepreneurs is unsure and dependent on government ties. This relates to the third problem, which is the presence of state owned enterprises, SOE. Luo et al. (2003) claim that SOEs enjoy soft budget constrains and loans guaranteed by the government. This is e.g. to keep unemployment from rising. As a consequence private and developing entrepreneurs face an unfair competition when selling their products, and when applying for external finance.

Nevertheless Jefferson et al. (2002) find that there are active innovation processes in China. They argue that the research and development, R&D, activity among Chinese firms has increased during the second half of the 1990s. The Chinese National Bureau of Statistics states that there is an up-going trend of expenditure on research (see figure 1).

Table 1. CHINESE EXPENDITURE ON R&D

Medium and Large-size Enterprises' Expenditure on R&D	2000	2002	2003	2004
Expenditure on R&D (100 million Yuan)	353,4	560,2	720,8	954,4
Funding for Science Activities (100 million Yuan)	922,8	1213,0	1588,6	2091,0
Full-time Equivalent of R&D Personnel (10 000 man-year)	32,9	42,4	47,8	43,8
Enterprises Having Scientific Institutions (units)	6187	5836	6424	6467

(National Bureau of Statistics of China, Yearbook 2005, 21-36)

1.1 Purpose

Since there are major obstacles of entrepreneurship and since the Chinese government has stated that China shall be an innovation oriented nation -with the market in focus-, it is of interest to

test whether further transformations of the Chinese innovation policies are required to maintain or even improve the innovation environment.

1.2 Disposition

To scrutinize the innovation system and value its factors, the paper is organized as the following. Initially, the present situation of Chinese R&D is described and attributes of National Innovation Systems and Chinese research is discussed. In chapter 3, the thesis discusses reasons for governments to interfere in innovation. This is followed by Joseph Schumpeter's fundamental thoughts, which introduces the discussion of what factors should be included in the tests. Furthermore, three hypotheses that are relating to the three major obstacles of Chinese entrepreneurs are presented. As the thesis uses a probit-test and a correlation-test, the method is introduced more in detail in chapter 4. Moreover in the method section, the paper explains the proxies that are included in the analysis. In chapter 5, the data is discussed from a statistical standpoint. Finally, chapter 6 contains the discussion and result, which is followed by a conclusion in chapter 7.

2. Chinese Innovation

Historically, as the Mao-era ended Deng Xiaoping became the leader and initiated a transformation of China, which still is most active. Deng declared it honourable to be rich and thus authorized future market-incentives. Therefore, today China's official homepage describes what should be done to become an innovation-oriented country where a private person can achieve success in business (Chinese Government's Official Web Portal, www.gov.cn, 23 Jan 2007). The government states that China has to increase its efforts to improve the NIS and thus enhance innovation. This can only be done by a leading role of the government next to a capital allocating function of the market, and a technical innovating role by the enterprises (Chinese Government's Official Web Portal, www.gov.cn, 23 Jan, 2007). Nevertheless China undergoes resource-consuming and inefficient state-owned enterprises, weak property rights and a lack of business networks. These market failures add additional expenses onto the entrepreneurs' innovation processes. Additionally since the innovation process is wider than the imitation procedure, the cost in time and money is higher to the innovator than to the imitator (Freeman (ed.) 1990, p.339). As a result the costs of innovation increases compared to cost of imitation, as the obstacles mentioned above affect the wider innovation process to a lager extend. Hence the Chinese innovation policies maintain a dissatisfactory environment to the entrepreneurs. Therefore the thesis argues that further actions need to be taken to strengthen the pro-innovation policies. Thus, when discussing whether further transformations should be considered it is central to start with a description of the Chinese NIS.

The NIS gives us a hint of what a government believes is important for the development of successful innovators within its nation. In this case a system is the plan of the government to support or direct the development. How the government wants to form its NIS is based on its political believes (Lundvall 1992, pp.5). In Lundvall's words, "…*innovation system implies a new perspective on a wide set of policies including, social policy, labour market policy, education policy, industrial policy, energy policy, environmental policy and science and technology policy. Specifically, the concept calls for new national development strategies with co-ordination across these policy areas*" (Lundvall et al. 2002, p.227).

2.1. Attributes of the Chinese Innovation System

It cannot be said that there are no efforts to improve research and the innovation processes of China. China has the conditions to become a technological superpower, as much as it has a global

economic influence. And quite right, as the economy grows the number of innovations increase. Table 2 clearly show an increase of patent applications and certified patents in China, even though the relative share of approved applications has not increased and stays around 50 % to 60 %.

Table 2. TOTAL NUMBER OF PATENT APPLICATIONS EXAMINED AND CERTIFIED

	2000	2001	2003	2003	2004
Examined patents	170682	203573	252631	308487	353807
Approved patents	105345	114251	132399	182226	190238
GDP/capita (Yuan)	7086	7651	8214	9111	10561

(National Bureau of Statistics of China, Yearbook 2005, 21-36 & 3-1)

However the Chinese innovation output is limited due to unfair obstacles. As the Chinese legal system is manipulated to maintain the political monopoly of the party, it is not attuned with the rule of law (Potter 1999, p.673). And even though the legal system has improved under the transformation, it still lacks trustworthy protection of the entrepreneurs. In 1999 a final Chinese contract law was defined. It stresses fairness and protection of social and economic welfare. Hence the government is permitted to interact in business contracts, to protect the social and economic welfare of the nation (Potter 1999, p.680, 683). As a consequence an entrepreneur who has gathered all the knowledge needed -including legal terms- can never fully trust the market since the conditions might change at any time.

Unclear laws and regulations lower the incentives of a private entrepreneur to invest in future business. For the same reason, foreign producers stay out of China due to the risk of being imitated or spied on. As mentioned in the Introduction Chinese consumers were offered perfect LG mobile phone counterfeits, as the imitator were faster than LG Electronics to adjust the product for the Chinese market (The Chosun Ilbo, 24 Nov 2006). The advanced imitators are usually successful unofficial innovators. One Chinese imitator confuses the market by putting a mobile phone function into Sony's portable game player –PlayStation. As a result the market believes the phone-version come from Sony, which is not the case (The Chosun Ilbo, 24 Nov 2006). Fake products from China are costly to the foreign brand exporters. For example, fakes cost Korea more than US$14 billion a year, which is comparable to 5 % of Korea's total export (The Chosun Ilbo, 15 Jan 2007).

However, there are cases were property rights have been defended by the legal system. Shanghai Xingbake infringed on the coffee chain Starbuck's name. Xing means star and the characters for ba and ke are pronounced similar to bucks (Xinhua News Agency, 5 Jan 2007). Still, entrepreneurs give up the never ending struggle due to poor laws, passive authorities and a market that cannot sort out real from fake (The Chosun Ilbo, 15 Jan 2007). This is the true problem. Innovating imitators are good for the competition and technological development. Yet, since the entrepreneurs has to fight against the imitators at unfair conditions, China risks missing the technology that efficient, fair and well-functioning entrepreneurship produce.

It is not just the poor legal system that hinders innovation processes. The presence of SOEs paves barriers to infant market-entering entrepreneurs, even thou most SOEs are inefficient (McMillan & Woodruff 2002, p.155). The SOEs enjoy government imposed credits of the banks, which are guaranteed by the government. As a consequence banks take a larger risk lending to private firms. A solution is to lure the bank officer with informal payments, or borrow financial means from friends and family. In the end a black loan market is established, which today account for 1 % of China's GDP (James 2005, p. 57). In relation to the poor legal system, the informal payments are reported as necessary when entrepreneurs apply for business licenses. The informal charge then adds on top of the total fixed cost that faces the entrepreneur prior to the upcoming market introduction (McMillan & Woodruff 2002, p.155). Hence the government's willingness –or unwillingness- to support the SOEs initiates a financial problem for the private entrepreneurs, who have to pay more for less external capital. As a result the innovative process is more expensive for independent entrepreneurs.

Moreover, Guan remarks that innovation is hampered by a lack of linkages between the research sectors and the industries. Since 1987 the enterprises' share of Chinese national innovation expenditures has more than doubled, while the universities' and the research institutes' shares have decreased (Guan et al. 2005, p.340). An industry accounting for 100 % of the R&D is a market failure. In that case there is no organized R&D. Consequently there is a risk that identical research might be performed simultaneously. In addition some research is too expensive for a single firm to complete by it self. As a result of the problems discussed in this section, 85 % of the Chinese industries' R&D projects fail the goal of a successful market entrance (Guan et al. 2005, p.340).

Furthermore the Chinese government stresses the importance of international cooperation as a factor of innovation. This is supported by Luo et al. (2003) who found that internationalization increases the innovation capacity. The main explanation is that contacts to foreign markets, improve the technological knowledge and the awareness of global trends. In addition, it is maintained that private producers from the south of China put more emphasis on exterior design. These producers are active "on the other side of the mountains far away from the emperor" and close to Hong Kong and other special administrative regions where foreign investors sojourn (Sun 2000, p.4).

To improve the researching-networks, the government subsidises fundamental research or let universities fulfil R&D. As a result new facts will be known to a wider range of researchers, without a risk of bankruptcy for the single firm. For this reason Guan (2005, p.341) argues that, to improve the innovative capacity of Chinese entrepreneurs collaboration between universities and industries ought to enhance. In the computer industry successful innovators are seldom older than 45. For this reason postgraduate students' education is integrated into technology research and financed by commercial businesses (Lu & Lazonick 1999, pp. 67). Therefore, as a part of the national transformation the Chinese government tries to motivate students to engage in technological studies. Today there are about 3 million engineering undergraduate students in China, of which half a million graduates each year. And the enrolled technical students are increasing (see table 3). From another viewpoint, in relation to the size of the population China graduates twice as many engineering students than the USA (James 2005, p.59). Times reported in October 2006 a ranking of universities' research qualities, based on academic professionals' opinions. Beijing University placed as number 14, just after the top universities in USA and Britain (Times Online October 5 2006). This is better than schools in France, Japan, Canada, Switzerland, or any other developed nation. Hence, it is once again stated that China has the capacity to be an innovative, technological and economic superpower. However –as declared above- there are a number of obstacles that ought to be reduced by the government.

