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An Assessment of Chinese Outward Foreign Direct Investments as an Innovation Strategy

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Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BIT	Bilateral Investment Treaties
FDI	Foreign Direct Investments
IPR	Intellectual Property Rights Regime
ISR	Industry-Science Relationship
MNC	Multinational Corporation
MOFCOM	Ministry of Commerce
NDRC	National Development and Reform Commission
OFDI	Outward Foreign Direct Investments
R&D	Research and Development
S&T	Science and Technology
SAFE	State Administration of Foreign Exchange
SOE	State Owned Enterprise
STIP	Science and Technology Industrial Park
TBI	Technology Business Incubator

Key Words: Outgoing Foreign Direct Investments, Innovation System, China, Innovation Strategy, Absorption, Diffusion, Technology and Knowledge Transfer

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Abstract

Chinese outward foreign direct investments (OFDI) have increased dramatically in the 2000s. Strategic asset seeking OFDI to developed economies have become a more prevalent characteristic of overseas investments by Chinese enterprises. This form of OFDI is being used as an instrument to access strategic assets such as knowledge and technology. The thesis attempts to assess the success of Chinese outgoing foreign direct investments as an innovation strategy. This is done by analyzing China's preconditions for increasing its innovativeness through OFDI. The assessment is conducted through the development of an analytical framework that draws on the innovation system literature. This framework is structured around the concepts of absorption and diffusion and focuses on the Chinese innovation system's capacity to absorb and diffuse knowledge and technologies acquired through OFDI.

This analysis shows that China has good preconditions to absorb foreign technology and knowledge by having a developed technical human capital base. Furthermore, China's ability to diffuse foreign knowledge and technology is facilitated by interactions between the business sector and public research institutions. However, a weak intellectual property rights regime, a poorly functioning judicial system and low levels of labor mobility impede China's diffusive capacity. Furthermore, a general shortage of management skills hampers China's absorptive capabilities. High costs associated with conducting OFDI are recognized to constitute a major stumbling block for using OFDI as an innovation strategy. The assessment further suggests that a revision of the active use of industrial policies, and a reformation of the federalist system could enhance OFDI as an innovation strategy.

1 Introduction

1.1 Background

Chinese outward foreign direct investments (OFDI) have increased rapidly since the introduction of the socialist market economy in 1992. During the 1990s Chinese outward investments were mainly resource seeking aimed at securing a long-term supply of raw materials such as timber, oil and minerals. The resource seeking investments were small in size and geographically concentrated to primarily Australia, Canada and the United States (Wang 2002: 196). A large part of the outward FDI also went to neighbouring Hong Kong - part of it probably as round-tripping FDI. Since year 2000 outward FDI have increased dramatically. From 2004 to 2006 the annual outgoing investments increased by 320% and reached $17.6 billion in 2006 (China's Statistical Yearbook 2007). In international comparison China is still a small OFDI player compared to developed countries such as the United States and other OECD countries[1]. However, in comparison to developing countries, China is becoming a major player and had the largest volume of annual outgoing FDI in 2006 of all developing countries (UNCTAD 2007).

The resource seeking rationale has lead to investments in new resource rich regions such as Africa. However, since year 2000 Chinese investments abroad have become larger in size and Chinese multinationals tend to invest more in high income and industrialized countries. Excluding Hong Kong and Macao, more than 70% of Chinese subsidiaries abroad were established in industrialised countries during the first years of the 2000s (Deng 2007: 72). Furthermore, about one third of the OFDI projects in 2006 were located in developed economies (Morck et al 2008: 338). Strategic asset seeking OFDI have become a more prevalent characteristic of Chinese OFDI. Outward FDI have become instrumental in obtaining strategic assets such as knowledge, technologies and know-how. The instrumentalist approach to OFDI of this kind has been actively encouraged and advanced by the Chinese government. In 2001, Premier Zhu Rongji announced the "Going global" strategy as a part of

[1] Members of the OECD are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

a long-term innovation oriented development strategy in which asset seeking OFDI was encouraged. Strategic asset seeking OFDI have since then been undertaken through mergers and acquisition and foreign greenfield investments in mainly research and development (R&D) centres in industrialised countries (Deng 2007: 74). Recent examples are Lenovo's takeover of US-based IBM, Huawi Group's acquisition of US-based Philip's R&D divisions, China Electronic Corporation's acquisition of Dutch-based Philips Electronic's mobile handset division, and TCL's merger with French-based Thomson. OFDI is becoming an integrated part in China's strategy for innovativeness, by being used as a way of gaining access to foreign technology and knowledge.