Table 3. NUMBER OF TECHNICAL SCHOOLS, STUDENTS AND PERSONNEL

	Technical Schools (units)	Total enrolment	Graduates (1 million persons)	Teachers & Staff
2000	3792	1,401	0,646	0,240
2001	3470	1,347	0,477	0,220
2002	3075	1,530	0,454	0,203
2003	2970	1,931	0,453	0,202
2004	2884	2,345	0,535	0,205

(National Bureau of Statistics of China, Yearbook 2005, 21-22)

To improve the entrepreneurial environment the government implements an innovation programme. The programmes are based on political believes and innovation theory. Generally, governments have moved from a R&D-subsidizing policy to a more networking-stimulating policy, where collaboration, market-oriented financial systems, entrepreneurship and technical spin-offs are the keywords (OECD 2002, pp.14). According to the statements discussed earlier in this section it is suggested that China is not an exception. Hence before discussing innovation theory to identify the independent factors of the hypotheses, the thesis briefly studies the major programmes of China's NIS. That is what tools the Chinese government owns to improve the innovative environment.

2.2. R&D Programmes

The very first NIS of China is the Key Technologies R&D Programme. It focuses on technical upgrading and restructuring by providing technologies, material and equipment to most levels of production within industry and agriculture. This system includes an establishment of innovation institutes where elite groups can concentrate on technological innovation. The government expects the Key Technological R&D Programme to optimize agricultural structure and quality, speed up the appliance of IT and clean energy, and enhance IT in the financial sector. To build up the programme alongside the Chinese overall economic growth the government tries to approve projects on a rolling basis. Each project will preferable perform in less than three years. Furthermore, projects are open for public bidding. Hence, universities and research institutes can undertake projects as long as it is a joint effort with an implementing enterprise (Ministry of Science and Technology of the People's Republic of China, www.most.gov.cn, February 7, 2007).

In 1986 Deng Xiaoping approved the National High-tech R&D Programme. Here focus is on high technological innovation, which includes a number of goals. The programme aims to develop the technology needed for China's information infrastructure that currently is being constructed. Furthermore technology for biological, pharmaceutical and agricultural improvements, advancement of the industry's competitiveness, and environmental protection are other fields of focus. To implement the programme a number of methods have been defined. Initially intellectual property rights are a widely accepted method. Yet, through patents a new technology becomes public, which is not always desired. Still, clearly defined rights and interests of the state makes the entrepreneur feel safer in his business. What is more, encouragement of stronger local and international technological cooperation is supported by special earmarked

funds. As a result, rural and urban China will gain from national and international technology (Ministry of Science and Technology of the People's Republic of China, www.most.gov.cn, February 7, 2007).

The National Basic Research Programme shares the most innovation programmes' goal to improve the technological standard and the welfare of the Chinese people. Yet, it deals with another kind of technology. The programme aims to improve the socio-economic development, support young scientists to cultivate innovative personnel, and secure future progress. Moreover it aims to create a safe and sound environment for exploration of new research fields and elemental science.

As China joined the World Trade Organisation, WTO, the government implemented a programme for Mega-projects of Science Research. It is based on the Key Technologies R&D Programme and initiates projects to industrialize fields linked to national socio-economic development. By integrating universities and enterprises -and thus gather gifted people- the program seeks to develop new products and industries. OECD advises policy-makers not to implement a grand design (OECD 2002, p.70). Yet, by simply emphasise innovative breakthroughs, the Mega-programme does not focus on the continuous production but the innovation itself.

There are a number of further innovation programmes in China. For example the R&D Infrastructure and Facility Development Programme aim to enrich the science and technology, S&T, capacity and improve the diffusion of new technology. What is more, the programme of Environment Building for S&T Industries endeavours to stimulate small and medium-sized enterprises, SME, to promote regional development, and to reinforce policy for environment structure (Ministry of Science and Technology of the People's Republic of China, www.most.gov.cn, February 7, 2007). The thesis does not discuss every R&D programme since it already is stated that innovation is taking place in China and that the government aims to further improve the national innovation capacity. Yet, the thesis argues that the government's efforts are not enough. To define the hypotheses, the following theoretical chapter identifies several factors of innovation.

3. Theory

It is argued that China is successful in its transformation, yet it is clear that the innovative capacity is not as efficient as it ought to be. The following sections discuss the theoretical issues of this task.

3.1. Government Innovation Policy

First, why should governments influence research at all? Nelson suggests that market failure in the "innovation business" is a good reason (1987, p.95). Moreover, the government could step in where research is not afforded by the single entrepreneur, or when the goal of the innovation process is too vague and thereby too risky. Elemental research does not always have a specific use when it is initiated. When it is assumed that a particular area of science would enhance the commonwealth, the government can guarantee the researcher will not go bankrupt in case of a failed innovation. In addition, when an entrepreneur faces unfair competition or is in need of infant industry support, the government can step in to help the initial process or state legal frames of the market.

A relating problem is how to decide what kind of R&D that should be done by the public sector, and what research should be left to the private. Since private research -for competitive reasons- is not shown to the public a lot of knowledge is hidden from entrepreneurs, who have use for it. As a consequence the government does not know what knowledge there is and might subsidise research that has already been done. Therefore to create an efficient NIS, collaboration is necessary to a certain level. These co-operations do sometimes originate from private initiatives, and are present at universities and technological societies. The government plays an important role in organising market institutions and networks, to ease for private initiatives and the flow of found knowledge (Nelson 1987, pp.95).

It is important to note that the government should not act in a central role of a NIS, but as an encouraging character. This means that it ought to help the "self-organisation" by creating institutional incentives through management, administrative and organisational support. Thus organisations, manager methods, marketing and labour performances are also important factors of innovation (OECD 2002, pp.24, p.70). This is controversial to the well-known Schumpeter who claimed that an innovation and its following entrepreneurial profit simply come from

technological competition (Schumpeter 1934, p. 132). And not from e.g. successful marketing (Fagerberg 2003, p.130 and Schumpeter 1942, p.84).

3.2. Schumpeter's Innovation theory

This section focuses on Joseph Schumpeter's fundamental thoughts of what is an innovation and who is the entrepreneur. Many new innovation theories are found since the days of Schumpeter. Nevertheless, when discussing innovation theory the thoughts of Schumpeter is the natural starting point. To Schumpeter development is "*changes in economic life as are not forced upon it from without, but arise by its own initiative from within*" (Schumpeter 1911, p.405, and more in full; Schumpeter 1934, p.53). If there were no development the economy would just adjust to the surrounding changes such as population growth. Schumpeter argues that the factor of real development is an internal initiative of improvement. Hence, national innovation is fundamental for a country's economy to grow. The scarce resources within a nation's boarders are to some level unchanged. Thus it is simply the combination of the resources that ought to be utilized to give higher benefits to the economy (Fagerberg 2003, p.131).

For the understanding of innovation it is important to note that Schumpeter differs between innovation and invention (Fagerberg 2003, p.131). As described above innovations are new combinations of resources and capital equipment which appear because of commercial reasons. Contrasting inventions can perform everywhere, for example at non-profit universities or at the kitchen table. Furthermore innovation differs from invention in a time perspective. Invention is the primary emergence of an idea that is hopefully followed by an innovation (Fagerberg et al. 2005, pp.4).

Continuing with Schumpeter, he believed that capitalistic progress is driven by technological challenges and competitions. For a capitalistic firm the outstanding way -to stay competitive and increase profit- is to establish new and efficiency enhancing machinery. Failure will force the firm off the market. Consequently the aggregate economy will face rising productivity due to capital accumulation around successful entrepreneurs. Schumpeter notes that it is not the competition of price. It is the competition of who can create a new innovation –a new technology, a new resources or a new organization structure- and put it on the market (Fagerberg 2003, pp.129 and Schumpeter 1942, p.84). Hence Schumpeter meant that success of a firm comes from its innovating skills in production, and not from the firm's skills in merchandising (Fagerberg 2003, p.130). Add new versions of old innovations. Schumpeter writes in "*The Fundamental Phenomenon*

on Economic Development" that "*New here denotes a new kind. In some sense every new jacket is new. But this is not what I mean. The emphasis lies on the creation of something not yet being created on regular basis in the static state of the economy from where we begin; something that, first of all, by being strange to the value system of statics will oppose it, and subsequently will have to be gradually assimilated by it so it changes more or less*" (1911, pp.409). Schumpeter argues that the world is in an economic state where innovators continuously reorganise the resources in new better combinations. The combination of two productions can also be combined in perpetuity to the never-ending search for the non-existing ultimate combination (Schumpeter 1911, p.411).

Schumpeter claims that the known combinations are limited, yet the possible combinations of future recreations are not less than to the cave men in the Stone Age. The recreation is what Schumpeter refers to as the "creative destruction". The old has to be reformed and hence turn into something new. Schumpeter states that "…*the same process of industrial mutation that incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in*" (Schumpeter 1942, p.83). The creative destruction is the initial cost for the entrepreneur that will eventually come back to him. Like broken eggs are required for an omelette the entrepreneur has to reorganise his capital to generate innovations.

In the average situation, an increased productivity decreases the price-level and thereby creates an advantage for the consumers. Yet, the enhanced efficiency has a price in increased unemployment. Thus frustration accelerates among the population (Ginzberg 1943, pp.154). As a result governments do not allow efficiency improvements that initially affect the people on the street negatively. It is therefore unsure whether the Chinese government dares to support labour-saving innovations. Schumpeter claimed that the loss from such unemployment can be afforded due to the aggregate gains from the increased productivity, originating in capitalism. Yet, the gains from enhanced productivity might not be valid in China due to the nepotism between the Party and the SOEs.

3.3. The factors of Innovation

As seen in the initial chapters, innovation is most active in China. Yet imitation is too. The imitators are often just as successful –and sometimes even better off- than the innovators. Furthermore the presence of SOEs and a lack of network are also reasons of a failing innovative system. As a result it is assumed that the entrepreneurs act in an insufficient environment. The

challenge for an innovator is to find an idea, make it a real product and put it onto the market. To do so the entrepreneur is in need of supportive factors -such as production and market knowledge, financial resources and protecting laws. With a focus on the factors relating to the previously discussed market failures, the thesis identifies several factors of innovation.

3.3.1. Networks and Collaboration

To the single innovator, progress is a long-going process that is constantly affected by government policy and other external factors. It does not matter whether it is a liberal or strictly controlled environment. What is relevant for one entrepreneur could be useless to another. Noteworthy features of the process are assembled by Van de Ven et al. (1999, pp.23). In the extensive "initial period" a need and thereby an idea slowly emerges from external shocks to the society or organisation. Secondly, in the "development stadium" the number of ideas enhances and thus gathers in paths. Over the time many inefficient paths are chosen, and thereby forces the organisation to end the project or choose a new path. Once a path is chosen the state holds until unsuspected crises escalate and generate vicious cycles. The reason for this is that all active partners of the process might not have the same image of a threat or a possibility to the innovation. Therefore, oppositions can be hidden until they emerge and generate antagonism. These conflicts are origins of new ideas and relations to other organisations, which in turn lead to new paths of the innovation process (Van de Ven et al. 1999, pp.23-58). Hence, collaboration is a factor of the creative destruction. So to ease the processes of innovation a government can build appropriate infrastructures and forums for entrepreneurs to meet, collaborate and exchange ideas.

One method is standardisation. For example, the Chinese electronic standardisation is a government imposed advantage known to the domestic Chinese producers. This advantage attracts foreign entrepreneurs and investors. As a consequence the standardisation increases international collaboration. This is since foreign companies -who are looking to sell into China- search for joint-ventures with domestic partners (James 2005, pp.58). As a result the standardisation facilitates international alliances, which are useful platforms for innovation as the globalisation requires more advanced knowledge (OECD 2002, p.66). In addition Luo et al. (2003, p.279) argue that internationalization forces the firms to be more entrepreneurial due to the global competition and cultural differences. Hence joint ventures and foreign direct investments, FDI, are possible starting points for e.g. technology-intense firms. The –probably domestic- firm gains access to training and support by the further advanced –probably foreign-venture, which enjoys a share of the Chinese arena. Moreover, the international collaboration

brings goodwill and product qualities that are important when introducing innovations to the market. As a supplementary benefit the goodwill generates incentives for privies to obtain credit for an assured forward commerce. As a result, privies help new innovations onto the market (Hobday 1995, pp.1177). Besides China does not have a capital gains tax, which is supportive when encouraging investments in innovative ideas (James 2005, pp.58). The Chinese National High-tech R&D programme follows the argument of international collaboration and stresses the importance of technological imports. Thus the thesis argues that most sorts of collaboration – global and domestic- are central factors for the entrepreneur who wants to innovate.

From a domestic viewpoint, collaboration between universities and industries are of great importance. Firms are sometimes not willing to accept the risk or the cost of a new innovation process. Therefore collaboration with a research institution –which possesses the necessary resources-, is useful (Guan et al. 2005, pp.346). Note that if the research institution is a government related university the research might be publicly introduced. This is not the wish of the specific firm, yet from a national perspective a wider spread of found knowledge improves the national innovation capacity. And of course, the precise result is not publicly presented every time.

The result of an innovation is a product introduced to the market. As the product and the knowledge from the research is available, imitators gather around the firm to get a share of the entrepreneurial profit (Fagerberg 2003, p.130). The gathering results in a cluster, which improves the national innovation capacity due to a utilized capital allocation and imitators who transform into innovators (Hospers 2006, p.4). Theoretically a government imposed science park is organised with the entrepreneurs in focus, surrounded by the supporting functions and privies. Therefore the Chinese government attempts to replicate clusters and hence create legitimate "imitators" that follow and support the innovators. These entrepreneurs are often spin-offs from local universities or research institutions. Due to the academic contacts these entrepreneurs enjoy a smoother innovation process (Zhu & Tann 2005, pp.377).

3.3.2. Legal System

In China the rule of law is widely discussed and accepted. In addition legal systems and institutions are imported from various countries, such as Germany. However, the policy goals are always preferred by the state (Potter 1999, pp.680-83). Chinese law does not limit the party's possibilities of governing, but exercises the government's power. Instead of rule of law, China experiences a rule through law. Furthermore, to develop a well functioning legal system, the

legislators and the leaders of legal institutions must be well educated within law. Yet, few Chinese senior legal bureaucrats are legally trained (Potter 1999, p.674). Next to the poor training, corruption is a major problem. Potter (1999, p.677) claims that courts sometimes ignore facts in favour for the disputants' or the lawyers' political connections. Hence disputes regarding e.g. property rights are depending of government relations.

As a consequence of the "rule through law", government relating innovation problems (discussed in the next section) are magnified and unfair to entrepreneurs who suffer from a lack of government connections. Moreover Slangen et al. (2003, p.1108) argue that the rule of law –from a property rights perspective- affects trust in legal institutions. Since trust is based on personal relations or commonly accepted institutions, trust lowers transaction costs and promotes new business deals (innovations). Hence to develop a nation and make it grow, the government has to work for a trustworthy environment, and thereby the rule of law. This is e.g. done in a contract law that stresses the importance of rational fairness and good faith. Yet, in China the contract law states that a contract is never as independent as it can threaten the national social and economic welfare. Thus the government is able to show a great willingness to support a strong legal system. At the same time, the Party can present a reservation to ensure its power (Potter 1999, pp.679-80). Hence for the sake of business progress, it is argued that China is in need of well established laws that are protected and implemented by the government.

3.3.3. Government Ties and State Owned Enterprises

Ownership structures are most likely to affect the innovative capacity of the firm. The thesis discussed joint-ventures earlier in this section. Furthermore as seen in the appendix, proxies for private and government sector ownership are perfect opposites –as correlation is negative 1. That means that pros and cons with a private ownership will be the contrary for a SOE, and vice versa. SOEs enjoy close ties to the government, state-owned banks, SOB, and other official institutions. As external finance is guaranteed by the government, the banks find a higher risk of lending to private entrepreneurs. No matter of the private firm's financial attributes. Moreover SOEs benefit from soft budget constraints and political privileges. As a result SOEs lack the financial incentives that appear in the private sector (Luo et al. 2003, pp. 278). Instead the managers of SOEs focus on activities that will pleasure the political leaders. Therefore it is argued that SOEs' management put efforts in keeping unemployment low and research in areas determined by the government, and not by the market (Xu et al. 2005, p.5). Xu et al. support the argument that this is due to badly constructed incentives. Instead of letting the managers exercise their authorisation and hence promote the performance of the firm, managers work to satisfy the

politicians. With the same reasoning, private firms and joint ventures compensate for their lack of government ties by performing entrepreneurship. Hence by focusing on the institutional theories of government ownership the thesis argues that private ownership is a positive factor of innovation, contrary to official ownership. Yet, on the other hand good government ties can provide advantages -such as external capital and favourable political decisions-, also for the private innovative firm. Hellman et al. (2003, p.753) differs between the –usually large and state owned- influential firms that originate from the communist system, and individual capture firms. Individual capture firms are new entrepreneurial private firms that make private payments to the government officers to improve the government ties, and thus gain legitimacy and political power. As a consequence those in power have incentives to provide an unofficial market for the political decisions. Hence the government ties are a way of competition, which is assumed to be more costly for the private entrepreneur than to the imitator or to the SOEs.

3.3.4. Skills and Knowledge Flow

Additionally it is obvious that innovation capacity and skills go hand-in-hand. Therefore to find the best path and develop a new combination, the firm needs to invest in its skill base. Similar to innovation the skill base can be transformed into new combinations to better suit the innovation path. The labour can move in the hierarchy and also be educated in new technology. Hence, important knowledge can move upwards and become more important to the firm's innovation strategy. In the same way the labour that possesses the knowledge important for the innovation process can be given incentives to act in a creative way. Therefore it is essential for the innovating firm that the leader can identify the firm's skill base, and that he or she understands what needs to be done. If there is a lack of skills or insufficient understanding of the skill base the firm cannot innovate. Consequently to stay competitive the successful entrepreneur has to assemble further knowledge, otherwise the firm will loose its future profit to copycats that transform into innovators by developing the initial firm's product (Fagerberg et al. (ed.) 2005, p.34).

Moreover how much innovation capacity a firm possesses depends on the firm's ability to absorb external knowledge and combine it with internal knowledge. Therefore networks such as trade and business organisations function as linkages between knowledge exchanging firms. As the firm improves its innovation capacity it is essential that the firm's management handles the information flow in a correct way. To be able to stay innovative it is vital that the management have visions and strategies and a controlled knowledge and a competence base. In addition, it is essential that organisation, creativity and the culture of the firm is correctly managed (OECD

2002, pp.19). Moreover, an OECD report (2002, p.23) confirms the Schumpeterian thought that the "*ultimate innovative behaviour implies the reinventing of the firm itself, radical rearrangements of both its mission and its internal structure. This kind of reinvention ensures future growth through the release of some activities to the benefit of others*". A firm possessing internal and external knowledge can by continually reorganising its resources find new combinations and thus become successful in a totally new industry or market (OECD 2002, p.23).

3.3.5. Incentives

In a capitalistic society an economic benefit awaits the successful entrepreneur. Yet, economic bonuses might not be the most important motivation of the entrepreneur. Schumpeter notes three psychological stimulus "*The joy of creating*", "*to prove oneself superior to others*", and finally -the one motivation that is linked to individual ownership- "*the dream or will to found a private kingdom or dynasty*" (Fagerberg 2003, p.131). However, if the manager and the entrepreneur is not the same person these stimuli do not function and a financial motivation is necessary.

In the case of socialistic countries, entrepreneurs have other purposeful incentives. Schumpeter's business cycle-theory argues that an entrepreneur does not have to be an individual, as a socialistic society has certain methods of supporting the entrepreneurial process (Fagerberg 2003, p.133, and Peukert 2002, p.87). In the socialistic society the entrepreneur does not answer for the risk taking and the –non-productive- day-to-day activities, such as accounting. Furthermore, being organized under the autocratic government the "first-class brains" focus on the innovation and collaborate to reach the common goal of growth for the national economy (Robinson 1943, p.382). However, China is transforming and these non-capitalistic incentives are not valid anymore. Chinese citizens face a larger responsibility for their social life, and thus need better incomes to pay for it. At the same time –as discussed above- the general managers are required to understand the processes and work for the success of the firm and its skill base. Otherwise it will not be innovative and hence loose market shares. As a result the thesis argues that good financial incentives for the managers are of great importance. In addition, as the personnel gets further educated it demands better conditions. Thus, as the society turns more transparent the labour will demand payments that are in good relation to the managers' compensation.

3.3.6. Size of the Firm

Moreover it has earlier been stated that the Chinese government support large-sized SOEs to avoid increased unemployment. As a consequence efficiency enhancing innovations –such as labour-saving technology- is not implemented. However, large enterprises have scale advantages

that ought to maintain the innovation efficiency. Soete (Freeman (ed.) 1990, pp. 291) finds that the innovative activity increases more than proportionately with the firm size. He claims that there is no empirical evidence that big firms are inflexible and unwilling researchers. Contrasting Luo et al. argue that small firms face more challenges due to the limited capacity and scarce resources. For example, a small firm that wants to invest in a research face a larger risk as the firm is more depending on success of the very specific innovation. Consequently, according to the resource based theory –where a firm innovates by reorganising the existing scarce and thus expensive resources-, a small firm needs to perform a more entrepreneurial activity. This is since small firms lack vital resources such as networks or official permissions. Thus necessity knows no law and small firms are more likely to consider growth strategies (Luo et. al 2003, p.279).