This thesis will perform an assessment of outgoing FDI as a development strategy to improve China's innovativeness. The assessment investigates China's preconditions for increasing its innovativeness through outgoing FDI. An analysis of this kind will unavoidably direct the attention towards policies and institutional arrangements that could be subject to reform. The policy implications of the analysis will therefore also be addressed.

This study deals with a topical subject that is interesting to study both as a part of a general global trend and as an interesting case in its own right. Outward FDI from developing countries to developed countries is a rather new phenomenon that has gained increased attention in recent years. The so called BRIC-countries, including Brazil, Russia, India and China, have primarily been the forerunners of this development. Chinese outgoing FDI can therefore be seen as a part of a broader global trend within international trade that involves increased trade flows emanating from developing countries destined for developed countries. At a higher level of abstraction a case study of Chinese outgoing FDI may reveal insights about how other developing countries and in particular the BRIC-countries may increase their innovativeness and international competitiveness through outgoing FDI. Furthermore, innovation is by various scholars and also the Chinese government regarded to constitute a key element to maintain China's international competitiveness in the future and to achieve economically sustainable long-term growth (see for example Yusuf and Evenett 2002). To further study how China can increase its innovativeness is therefore relevant and of interest to get an idea of China's future economic development and the challenges the economy faces in order to stay competitive.

1.2 Aims and Research Questions

The principal aim of the study is to assess outgoing FDI as an innovation strategy for China. This will be done by making use of some of the theoretical elements developed within the national innovation system approach. The study aims to assess China's preconditions for increasing its innovativeness through outgoing FDI. In sum the study will address the following questions:

- *What are the benefits and limitations of using outward FDI as an innovation strategy for China?*

- *What are the policy implications of the assessment?*

The research questions will be theoretically developed and further clarified as the study progresses.

1.3 Method and Material

In order to asses OFDI as an innovation strategy for China an analytical framework that draws on the innovation system literature will be developed. The framework is used to systematize the descriptive analysis and to determine which empirical data that is relevant for the study. The framework will hence inform the structure of the empirical analysis.

Innovation system literature by scholars such as Dahlman and Nelson, Edquist, and Lundvall have been used to develop the framework. Literature on innovation systems in developing economies have been particularly useful when developing the framework. Furthermore, the framework also draws on the work on national innovation systems by the OECD. Studies on innovation systems in various countries by the OECD have been particularly useful in order to operationalize the theoretical elements of the innovation system approach.

Both primary and secondary data has been used to conduct the empirical analysis. Primary data from China's Statistical Bureau, the World Bank and UNCTAD has been used. Data from the World Bank Knowledge Assessment Methodology 2008, and China's Statistical Yearbook have been particularly useful. Furthermore, interviews conducted in Shanghai in

April 2008 have also contributed to the empirical base of the study. In terms of secondary data, various academic articles, studies and surveys have been used. Studies by the World Bank and the OECD have been particularly useful in this respect. The access to relevant material has overall been satisfactory. However, the study could have gained further depth and credibility if more primary data on labour mobility and inter-firm collaborations would have been available. Furthermore, more available statistical data on Chinese outgoing investments could have further enhanced the assessment.

1.4 Limitations

To avoid misunderstandings I would like to briefly clarify the limitations in scope of the thesis. The study does not aim to deliver general insights on outgoing FDI as an innovation strategy, but is limited to the case of China. This however does not mean that no general insights can be distilled from the present case. Furthermore, the study does not intend to establish causality and to test if outgoing FDI lead to improved innovativeness. The study departs from the assumption that outgoing FDI have the potential to improve the innovative capabilities of an economy through for example R&D spill overs and reverse knowledge transfers from subsidiaries to parent companies. There are studies supporting this assumption (see Globerman and Shapiro 2006, Lichtenberg and van Pottelsberghe de la Potterie 1998). The study rather assesses China's preconditions for increasing its innovativeness through outgoing FDI. This study will hence identify conditions that influence the likelihood of outgoing FDI being a successful innovation strategy and apply this theoretical understanding when analyzing China's innovation system.