3.4. Hypotheses

Innovation is of great importance to the growth of a firm, a region and a nation. This is accepted by theorists, politicians and entrepreneurs. In the case of China, well-known innovation theories support the government's R&D policy and NIS. Yet, this is merely to a certain level since China suffers from market failures that are negative to the entrepreneurs. This is most obvious at the imitators' lucrative market situation, which to a certain extent origins in the obstacles facing the innovators. The thesis identifies three major hinders that add costs onto the innovation processes. To support the entrepreneurs, further efforts have to be taken to limit the damage of resource consuming and inefficient SOEs, a poor legal system and the lack of business networks. The Chinese government is aware of the situation. For that reason -since the Chinese government has stated that China shall be an innovation oriented nation with the market and research institutions in focus- it is of interest to test what further transformations that ought to be considered. Therefore the thesis uses data from the World Bank Investment Climate Survey, ICS, and test whether more networks, a more trustworthy legal system and less government nepotism will enhance Chinese innovation. The hypotheses to be tested are for that reason defined as the following:

- H1: The more networks and collaboration, the more innovation output
- H2: The more trustworthy legal system, the more innovation output
- H3: The less government ties, the more innovation output.

4. Method

The thesis performs a probit-test for the variables that are chosen to describe innovation. Besides to confirm the result the correlations between all parameters and the depending innovation variables are presented.

Probit tests are used to describe binary variables. This is due to the probability of the depending variable's two alternative choices. The probability has to be equal to 0 or 1. In this case, the alternatives are to perform the innovation or not to perform the innovation. Anything else would be false. Therefore the probit function for y depending on x -at the time i- is:

$$f(y_i) = \left[F(\beta_1 + \beta_2 x_i)\right]^{y_i} \left[1 - F(\beta_1 + \beta_2 x_i)\right]^{1-y_i}, \qquad y_i = 0,1 \quad (1)$$

To clarify, the probability of the innovation proxy y to equal 1 –i.e. a certain innovation is performed- is $p = F(\beta_1 + \beta_2 x)$. If not, the probability is $[1-p] = [1-F(\beta_1 + \beta_2 x)]$. It is assumed that there is a non-linear relation between β_1 and β_2 at the same time as they are unknown. To find the maximum likelihood of a certain innovation we therefore have to estimate the β_1 and β_2. For the result it is important to note that a positive β_2 indicate that an increase of factor x improves the innovation output.

To assume normal distribution, a large enough sample is required for this procedure. The thesis uses variables with roughly 2000 observations. Hence it is assumed that the sample is normally distributed.

By identifying three depending proxies for innovation and probit-test each of them against the identified describing variables the result will tell us how each describing variable affect innovation. Thus the estimates –the β_2s- tell whether the probability of a performed innovation increases or decreases as a result of a change in a describing proxy. That is why the thesis is able to suggest crucial changes for the Chinese NIS.

To supplement the test all proxies will be included in a correlation test. The correlation tells us the linear association between the variables in an observed sample. In other words, how much they fit together. That is how much they explain the same fact. The correlation varies between 1 and -1. Negative one means that the variables explain the exact opposite.

4.1. Innovation-proxies

The definition of an innovation varies over time. Cantillon defined the entrepreneurial process as a new good, which is introduced to a market for a -until then- unknown price (Schumpeter 1994, p. 25). Schumpeter has then developed the theory and claimed that in a capitalistic economy each firm has to innovate and develop its production. He argued that innovation is not about offering the lowest price, but about who can create a new product, a new organization structure or new technology, and successfully introduce it to the market. Finally, Schumpeter's creative destruction theory enlightens the importance of restructure and upgrading of combinations. By rearranging the factors of an existing product or technique, the new combination is a new innovation that can be introduced to the market. To find satisfactory representation of Chinese innovation the thesis uses three depending innovation proxies to test and thereby solve the hypotheses. Proxies for upgraded product line, new management techniques, and new quality control over the years of 1998 to 2002 will represent the wide range of innovations as described in theory (see table 4).

Table 4. DEPENDING PROXIES OF INNOVATION

Innovation Proxy	Obser.	Mean
Upgraded product line	2380	0,4034
New management techniques	2375	0,5402
New quality control	2371	0,5146

(Investment Climate Survey)

4.2. Describing Variables

Following the variables identified as essential factors of entrepreneurship. This section discusses advantages, disadvantages and expected results from the chosen proxies. The variables are grouped into sections to fit the hypotheses and simplify the presentation.

Starting with collaboration and networking and thereby focus on the first hypothesis, Guan et al. (2005) argue that it is central to efficient innovation that the collaboration between industry and research institutions work effortlessly. Otherwise innovated information will not spread and identical research processes might take place at the same time. Besides research is a high-price activity. Some research is too costly and risky for the single firm to perform by it selves. In this case cooperation is a good alternative. Thus it is assumed that the estimates of long standing relations to universities and other firms are positive factors of innovation (see table 5). Moreover Luo et al. (2003) find that a firm's internationalization enhances the innovative capacity. Besides Chinese export develops as national producers get more aware of distant fashions and trends.

The thesis use two variables –the share of sales that are supplied by imports and the percent of buyers who are located abroad (see table 5)- to describe the link between international relations and innovation. It is argued that more foreign privies and longer relations to universities or other firms increase the innovation output.

Table 5. COLLABORATION PROXIES

#	Variable	Obser.	Mean
1	Longstanding relation to university 1 year ago	2361	0,1275
2	Longstanding relation to other firm 1 year ago	2356	0,1677
3	Percent of the total sales supplied by imports	1559	6,4347
4	Percent of buyers located overseas	2326	9,0776

(Investment Climate Survey)

In addition international and domestic collaboration is found in business associations, export zones and science parks. These institutions enhance the networks discussed above. Clusters are said to utilize the aggregate capital, of a market or a sector. OECD states that clusters are good replies to larger firms that are in need of rationalization (2002, p.63). Large enterprises are kept floating by the government: Yet, in case of a rationalization a government supported cluster can grow and thereby keep unemployment from rising. At the same time SOEs can focus on efficiency enhancing innovations, such as labour saving machinery. As a result, no jobs are lost and innovation enhances. The thesis argues that memberships in business associations and, science parks and export zones enhance the innovation output. Thus two proxies are included – the firm is a member of a business association, and the firm is located in a science park or export zone (see table 6).

Table 6. CLUSTER PROXIES

#	Variable	Obser.	Mean
1	The firm a member of a business association	2379	0,5834
2	Firm is located in a science park or an export zone	2353	0,2567

(Investment Climate Survey)

Specific Chinese standardisation that is known to the domestic producers improves the international partnerships. This is since foreign companies seek joint ventures with Chinese associates who are experienced and have local knowledge (James 2005, pp.58). Moreover joint ventures are of interest for the partners as legal and technological information is exchanged. Hence information on the market, standards and laws is essential to the domestic partner. In addition, it is obviously vital to any entrepreneur to understand the environment he or she acts in.

Therefore it is argued that a high satisfaction with information on laws, technical standards, and market demands enhance the innovation output. The same effect is expected by an increasing number of certified products. See table 7 for summary statistics. Joint-ventures and government relations are discussed later in this chapter.

Table 7. INFORMATION AND STANDARD PROXIES

#	Variable	Obser.	Mean
1	Satisfactory information on laws & regulations	2192	0,8326
2	Satisfactory information on technical standards	2172	0,8881
3	Satisfactory information on demand for firm's product	2187	0,8441
4	Firm's products and systems is certified by a standard	2354	0,3301

(Investment Climate Survey)

Knowledge is claimed to be the core of innovation. To stay innovative it is crucial that the management possesses visions and plans and understands the firm's skill base. This is because the skill base can be altered into new combinations that better suit the innovation process. By enlightening the personnel about e.g. computers and new technology, labour can move up the ladder to adapt to the innovation processes. To test the skill base's affection on Chinese innovation output the thesis use three variables –formal training to the firm's personnel, the share of staff regularly applying computers, and the General Manager's level of education. The skill base variables are presented in table 8. It is assumed that the higher formal training of the personnel, the more frequent usage of computers, and the higher education of the general manager; the larger is the innovation output.

Table 8. SKILL BASE PROXIES

#	Variable	Obser.	Mean
1	Firm offer formal training to employees	2390	0,9301
2	High level of education of the general manager (see appendix for units)	2382	0,7905
3	Percentage of workforce that regularly uses computer	2367	33,330

(Investment Climate Survey)

However, merely knowledge is not enough to succeed with an innovation. Schumpeter stated that stimulus is just as necessary. As China slowly converts into a capitalistic country with a social security system based on private investments, financial incentives are central to the personnel. Since knowledge -important to the firm's innovation strategy- move upwards in the hierarchy, educated persons understand their value. In addition it is a worldwide rivalry regarding the most superior personnel. Therefore labour that possesses the knowledge important for a specific

innovation process can be given incentives to stay and act in the creative way. This holds for employees at all levels of a firm's hierarchy, no matter what industry or firm size. The thesis use proxies for the General Manager's incentive plan, expenditure or R&D-personnel, and the wage-ratio between managers and employees. The variables are shown in table 9. It is argued that a manager's incentives linked to the firm's performance and larger compensation to the R&D-personnel enhance the innovative capacity of a firm. Furthermore it is claimed that a low ratio between the managers' and the workers' earnings generate a better innovation output.

Table 9. INCENTIVE PROXIES

#	Variable	Obser.	Mean
1	GM's incentive plan links income to firm's result	2400	0,2762
2	Expenditure on compensation for R&D-personnel (1000 Yuan)	503	906,77
3	Ratio of wages of middle-managers to most employees	2214	4,0581

(Investment Climate Survey)

Potter (1999, p.673) maintains that the legal system in China does not bottom on the rule of law. The Chinese contract law stresses justice and guard of social and economic welfare. Thus the government allows itself to interact in businesses by arguing that it is for the sake of national welfare (Potter 1999, p.680, 683). Hence, disputes of e.g. property rights could be depending of government ties. In addition, good legal knowledge could be worthless to the entrepreneurs as the rules and conditions might change on every occasion. However, McMillan and Woodruff (2002, p.167 & 2000, p.2) argue that firms are in need of a stable and well established legal system. This is because firms face further privies as business operations grow outside the villages, and even globalises. In China guanxi has a central role of business. Yet, guanxi is between persons. Hence the wider spread of privies and employees the less strong is the average guanxi. Therefore the legal system is of great importance to limit the innovators' uncertainty, and thereby the transaction costs. For that reason to solve the second hypothesis, it is argued that a more trustworthy legal system cause a better innovation output.