The analytical framework of the study builds on the innovation system approach. The indicators used in the study are therefore informed by this theoretical approach. Using a single approach to analyze empirical data implies that only a limited conception of the reality will be conveyed. There is not only one way of assessing OFDI as an innovation strategy and it is therefore vital to bear in mind that this assessment conveys a description of the reality that is informed by the innovation system approach.

2 The Innovation System Approach

In the following part the innovation system approach as an analytical approach will be presented. The innovation system approach's theoretical understanding of central concepts such as innovation and the mechanisms behind innovation will be introduced and briefly elaborated on.

2.1 Defining Innovation

Since Schumpeter we have defined innovation as a new combination of existing elements or as a brand new creation (see Schumpeter 1911: 410). Innovation is basically about discovering and exploiting opportunities by e.g. releasing new products or services that fill a gap in the market. In short it is about the economic application of a new idea. There are different forms of innovations labeled slightly different by various scholars. According to Schumpeter an innovation can be the introduction of a new product, a new process, a new raw material or a new organizational structure. Some authors distinguish between innovations entailing technological change and innovations entailing organizational change (see Lundvall 2007). Innovations involving technological change are goods or services, while organizational innovations are new forms of organizing a business to improve its performance.

Other scholars distinguish between product innovation and process innovation (see Edquist 2001, Black 2008). The former involves the introduction of a new or a modified product while the latter entails a new or a modified way of making a product. Product innovations can consequently involve new services or goods and is in this sense a matter of what is being produced (Edquist 2001: 7). Process innovations on the other hand can be technological or organizational and revolve around how goods and services are produced. This category of innovations constitutes innovations per se but can also constitute means to product innovations. In a similar way a product innovation can instigate process innovation. The invention of a new type of machine could for example bring about process innovation by generating a new form of organizational structure. Process and product innovation can therefore be seen as intimately related and it is consequently important to consider both forms when analyzing innovation.

Within the innovation system approach, innovation is fundamentally regarded to revolve around the creative use of knowledge to respond to market demands and opportunities (OECD 1999: 14). Knowledge is conceived as the building block of innovation and is consequently a central unit of analysis within the innovation system approach. To analyze innovation using the innovation system approach implies an analysis of how knowledge is managed, transferred and utilized in order to result in innovative output. Furthermore, learning is seen as central to innovation since learning and the diffusion of knowledge is regarded to spur innovative activities (Lundvall 2007: 107). Consequently, this thesis will have a strong focus on knowledge and learning when dealing with innovation and the topics of China's innovativeness and Chinese OFDI.

2.2 The Origin and Emergence of the Innovation System Approach

The innovation system approach represents a shift away from the linear model of science and technology push that dominated the debate on innovation after the Second World War. At that time major inventions such as the atomic bomb were seen as decisive drivers of innovation (Feinson 2003: 13). Large investments in R&D were assumed to lead to similar innovation output. However, the linear model proved unable to explain why similarly large investments in R&D among industrialized countries in the 1950's and 60's yielded different results in terms of rates of technological innovation and economic development. The innovativeness of an economy seemed to depend more on efficient diffusion of knowledge than on the introduction of radical innovations or large scale investments in R&D (Feinson 2003: 13). The innovation system approach gained momentum in the late 1980s within science, technology and innovation studies, as it in a convincing way could account for cases such as the economic catch-up of Japan and South Korea and the economic collapse of the socialist economies in Eastern Europe. Since then the approach has become widely employed by institutions such as the OECD, the World Bank, UNCTAD and the European Commission.

2.2.1 A Shift Away from the Neo-Classical Paradigm

The innovation system approach was partly developed as a critique of the neoclassical paradigm (Godin 2007: 7). The approach is based on the assumption that knowledge important to economic performance is localized and not easily moved from one place to another. Within the neoclassical world where knowledge equaled information and where the society consisted of perfectly rational agents with unlimited access to information, the concept of innovation system would be unnecessary as an analytical tool (Johnson et al 2003: 5). According to the innovation system approach, knowledge is something more than information that includes tacit components embodied in agents, in routines of firms and in the relationships between people and organizations. Knowledge is therefore a more central concept than information in the innovation system approach.