Two proxies are tested. First, an increased predictability that law affects the business operations is supposed to improve the innovation output. This is due to the entrepreneurs search for a safe environment. As long as there is a stable law, the businesses will proceed. Yet, the thesis formulates a small reservation for too much government interruption, as the rule through law causes an unsteady situation. Furthermore, the proxy for better protection of property rights is assumed to improve the innovation output. Better protection of the property rights enhances the trust. However note that too strict property rights could strangle the "good" imitators' attempts

to transform into innovators, and thus limit the innovations. Both proxies for upholding of legal trust and property rights are displayed in table 10.

Table 10. PROXIES FOR LEGAL TRUST AND PROPERTY RIGHTS

#	Variable	Obser.	Mean
1	Legal system protecting property right in dispute	2068	63,977
2	Predictability that law affects operation of business (%)	2041	27,572

(Investment Climate Survey)

Relating to the third hypothesis, it is stated that the government preserve the continuation of large firms, SOEs and clusters to avoid an increased unemployment. As a result, labour saving innovations are mistreated or never put into practice. For this reason it is claimed that firms with government representatives in the board are to hold employment by limiting further research. To succeed to keep the unemployment low, these firms enjoy soft budget constrains and have thus lost their financial incentives to innovate. On the other hand it is argued that the government implements new technologies onto the market through the companies where it is represented. However government forced technology might not be required by the market. Therefore the thesis argues that the less government representation in a firm, the better innovation. Nevertheless the government ought to take a market supportive role and assist the entrepreneurs' search for e.g. external finance and foreign technology, as the support would enhance innovation. Summary statistics of the government tie proxies are presented in table 11.

Moreover it is of interest to scrutinize the ownership structures. Foreign ownership is included in the tests due to the previously discussed theories of international relation, and as a result of the advantages of foreign joint-ventures. Joint-ventures are practical organisations to gather information, capital and knowledge. Hence joint ventures are suitable starting points for technology-intense innovators. The entrepreneur enjoys the access to training and support by the further advanced foreign venture. The foreign partner gets Chinese market knowledge, culture and networks. Therefore the thesis argues that more foreign ownership, less state-owned firms, and more joint-ventures with a multinational foreign firm increase the innovative capacity.

Table 11. PROXIES FOR GOVERNMENT TIES AND OWNERSHIP

#	Variable	Obser.	Mean
1	The government is represented in the firm's board	1202	0,2962
2	Government assist in locating foreign technology	2342	0,0265
3	Government assist in obtaining bank financing	2353	0,1594
4	Gov't officials oriented toward helping	2225	34,331
5	Percent of total ownership held by foreign firms	2399	4,482
6	Percent of total ownership government sector	2399	21,900
7	Firm is a joint venture of a foreign investor	1696	0,0855

(Investment Climate Survey)

According to Schumpeter the entrepreneur increases efficiency by borrowing capital to invest in technology. The enhanced production decreases average costs, and consequently increases the earning. The yield is used to pay off debts and the rest is rewarded as the entrepreneurial profit. However, since capital is limited and SOEs benefit from government guaranteed bank loans, the banks are reluctant to take the risk of financing a new innovation process. As a consequence banks take a larger risk lending to private firms. A solution for the entrepreneur is to attract the bank officer with informal payments. Therefore the thesis argues that the government must promote rational credit valuations. As a result the banks would finance the projects with good economical prospects. Add the price of external funds. At a lower interest rate, it is cheaper for the entrepreneur to buy a bank loan. With the same low interest rate, investors -or entrepreneurs with a high liquidity- find it more valuable to invest the capital in an innovation process than holding it in a bank account. Therefore it is claimed that the more external credit, the lower interest rate, and the more profit reinvestment; the larger innovation output. Moreover due to the unfortunate need of informal payments to receive external funds, the thesis expects more travel and entertainment costs to enhance innovation.

As an alternative to bank funds; reputation achieved through joint ventures and licensing provides the privies –in particular clients of unique products- with incentives to obtain credit for an assured forward commerce. As a result privies help funding new innovations to thereby reach the market. Nevertheless it ought to be noted that this sort of credit, risks moral-hazard behaviour of the entrepreneur. Anyway, an entrepreneur being offered external finance uses it wisely to achieve an entrepreneurial success. Therefore the thesis argues that the more supplier credit, the better innovation output.

Concluding the financial part, it is of general interest whether a larger amount of expenditure on R&D increases innovation. Since an innovation process requires some kind of investment it is

argued that the more investments, the better innovation output. Hence another describing proxy is included. All financial proxies are displayed in table 12.

Table 12. FINANCIAL PROXIES

#	Variable	Obser.	Mean
1	Amount of the line of credit/overdraft facility (1000 Yuan)	555	102012
2	Approximate annual rate of interest on loan (%)	1142	5,391
3	Percent of net profits re-invested last year	2115	17,607
4	Firm uses supplier credit to purchase inputs	2220	0,2622
5	Total travel & entertainment costs 1 year ago (1000 Yuan)	2362	1040,3
6	Expenditure on purchase of R&D-technology (1000 Yuan)	503	1733,4

(Investment Climate Survey)

According to innovation theory all industries have to be innovative to stay competitive. High-technological industries are investing large amounts in research to keep market shares. Next it is argued that the financial sector have to improve its technology to cope with the national transformation. This too applies to the basic industries, such as food and garment. As China grows and becomes richer, poorer neighbouring nations are cheaper producers of simple goods. Hence the food and garment industries in China have to develop its production to enhance its efficiency, and thereby keep a low average production cost. Therefore the thesis argues that further investments in research are necessary to the innovations of all industries.

Moreover it is stated that the Chinese government support larger SOEs to avoid unemployment. As a consequence innovation is set aside. Yet, large enterprises have scale advantages that ought to maintain the innovation efficiency. It is argued by Soete (Freeman (ed.) 1990, pp. 291) that the inventive activity increases more than proportionately with the firm size. Contrary Luo et al. claim that small firms face more confrontations due to their scarce resources. It is riskier for a small firm to initiate a new innovation process as the single firm is more depending on success of the specific innovation, than a large company. Therefore small firms are more expected to consider growth policies to maintain market shares (Luo et. al 2003, p.279). Nevertheless the thesis focuses on actual innovations and thus argues that the larger size of a firm, the more innovation capacity. Table 13 presents two variables of firm size. First, a dummy for a large group of labour, and second a proxy for the net value of total fixed assets. In the thesis a large firm has more than 100 but less than 250 employees and a very large enterprise has a workforce larger than 250. This is not consistent with the Chinese view, however since this is the measure of the ICS it will be used in the thesis.

Finally, a proxy for the number of times electric power is lost from public services represents the importance of a functioning infrastructure. Poor infrastructure increases the costs of production. Since frequent losses of power generate an unsure environment for the entrepreneur it is expected that the better infrastructure there is, the better innovation output. The proxy's summary statistics is presented in table 13, variable number 6.

Table 13. PROXIES FOR INDUSTRY, SIZE & INFRASTRUCTURE

#	Variable	Obser.	Mean
1	Industry is technological advanced	2400	0,5154
2	Industry is garments and food	2400	0,1767
3	Industry is finance	2400	0,0654
4	Size of the firm is large	1695	0,4372
5	Net value of total fixed assets in 2002 (1000 Yuan)	2346	101368
6	Number of times power was lost from public services	2342	5,779

(Investment Climate Survey)

4.3. Dummies

The binary depending proxies in a probit test can only answer to 0 or 1. That is, the variables have to be transformed into dummies where the specific variable equals either 0 or 1. The codes of the binary dummies are displayed in the appendix.

Furthermore the categorical variables are a statistical problem for the correlation test. Since categorical variables only describe whether or not a certain situation occurs, the degree of linear association cannot be found between them. Therefore before performing the correlation tests all categorical proxies has to be converted into continues dummies. The keys of the transformed categorical variables' dummies are displayed in the appendix.

5. Data

To test the hypotheses the thesis use data from the World Bank Investment Climate Survey, ICS. In the ICS the World Bank collaborates with the European Bank for Reconstruction and Development. Since the year of 2000, the ICS has assessed the investment climate to create business profiles and evaluate the business environment from an international and a local viewpoint. The Chinese part of the ICS is conducted in 23 major cities (see table 6). It is based on a questionnaire send to 2 400 domestic and international companies. Currently, the latest ICS accessible is concerning 2003; hence, the thesis will use data published that year. Note the country dataset includes all the variables used in the specific country and can thus not be compared to any other similar surveys.

Table 14. CITIES WERE THE ICS WAS CONDUCTED

Benxi	Jiangmen	Xian
Changchun	Kunming	Zhengzhou
Changsha	Lanzhou	Beijing
Chongqing	Nanchang	Chengdu
Dalian	Nanning	Guang Zhou
Guiyang	Shenzhen	Shanghai
Haerbin	Wenzhou	Tianjin
Hangzhou	Wuhan	

(Investment Climate Survey)

5.1. Statistical Limitations

For safety reasons, to keep participating firms non-identifiable the ICS do not include results consisting of too few observations. This is a problem we have to accept when working with this kind of material from non-democratic nations. This problem, however, should not cause any major distortions to the result.

The result also state whether the estimate is statistically significant. In other words, the tests compute the probability of the estimation of being false. In the significance column one dot (.) shows a risk of 10 % that the result could be false, and one (*) two (**) and three asterisks (***) show that the results are accurate up to 95 %, 99 % and 99, 9 % of the times the test will be carried out. A low significance level could be a sign of that the hypothesis is incorrectly defined, or the observations are not representative. Therefore, a low significance level indicates that in

reality the result could be contradictory. The thesis does not need to state a strict significance level as the significance will be discussed in each specific case.

Furthermore the problem of multicollinearity has to be considered. Multicollinearity is when two or more proxies describe the same information. It is found by testing for correlation between the describing variables. If two variables are correlated with more than 0.30, multicollinearity should be suspected. This is solved by excluding one of the variables. Sometimes, more than two variables present multicollinearity. In that case one proxy at the time is excluded until no more significant correlation can be found. Innovation can be described by an infinite number of variables and to simplify the tests it is convenient to exclude variables that describe similar information. Note that the correlation test between the depending variables and each of the describing variables is to guarantee the result of the probit tests. This correlation test is used after the redundant describing variables are excluded due to multicollinearity.