Furthermore, the innovation system approach draws on theoretical insights from new institutional economics by recognizing that institutions matter when explaining economic behavior. Institutions can be defined as the rules of the game, i.e. they are constraints such as norms, rules and regulations that shape human behavior (North 1990: 3). There are both formal and informal institutions. The former are rules and regulations that are promulgated by a political act such as laws. The latter are conventions and norms that have evolved over time, such as culture. Institutions define and limit the set of choices for individuals and firms. To understand firm behavior it is necessary to consider the institutional context of the firm, i.e. to consider the institutions that define the rules of the game for the firm. The innovation system approach departs from the insight that institutions matter and apply this understanding when analyzing innovation systems.

The innovation system approach is a form of evolutionary economics. The approach can be understood as an analysis of how knowledge evolves through processes of learning and diffusion in the innovation system (Lundvall 2007: 106). The approach partly draws on Friedrich List's concept of national systems of production (see List 1841). List emphasized the need to build a national infrastructure and institutions to spur economic development rather than just to trust "the invisible hand" to solve all problems as Adam Smith had suggested (Lundvall et al 2002: 214). In a similar way the innovation system approach

employs a more systemic and holistic approach when analysing competitiveness and economic development.

2.2.2 New Growth Theories

Within the field of economics, learning processes, human capital and innovation gained increased interest with the emergence of the new growth theories. Romer (1990) recognized that innovation can be the engine of growth. His conclusion is based on the assumption that ideas and knowledge are not like conventional inputs in the sense that they are non-rival. Non-rival means that the use of knowledge by one party does not limit or impair the use of the same knowledge by other parties. For example, a blue print can be used by many parties at once. Moreover, it can be reproduced at a low cost although there are large sunk costs to develop it. By recognizing knowledge as a non-rival input, the social benefit from investments in knowledge are enhanced. Romer's conclusion is that the stock of human capital determines the rate of growth (Romer 1990: 71). An economy with a large total stock of human capital will experience faster growth. Consequently, a low level of human capital may help to explain why growth is not observed in developing economies (Romer 1990: 99). This model suggests policies that would increase investments in learning. Hence, it shifts the focus from investments in physical capital that the neoclassical growth models propose, and suggests investments in education that increase the human capital.

Furthermore, other new growth theorists such as Grossman and Helpman (1994) recognize innovation as an engine to sustained growth. Investments in knowledge conducive to innovativeness are regarded as critical for long-run growth processes (Grossman and Helpman 1994: 24). They find that spillover effects of innovation and investments in knowledge make growth more sustainable (Grossman and Helpman 1994: 42). The new growth theories have paved the way for a greater focus on knowledge, human capital and learning within the field of economics and the study of economic growth. In this sense the innovation system approach builds on the insights from new growth theories by recognizing knowledge as central to innovation and economic growth.

2.3 Methodology of the Innovation System Approach

The innovation system approach provides an analytical framework to analyze innovation processes and innovative capabilities. The system under analysis can be delineated spatially or sectorally. Hence it can for example be applied on a local, national or regional system of innovation or on a specific sector of the economy. By definition an innovation system is a network of institutions and actors in the public and private sector whose activities and interactions contribute to the development and diffusion of new technologies and innovations (OECD 1999: 24). The innovation system approach can therefore be labeled a systemic approach since it analyses a set of institutions and actors and how they jointly and individually play a role in the innovation system. The innovative performance of an economy does therefore not only depend on how individual actors (e.g. firms, research institutes, universities) perform in isolation, but also how these actors interact.

The systemic and holistic approach implies that the method to study innovation systems involves an analysis on both the micro and the macro level. Firms play the most crucial role for innovation and can be regarded as a “focusing device”, spotting avenues and niches for technological development (Feinson 2003: 18). However, a firm does not innovate in a vacuum. Firms innovate in interaction with other firms, research institutions and actors. Hence, it is embedded within a specific innovation system that shapes its incentives and the resources at hand. The firm’s innovative activities therefore depend on the institutional set up and how the firm interacts with institutions and actors in the innovation system. Crucial for the firm’s innovativeness is for example the linkages and interactions between the firm and non-firm actors such as financing organizations, the labor market and the educational system (Johnson et al 2003: 7). Innovativeness is therefore also about having an institutional set up conducive to innovative activities.