The correlation varies between 1 and -1. Negative one means that the variables explain the exact opposite. Hence in case of two variables having a correlation of 0, 80, this means that they up till 80 % describe the same thing. Yet, it cannot be said what information that is in common. Therefore most variables are included unless they present a relatively high correlation. Multicollinearity among the variables is discussed more in detail in the appendix.

6. Result and Discussion

6.1. H1: More networks and collaboration

Regarding first hypothesis, the significant estimates in table 15 and 16 are completely positive with one exception. An increase of buyers located overseas would apparently lower the probability of an upgraded product line (see variable 4 in table 15). However, it is a relatively small estimate. Similarly the positive estimates for suppliers and buyer located abroad (variables 3 & 4 in table 15) do not affect the innovation output much at all. Hence it is stated that foreign connections outside the research field does not matter to the innovation capacity. The result is unexpected as theory claimed all kinds of networks to be positive for the innovation output. In particular, connections to foreign privies were supposed to affect the firms' awareness of market trends, international fashions, and new technologies. The result of the relation to foreign suppliers and buyers differs from the estimates of longstanding collaborations to universities and other firms (variables 1 & 2 in table 15). Longer-standing collaborations to universities and firms strongly generate a better innovation output, which is expected. Moreover, the positive estimates of collaboration to universities support the explanation that only cooperation within research enhances the innovation output.

Furthermore, memberships in business associations, science parks or export zones tend to increase the innovation output (see table 16). This result is logic since the partisanships are successful in its purpose to improve the innovation capacity. Note the relatively large correlations between the innovation proxies and longstanding relations to other firms, and to memberships in business associations. The correlations thereby declare that firms join this kind of network institution to improve the innovation output.

As a conclusion it is stated that there is a lack of collaboration and networks facing the Chinese entrepreneurs. This is since a membership or collaboration in any research focused organisation, clearly increases the probability of a better innovation output. Hence the first hypothesis is accepted.

Table 15. ESTIMATES OF COLLABORATION & INTERNATIONAL PRIVIES

#	Innovation	Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	Longstanding relation to university 1 year ago	0,528	5E-12	***	0,006
	man. tech.	Longstanding relation to university 1 year ago	0,781	<2e-16	***	0,103
	quality ctrl	Longstanding relation to university 1 year ago	0,715	<2e-16	***	0,038
2	prod. line	Longstanding relation to other firm 1 year ago	0,536	9E-16	***	0,322
	man. tech.	Longstanding relation to other firm 1 year ago	0,691	<2e-16	***	0,101
	quality ctrl	Longstanding relation to other firm 1 year ago	0,596	<2e-16	***	0,086
3	prod. line	Percent of the total sales supplied by imports	0,003	0,094	.	0,055
	man. tech.	Percent of the total sales supplied by imports	0,011	8E-08	***	0,033
	quality ctrl	Percent of the total sales supplied by imports	0,008	7E-05	***	-0,055
4	prod. line	Percent of buyers located overseas	-0,002	0,020	*	-0,021
	man. tech.	Percent of buyers located overseas	0,004	9E-06	***	0,112
	quality ctrl	Percent of buyers located overseas	0,005	1E-06	***	0,088

(Investment Climate Survey)

Table 16. ESTIMATES OF CLUSTERS AND BUSINESS ASSOCIATIONS

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	The firm a member of a business association	-0,026	0,435		0,120
	man. tech.	The firm a member of a business association	0,301	<2e-16	***	0,231
	quality ctrl	The firm a member of a business association	0,208	1E-09	***	0,213
2	prod. line	Firm is located in a science park or an export zone	0,221	2E-05	***	0,048
	man. tech.	Firm is located in a science park or an export zone	0,465	<2e-16	***	0,166
	quality ctrl	Firm is located in a science park or an export zone	0,495	<2e-16	***	0,132

(Investment Climate Survey)

6.2. H2: A More Trustworthy Legal System

It is somewhat surprising that a better protection of the legal system would barley increase the innovation output (see table 17). A stronger property right would even decrease the possibility of an upgraded product line. Anyway, a support of the hypothesis is the correlation between an upgraded product line and better property rights. Yet, the correlation is just above 10 %.

Observing the second variable in table 17, two estimates show that more legal intervention in the business operations would improve the innovation output. Each estimate in table 17 is statistically significant. However, similar to variable 1 the estimates are relatively small. As told in the theoretical chapter firms are depending on well-functioning contract laws. This is due to the globalisation and the wide spread of privies and employees. Thus the result tells that a strong legal system is necessary to the entrepreneurs. It is better to act in a stable but insufficient legal system, than to operate in a defined but interrupted legal structure. Hence it is stated that Chinese entrepreneurs are in need of a well established, and thereby a more trustworthy legal system.

The entrepreneurs are willing to act as long as they are aware of the consequences. Estimates of variable 1 in table 19 –satisfaction with information on laws- support the above explanation, with one exception. The exception tells that better information on laws and regulations decrease the probability of an upgraded product line. The exception is supported by two negative correlations. Anyway, better legal information improves managerial techniques and quality controls. Therefore, the result states that better protection of property rights and further information on laws and regulations would improve the output of new management techniques and quality controls. In short, better information on the legal system enhances the trustworthiness as entrepreneurs are more aware of the existing system. See variable 1 in table 17, and variable 1 in table 19.

In any case, a change of the legal proxies is of a very limited use to the innovation output. When observing the correlations, there are solely low numbers. 50 % are negative. Hence the Chinese innovation output and the legal system seem to have little effect on each other.

Regarding the hypothesis, a more trustworthy and steady legal system would slightly improve the innovation output, with one exception for the upgraded product line. In addition it is argued that better information on the legal system generates a better innovation output. Furthermore, due to variable 2 in table 17 Chinese entrepreneurs are in need of better defined and steadier laws, thus a more trustworthy legal system. With one exception in the result, stable and influential laws are better to innovation than weak and unclear rules. Hence, what seems to be the problem is the current market situation. As long as China is ruled through law, the entrepreneurial environment is hard to manage for new, and domestic and foreign innovators. As a conclusion the thesis accepts the second hypothesis, even thou it is not as evident as expected.

Table 17. ESTIMATES OF LEGAL SYSTEM

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	Legal system protecting property right in dispute	-0,002	3E-06	***	0,102
	man. tech.	Legal system protecting property right in dispute	0,002	3E-10	***	-0,004
	quality ctrl	Legal system protecting property right in dispute	0,001	0,002	**	-0,049
2	prod. line	Predictability that law affects operation of business	-0,002	0,015	*	-0,012
	man. tech.	Predictability that law affects operation of business	0,005	2E-13	***	0,082
	quality ctrl	Predictability that law affects operation of business	0,004	8E-08	***	0,063

(Investment Climate Survey)

6.3. H3: Less Government Ties

First it is interesting to note that the ownership structure barley matter to the innovation output. In the appendix it is clear that private and government sector ownership are their exact opposites. However since an increase in any ownership structure barley changes the innovation output; this opposition has no value to the discussion. Nevertheless, there is a trend. Two of three innovation outputs decrease due to government ownership. By observing the correlations, this trend is confirmed. See variable 6 in table 18. Furthermore, government ownership has relatively strong negative correlations to innovation. This trend origins in the SOEs soft budget constrain, combined with badly constructed incentives.

Incentives must be constructed to follow economical attributes, not to satisfy the politicians. The estimate for variable 1 in table 21 tells that if the general manager's incentive-plan is more depending on the firm's result, the innovation output will enhance. In particular new management techniques will renew. Moreover, soft budget constrains and state guaranteed bank loans impair the economic incentives and hinder the new and private entrepreneurs search for external capital. In table 22 estimates of variable 1 show that larger overdraft facilities have a positive but small effect on the innovation output. Furthermore, government assistance to obtain bank financing (table 18) would robustly generate a better innovation output. Hence it is the actual recommendation and protection of the government that engender innovation, not the access to external financial means. Note that direct government ownership minimizes these advantages (see variable 6 in table 18).

As previously stated, increased government assistance in obtaining external finance and foreign technology will improve the quality control and management techniques (see variables 2 & 3 in table 18). In the same way government representation in a firm's board enhances the probability of larger innovation output (variable 1 in table 18). This is not expected. Yet as stated by the theory, government relations and support provide the entrepreneur with a number of advantages –such as external capital and favourable political decisions. To a curtain level this is called market support. However, since the estimates are relatively large it is suspected that the Chinese market is too dependent of government assistance. In the same way, SOEs have minimal incentives to develop without financial guarantees from the state. To stay in steady power and control, the government rules through the law and pretends to be indispensable. Hence the entrepreneurs who possess good government ties have a clear advantage to the independent innovators. However -as table 18 declares- these entrepreneurs are in constant need of further government

assistance. If the market would liberate, the government supported entrepreneurs would find it harder to compete. This is confirmed as the correlations between government ties and innovation outputs are relatively low (see correlations for variables 1 to 4 in table 18). Therefore it is stated that the market forces are limited. Hence at the present Chinese market situation, government ties are good for the Chinese innovator. However the market ought to be more liberal and directed by market forces. After such as transformation, government relations would be less important to the entrepreneurs.

Nevertheless it is still positive to be a private or foreign entrepreneur in China. Ownership by foreign firms illustrates small estimates but positive correlations to innovation outputs (variable 5 in table 18). And moving on to variable 7 in table 18, as expected, joint ventures with foreign firms have a robust influence on the innovation output. In particular, the probability of a renewed quality control increases due to the multinational joint venture. As a result of the exchange of knowledge and experience that is active within a joint venture, the entrepreneurs are more aware of international trends, qualities, production methods and so on. Therefore -as seen in the result-, joint ventures improve the innovation output.

Finally, many of the larger firms in China have close ties to the state. This is because they are state owned, or supported to not release any personnel. The thesis uses two proxies for size. The size of the staff and the net value of total fixed assets (variables 4 & 5 in table 23). First, the estimates of the net value are small. Surprisingly the correlations are negative. This means that the large size of fixed assets decrease the innovative capacity. However, by observing the estimates of the workforce's size, the larger group of employees the better innovation output. With the argument that the government prefers to keep unemployment low than innovation capacity high, it can be said that the government actually supports innovation in large enterprises as long as they keep the group of staff. Note that it is a social innovation –new management technique- that increases the most as the size of the personnel increase. Therefore the third hypothesis is rejected. It is not negative to be private. However, at the present market situation the correct hypothesis should be formulated; the more government ties, the better innovation output. Even thou government ownership is negative to the innovative capacity.