2.3.1 The Innovation System Approach and Transition Economies

There are some differences between developed and less developed countries worth considering when applying the national innovation system approach on a transition economy like China. The national innovation system approach has mainly been developed based on

industrialized and developed economies as a model. In recent years the applicability of the approach for developing economies and economies in transition has been highlighted.

Developing economies often acquire technology from abroad rather than develop innovative technologies themselves, as more developed countries usually do. China for example generally imports technology rather than develop technology (Chang and Shih 2004: 536). The innovative capability of a developing country is therefore particularly dependent on the transfer of knowledge and technology from abroad. The innovation system's ability to learn and adopt foreign technologies and knowledge is therefore important to consider when analyzing the innovativeness of a developing country and how it acquires knowledge and technology from abroad.

The innovation system approach identifies certain functions that constitute prerequisites for innovativeness and that facilitate innovation processes within an innovation system. There exist a broad and a narrow version of the approach. The narrow approach focuses primarily on the institutions and actors that directly generate and promote diffusion of knowledge and scientific and technological innovation (Johnson et al 2003: 3). Using a narrow approach would primarily focus the analysis on the national R&D system. The broader approach encompasses all economic, social and political institutions affecting learning and innovative activities. Thus, the broader version of the innovation system approach could include the financial system, the educational system, the judicial system, the labor market, the intellectual property rights regime (IPR), etc.

The broad approach is often applied on less developed economies (see fore example Oyelaran-Oyeyinka 2006: 253, Feinson 2003: 25). In this study the broader conception of the innovation system will be employed on a national level. It is reasonable to assume that there are bottlenecks in the Chinese economy affecting the innovativeness of the innovation system which would not be captured if the narrow version of the approach was applied. China's economy is to be regarded as a transition economy where some markets are more deregulated than other and where political distortion of the market is not unusual. A broader approach would therefore give a more accurate picture of the present state of the Chinese national innovation system. Applying a broad conception of the innovation system approach when analyzing outgoing FDI implies an analysis of the institutional set-up affecting OFDI and the actors and interactions related to such activity.

3 Analytical Framework

In the following paragraph a theoretical introduction to the relationship between outgoing FDI and innovativeness will be presented. Furthermore, an analytical framework on how to assess the Chinese innovation system's capacity to absorb and diffuse foreign knowledge and technology acquired through OFDI will be introduced. The analytical framework will lay the foundation for the assessment of OFDI as an innovation strategy for China.

3.1 Outgoing FDI as a Means to Innovation

Outgoing FDI can be a means to innovation by constituting a channel through which foreign knowledge and technologies can be transferred. Research on the effects of outward FDI for the home country of multinationals is however still limited and is scarce for developing countries and transition economies. Studies of developed economies have shown that outward FDI create spillover effects of knowledge and R&D skills back to the home country (see Lichtenberg and van Pottelsberghe de la Potterie 1998). Business associations, personal contacts and labor mobility create knowledge spill overs from the firms investing abroad to local firms. Local firms in the home economy can in this way benefit from outgoing FDI by accessing the knowledge acquired by the firm conducting outgoing FDI (Globerman et al. 2000).

Other studies on spill over effects in developed countries from OFDI have shown that the embeddedness in the national innovation system of the firm investing abroad matters for the positive spillover effects in the home economy (Friberg 2006: 27). The degree of embeddedness is defined by how much the firm interacts with other actors within the national innovation system. Interactions such as firm collaborations with national universities or the use of national SMEs for subcontracting contribute to increase the embeddedness of the firm in the national innovation system. A higher degree of embeddedness facilitates diffusion of knowledge and technology and has thereby greater potential to contribute to the innovativeness of the economy.

Other studies have demonstrated that outgoing FDI can lead to reverse knowledge transfers from the subsidiary to the parent company (see Håkanson and Nobel 2001, Globerman and

Shapiro 2006: 10). Outgoing FDI constitute a potential channel for transfer of knowledge about for example new production and management techniques from foreign affiliates to the parent company. Such reverse transfers of knowledge are more likely for strategic asset seeking FDI going to regions with clusters of expertise in specific technologies. Other studies have shown that multinational corporations (MNCs) investing abroad are more innovative due to access to a larger stock of ideas and knowledge (Rabbiosi 2005: 10). MNCs that carry out R&D overseas will gain access to foreign localized knowledge, which can be transferred back to the parent company in the home country. Moreover, companies that go abroad and establish subsidiaries in proximity to knowledge clusters can benefit from this association in terms of employee recruitment, supplier and distributor access and knowledge spillovers (Tavares Young 2005: 11).