Table 18. ESTIMATES OF GOVERNMENT TIES & OWNERSHIP

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	The government is represented in the firm's board	0,149	0,026	*	0,119
	man. tech.	The government is represented in the firm's board	0,385	2E-08	***	0,100
	quality ctrl	The government is represented in the firm's board	0,367	8E-08	***	0,065
2	prod. line	Government assist in locating foreign technology	0,372	0,023	*	-0,016
	man. tech.	Government assist in locating foreign technology	0,753	2E-05	***	0,046
	quality ctrl	Government assist in locating foreign technology	0,853	3E-06	***	0,073
3	prod. line	Government assist in obtaining bank financing	0,290	1E-05	***	0,115
	man. tech.	Government assist in obtaining bank financing	0,616	<2e-16	***	0,114
	quality ctrl	Government assist in obtaining bank financing	0,641	<2e-16	***	0,095
4	prod. line	Government officials oriented toward helping	-0,002	1E-04	***	0,043
	man. tech.	Government officials oriented toward helping	0,003	1E-08	***	-0,025
	quality ctrl	Government officials oriented toward helping	0,003	1E-06	***	0,031
5	prod. line	Percent of total ownership held by foreign firms	0,001	0,483		0,055
	man. tech.	Percent of total ownership held by foreign firms	0,005	0,001	**	0,036
	quality ctrl	Percent of total ownership held by foreign firms	0,006	2E-05	***	0,040
6	prod. line	Percent of total ownership government sector	-0,003	1E-07	***	-0,071
	man. tech.	Percent of total ownership government sector	0,001	0,088	.	-0,202
	quality ctrl	Percent of total ownership government sector	-0,001	0,028	*	-0,134
7	prod. line	Firm is a joint venture of a foreign investor	0,300	0,005	**	0,117
	man. tech.	Firm is a joint venture of a foreign investor	0,381	4E-04	***	0,020
	quality ctrl	Firm is a joint venture of a foreign investor	0,543	9E-07	***	0,064

(Investment Climate Survey)

6.4. Result of the Control Variables

The result already has answered the three hypotheses. For the context, this section briefly points out some noteworthy estimates that have not been mentioned in the above discussion.

Most control variables act as expected. More market information (table 19), training to the personnel and the managers (table 20) and more supplier credits (table 22) seem to generate significantly better innovation outputs. Hence, the thesis suggests that the Chinese government put further efforts to develop these factors. Moreover it is stated in table 23 that management techniques and new quality controls are depending on a growth of the technologically advanced industry. A bit surprising, an enlargement of the financial industry would worse the innovation output. As explained above, this result could origin in the government influenced environment with a lack of market forces.

It is worth noting that an increase of computer usage (table 20), compensation to the personnel (table 21), and certainty of electric power (table 23) would not change the innovation output much at all.

Finally it is striking that estimates for upgraded product lines are negative in a wide range of variables (see variable 4, table 15; variable 1, table 16; variables 1 and 2, table 17; variables 4 and 6 in table 18; variables 1, 2 and 3 in table 19; variables 1, 2 and 3 in table 20; variable 2 in table 22; and finally variables 2, 3 and 6 in the 23 table). To clarify, 43 % of the innovation factors seem to decrease the number of upgraded product lines. Compare to the other two innovation proxies, where barley 3 % of the innovation factors reduce the new management techniques and 5 % diminish the new quality controls. The reasons are found in the difference between the depending innovation proxies. One explanation could be foreign influences. Upgraded product lines are possible innovations from abroad. While to succeed with new management techniques, there is a local cultural aspect on the innovation process. Hence, if the product lines are upgraded abroad, improved factors of innovation will have no affect on the innovation output. However, some innovation factors actually decrease the upgrading of product lines. Thus this is a very vague explanation, but it illustrates the complexity of innovation. Anyway, it is clear that employed innovation theory must become more specific in what kind of innovation it scrutinizes.

Table 19. ESTIMATES OF INFORMATION & STANDARDS

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	Satisfactory information on laws & regulations	-0,198	2E-11	***	-0,124
	man. tech.	Satisfactory information on laws & regulations	0,132	7E-06	***	-0,027
	quality ctrl	Satisfactory information on laws & regulations	0,101	0,001	***	4E-04
2	prod. line	Satisfactory information on technical standards	-0,167	6E-09	***	0,056
	man. tech.	Satisfactory information on technical standards	0,155	7E-08	***	0,087
	quality ctrl	Satisfactory information on technical standards	0,119	4E-05	***	0,077
3	prod. line	Satisfactory info. on demand for firm's product	-0,174	3E-09	***	0,011
	man. tech.	Satisfactory info. on demand for firm's product	0,159	6E-08	***	0,113
	quality ctrl	Satisfactory info. on demand for firm's product	0,123	3E-05	***	0,109
4	prod. line	Firm's products and systems is standard certified	0,002	2E-06	***	0,274
	man. tech.	Firm's products and systems is standard certified	0,004	<2e-16	***	0,135
	quality ctrl	Firm's products and systems is standard certified	0,005	<2e-16	***	0,243

(Investment Climate Survey)

Table 20. ESTIMATES OF EDUCATION & SKILLS

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	Firm offer formal training to employees	-0,199	1E-13	***	-0,048
	man. tech.	Firm offer formal training to employees	0,163	1E-09	***	0,119
	quality ctrl	Firm offer formal training to employees	0,090	0,001	***	-0,041
2	prod. line	High level of education of the general manager	-0,167	1E-08	***	0,079
	man. tech.	High level of education of the general manager	0,180	8E-10	***	0,002
	quality ctrl	High level of education of the general manager	0,083	0,004	**	-0,010
3	prod. line	Workforce regularly uses computer	-0,002	0,003	**	0,058
	man. tech.	Workforce regularly uses computer	0,004	2E-13	***	0,233
	quality ctrl	Workforce regularly uses computer	0,001	0,008	**	0,112

(Investment Climate Survey)

Table 21. ESTIMATES OF INCENTIVES

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	GM's incentive plan links income to firm's result	0,113	0,021	*	0,015
	man. tech.	GM's incentive plan links income to firm's result	0,549	<2e-16	***	0,140
	quality ctrl	GM's incentive plan links income to firm's result	0,407	7E-16	***	0,061
2	prod. line	Expenditure on compensation for R&D-personnel	2E-04	5E-05	***	0,078
	man. tech.	Expenditure on compensation for R&D-personnel	3E-04	7E-06	***	0,137
	quality ctrl	Expenditure on compensation for R&D-personnel	4E-05	0,046	*	0,054
3	prod. line	Ratio of wages of middle-managers to employees	8E-04	0,800		0,017
	man. tech.	Ratio of wages of middle-managers to employees	0,017	2E-05	***	0,123
	quality ctrl	Ratio of wages of middle-managers to employees	0,027	2E-08	***	0,129

(Investment Climate Survey)

Table 22. ESTIMATES OF FINANCIAL PROXIES

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	Amount of the line of credit/overdraft facility	1E-06	0,003	**	0,094
	man. tech.	Amount of the line of credit/overdraft facility	2E-06	1E-04	***	0,089
	quality ctrl	Amount of the line of credit/overdraft facility	1E-06	0,002	**	0,068
2	prod. line	Approximate annual rate of interest on loan	-0,007	0,171		0,061
	man. tech.	Approximate annual rate of interest on loan	0,027	2E-05	***	-0,016
	quality ctrl	Approximate annual rate of interest on loan	0,023	1E-04	***	-0,053
3	prod. line	Percent of net profits re-invested last year	0,002	0,006	**	0,139
	man. tech.	Percent of net profits re-invested last year	0,005	3E-12	***	0,084
	quality ctrl	Percent of net profits re-invested last year	0,005	3E-12	***	0,024
4	prod. line	Firm uses supplier credit to purchase inputs	0,156	0,003	**	0,010
	man. tech.	Firm uses supplier credit to purchase inputs	0,378	1E-12	***	0,125
	quality ctrl	Firm uses supplier credit to purchase inputs	0,398	1E-13	***	0,039
5	prod. line	Total travel & entertainment costs 1 year ago	4E-08	0,982		0,065
	man. tech.	Total travel & entertainment costs 1 year ago	4E-07	0,847		0,041
	quality ctrl	Total travel & entertainment costs 1 year ago	2E-07	0,921		0,002
6	prod. line	Expenditure on purchase of R&D-technology	5E-05	0,023	*	0,095
	man. tech.	Expenditure on purchase of R&D-technology	3E-06	0,472		-0,076
	quality ctrl	Expenditure on purchase of R&D-technology	3E-06	0,550		-0,106

(Investment Climate Survey)

Table 23. ESTIMATES OF INDUSTRY, SIZE & INFRASTRUCTURE

#		Variable	Estim.	P-value	Sig.	Corr.
1	prod. line	Industry is technological advanced	0,081	0,024	**	0,184
	man. tech.	Industry is technological advanced	0,285	4E-15	***	0,066
	quality ctrl	Industry is technological advanced	0,297	3E-16	***	0,079
2	prod. line	Industry is garments and food	-0,529	<2E-16	***	-0,229
	man. tech.	Industry is garments and food	0,030	0,625		0,045
	quality ctrl	Industry is garments and food	0,087	0,156		0,014
3	prod. line	Industry is finance	-0,828	3E-13	***	NA
	man. tech.	Industry is finance	-0,283	0,005	**	NA
	quality ctrl	Industry is finance	-0,545	3E-07	***	NA
4	prod. line	Size of the firm is large	0,015	0,740		0,078
	man. tech.	Size of the firm is large	0,351	1E-13	***	0,135
	quality ctrl	Size of the firm is large	0,279	3E-09	***	0,083
5	prod. line	Net value of total fixed assets in 2002	5E-09	0,851		0,097
	man. tech.	Net value of total fixed assets in 2003	1E-07	0,021	*	-5E-04
	quality ctrl	Net value of total fixed assets in 2004	8E-08	0,080	.	-0,035
6	prod. line	Number of times public power was lost	-0,012	1E-05	***	-0,001
	man. tech.	Number of times public power was lost	0,012	9E-06	***	0,054
	quality ctrl	Number of times public power was lost	0,009	4E-04	***	0,110

(Investment Climate Survey)

7. Conclusion

Since the Chinese innovators suffer from unfair competition, the thesis identifies three obstacles facing the entrepreneurs. First, the entrepreneurial environment lacks networks and collaboration between industries and research institutions. Second, weak property rights and government interventions generate a vague and varying legal system. Finally, SOEs enjoy soft budget constrains and government guaranteed bank loans. As a consequence these inefficient state-related enterprises neglect labour saving innovations to satisfy the political leaders. In addition, the government's nepotism obstructs the innovators search for external capital. Due to these three market failures, it is stated that the inefficient and unfair market environment is more expensive to the entrepreneurs, whose advancement is a longer process than the imitators'. Thereby, the imitators benefit from the unfair advantages.

The Chinese government has declared that China should increase their efforts to become an innovation-oriented country where innovation is generated by a supportive role of the government, next to a capital allocating function of the market, and a technical innovating role by the enterprises. Therefore the thesis states that to help the innovators overcome the copy-cats the NIS ought to implement an efficient and competitive market-environment for the innovators. However the hypotheses claim that more needs to be done. The thesis argues that more networks; a more trustworthy legal system; and less government ties, would improve the Chinese innovation output. Therefore the three hypotheses are tested.

Regarding the conclusion, the third hypothesis is rejected and the initial two hypotheses are accepted. Following, is a conclusion for each hypothesis. Initially, the first hypothesis is confirmed. It states that the more networks and collaboration, the more innovation output. The hypothesis is accepted since more collaboration and memberships in business associations and clusters generate a better innovation output. However, the collaboration does only affect the innovation output since it has a focus on research. A general connection to suppliers and clients does not improve the innovative capacity. Even thou it is argued that –in particular international-relations enhance the awareness of trends and technological progress. Therefore, to eliminate the setback of too little collaboration, the government ought to improve the networks and enhance the number of collaborations with research institutions. As a result the innovation output would improve.

To succeed, the government should increase the efforts of the Key Technological R&D Programme. As a consequence further innovation projects would be undertaken in collaboration between universities and commercial enterprises. As a bonus effect, the number of private entrepreneurs with a government support would increase. Thus, these entrepreneurs become more willing to initiate innovation processes. Alternatively the Chinese government can put fresh capital into the National High-tech R&D Programme's direction on local and international technological collaboration. As a consequence, local entrepreneurs will be better off to receive foreign technology, and in addition diffuse their innovations onto the global market. Finally, the programme for Mega-projects of Science Research aims to construct innovative breakthroughs, with no support to the continuous production. Anyway, by gathering gifted researchers and integrate them in a collaboration between universities and enterprises the government seeks to develop new industries and products. Hence, as a complement to the previous suggested efforts, the mega-projects can improve the networks at a more central level.

Moving on to the second hypothesis, it argues that a more trustworthy legal system will improve the innovation output. Likewise to the first hypothesis, the second hypothesis is accepted. Even thou it is not as evident as expected. The results points out some exceptions and the estimates are relatively low. However, there is no hesitation that the Chinese entrepreneurs are in need of a more trustworthy legal system. Due to the globalisation, contracts cannot be set by personal relations at the same level as before. Furthermore at the present market situation, an entrepreneur prefers to act under a legal system that is stable but interrupting, rather than under a liberal but varying legal system. So, due to the current legal environment where the government rules through the law, it is an advantage to the entrepreneur if the laws are affecting the business operations. As it probably is a positive effect. Yet, the theories of liberal markets and the rule by law are not refuted. Thereby, one conclusion is that the result should be read with an understanding for the present government-depending market in China. Therefore as an overall conclusion, China should enhance the efforts to decentralize the markets.

However, the thesis discusses what transformations that are needed to improve the innovators' situation against the imitators'. Therefore, the thesis searches for improvements that can be done at the present situation. China's National High-tech R&D-programme aims to develop advanced technology. To be successful, a well-protected property right is one method. Since the property rights secure the entrepreneurial profit and thereby increase the incentives of the innovators. For this reason, at the present situation, further government efforts are needed to support the

institutional methods of the innovation programmes, such as property rights. In addition the legal policy makers must become more decentralized and less depending on the Party, with a liberal market as the focal point.

Finally, the third hypothesis is rejected. Under the current market environment, better government ties generate a better innovation output. According to the result, good government relations award the innovators with advantages, such as assistance in finding external capital and new technologies, or favourable political resolutions. This could be defined as market support. Yet, the large estimates suggest that the Chinese entrepreneurs are too reliant of the government's help. Similarly, it is stated that government ownership is negative for the innovation output. This is due to the financial incentives that are lost because of soft budget constrains and government guaranteed bank loans. Hence due to the Party's rule through the law, the government possesses a position that to the Chinese entrepreneurs seem to be indispensable. Therefore it is stated that the market forces are limited. Hence to adjust to the situation, private entrepreneurs try to capture the government officers and thus gain the advantages. As a consequence the rule through law is reinforced.

Moreover, large-sized firms are usually related to the state. One reason is that the government wants to make sure the large firms do not release any personnel. Since the result shows that the net value of total fixed assets has a negative relation to innovation, but the size of the workforce improves the innovation output. It is claimed that the government supports innovation of large-sized firms as long as they employ a large group of citizens. Consequently, due to the prior arguments the third hypothesis is rejected.

Generally, as long as the current government-depending environment maintains, the results are expected. Hence, the apparent advice is to transform the whole market, and make the innovation climate less government-dependent. However, such a transformation is done in fragments. The thesis has focused on three of the fragments, as they appear to be obstacles that promote imitators before innovators. As a conclusion, more collaboration and networks within research, and a more established trustworthy legal system, is vital to improve the Chinese innovation output. Yet, when analysing the complete Chinese business environment there are further obstacles of innovation. To identify these obstacles, and scrutinize their affection on the Chinese development is an assignment for future research. Furthermore, future research ought to assess the differences between various kinds of innovation outputs.

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Appendix

Codes of Dummies

Dummy	Code
Longstanding relation to university 1 year ago	DummyByCondition(mb8a11 == 'Yes')
Longstanding relation to other firm 1 year ago	DummyByCondition(mb8a44 == 'Yes')
The firm a member of a business association	DummyByCondition(mc5 == 'Yes')
Firm is located in science park or export zone	DummyByCondition(mh1 == 'Yes')
Government is represented in the firm's board	DummyByCondition(mm7d == 'Yes')
Gov't assist in locating foreign tech. to license	DummyByCondition(mg3b=='Yes')
Gov't assist in obtaining bank financing	DummyByCondition(mg3e=='Yes')
Firm is a joint venture of a foreign investor	DummyByCondition(ua16 == 'Yes')
Firm offer formal training to employees	DummyByCondition(mi1_new == 'Yes')
General Manager's highest level of education	DummyByValues(mi1,'postgraduate education at home','postgraduate education abroad','undergraduate education at home','undergraduate education abroad')
Satisfied with information on laws & regulations	DummyByValues(mo1f,'Moderately satisfied','largely satisfied','Very Satisfied')
Satisfied with information on technical standards	DummyByValues(mo1d,'Moderately satisfied','largely satisfied','Very Satisfied')
Satisfied with information on market demands	DummyByValues(mo1b,'Moderately satisfied','largely satisfied','Very Satisfied')
GM's income links to the firm's performance	DummyByCondition(mm10 == 'Yes')
Average compensation for R&D-staff last 3 yrs	(ub11a2 + ub11b2 + ub11c2) / 3
Firm uses supplier credit to purchase inputs	DummyByCondition(ml13 == 'Yes')
Average purchase of R&D-technology last 3 yrs	(ub11a4 + ub11b4 + ub11c4) / 3
Size of the firm	DummyByValues(size,'Very large','Large')
Industry	DummyByValues(industry,'Electronics', 'Auto and auto components','IT services','Telecommunications','Chemicals and pharmaceutics')
Industry	DummyByValues(industry,'Garments','Food')

Industry	DummyByValues(industry,'Accounting and finance')
Upgraded product line last five years	DummyByCondition(mb11 == 0 | mb11 == 1)
New management techniques last five years	DummyByCondition(mb14 == 0 | mb14 == 1)
New quality control last five years	DummyByCondition(mb15 == 0 | mb15 == 1)

(Investment Climate Survey)

Multicollinearity between Variables

The thesis suspects multicollinearity in-between external- and internal finance-proxies, and ownership structures. As the tests demonstrate low correlations in table 24 it is stated that the suspected multicollinearity between financial proxies are overstated.

Table 24. CORRELATION BETWEEN EXTERNAL AND INTERNAL FINANCE-PROXIES

	Line of credit	Interest rate of loan	Supplier credit
Net-profit reinvestment	5,44 %	2,58 %	1,12 %
Supplier credit	2,56 %	4,11 %	
Interest rate of loan	-0,73 %		

(Investment Climate Survey)

When testing multicollinearity between proxies for ownership structure, the test estimate that the proxies for ownership by private- and government sector show perfect multicollinearity as they to 100 % describe the exact opposite. Therefore the test will not include the proxy for private ownership as it is perfectly described by the government sector ownership proxy. The ownership structure correlations are presented in table 25.

Table 25. CORRELATION BETWEEN SHARE OF OWNERSHIP-PROXIES

	Foreign firm	Gov't sector
Private sector ownership	12,45 %	-100,00 %
Joint venture of international firm	50,89 %	-13,11 %
Government sector ownership	-12,45 %	

(Investment Climate Survey)

Moreover multicollinearity is suspected between industry-proxies. Yet as stated in table 26, the largest correlation between the proxy for advanced industries –such as IT, cars, electronics and chemicals- and the proxy for the food- and garment-industries, is smaller than 50 %. Hence the thesis will include all three of the variables.

Table 26. CORRELATION BETWEEN INDUSTRY-PROXIES

	High-technological	Food and garments
Accounting and finance	-27,29 %	-12,26 %
Food and garments	-47,77 %	

(Investment Climate Survey)

The correlation in table 27 is large. Therefore is it possible to have a sufficient discussion with only one of the proxies included in the test. Since theory suggests that the Chinese government support large SOEs the tests will include the large-size dummy. As a result it is possible to see whether the government ties enhance the innovative capacity of the firm. If not, it is due to the large negative correlation in table 27 stated that small-sized firms are better innovators than larger enterprises.

Table 27. CORRELATION BETWEEN PROXIES FOR SIZE OF THE FIRM

	Large sized firm
Small sized firm	-76,93 %

(Investment Climate Survey)