Studies on emerging economies have shown that outward foreign direct investments stimulate international trade by expanding and creating trade channels (Globerman and Shapiro 2006: 2). Home country MNCs can in this respect be efficient channels for the importation of goods (including factors of production) from which the home country is lacking. The positive effects of outgoing FDI for developing countries and emerging economies have not been thoroughly researched. However, there is no basis to assume that outgoing FDI would have a negative effect on the home economy's innovativeness (Globerman and Shapiro 2006. 36). It is rather expected that OFDI have similar positive effects for emerging economies as indicated in studies on developed economies.

In sum, outward FDI can be a means to access and transfer technology and knowledge (including localized knowledge) from more developed economies. Outgoing FDI may give the firm access to foreign knowledge and technology from R&D institutions (such as universities and R&D centers abroad), management and production techniques and more tacit know-how in general that can be hard to acquire. However, the benefits of reverse knowledge transfers and spill overs of knowledge and technology to the home economy depend on the absorptive capacity of the innovation system and its ability to diffuse knowledge acquired through outgoing FDI. If the economy shall benefit from outgoing FDI, the knowledge and technology acquired by the firm conducting outgoing FDI have to be diffused and absorbed throughout the innovation system by various actors and institutions. The following paragraphs will therefore delve deeper into how the innovation system approach understands diffusion and absorption and how these processes relate to outgoing FDI.

3.2 How to Assess OFDI as an Innovation Strategy

The benefits of outgoing FDI as a strategy to increase a nation's innovativeness revolve around the national innovation system's capacity to absorb and diffuse foreign technologies and knowledge. Absorption is about the national innovation system's ability to adopt and learn technology and knowledge, while diffusion is about disseminating knowledge and technology within the national innovation system in order to enable other actors to learn and utilize knowledge and technologies coming from abroad (Franco 2007: 7). Diffusion is essential to increase the innovativeness of the economy. It occurs through interactions between actors and institutions in the innovation system. If technology and knowledge is diffused, more actors can absorb this technology and knowledge in order to further utilize and develop it. In this way the innovativeness of the economy may be improved and sustained.

In the case of outgoing FDI the absorptive capacity of the economy is to a certain extent determined by the costs of accessing foreign knowledge and technology for firms investing abroad or wishing to do so. If China is going to improve its economy's innovativeness through increased volumes of outgoing FDI to developed economies, the Chinese national innovation system has to be able to access and absorb foreign knowledge and technology in an efficient way. Consequently, an assessment of the benefits and limitations of using outward FDI as a strategy for innovativeness involves an analysis of the absorptive capacity of the national innovation system and an assessment of the costs of accessing foreign knowledge and technology through outgoing FDI for the firm. Furthermore, such an assessment also needs to include an analysis of the ability of the Chinese innovation system to diffuse knowledge and technology. In the following section an outline on how to assess the Chinese innovation system's capacity to absorb and diffuse foreign knowledge and technology acquired through OFDI will be presented. The outline will present indicators and proxies that are of interest when later undertaking the empirical assessment of the Chinese innovation system.

3.2.1 Absorption

3.2.1.1 Costs Associated with Absorption

If absorption of foreign knowledge and technologies shall take place through OFDI the firm has to be able and willing to conduct OFDI. The proneness of the firm to undertake outgoing FDI is to some extent determined by the cost of such an activity. New institutional economics has highlighted the merit of considering transaction costs in order to understand the behavior of an economic organization like the firm. Transaction costs involve the additional costs that the firm has to carry in order to make an economic exchange. Such costs could be: search and information costs like for example costs associated with finding out whether the required good is available on the market and how to gain access to such a good; negotiation costs which are the costs associated with reaching an agreement with the other party to the transaction; and enforcement costs which are the costs of upholding the contract with the other party (North 1990: 29). These costs are to some extent determined by the institutional context within which the firm operates. For example, a well functioning legal system that enforces contracts decreases the enforcement costs when doing business. Furthermore, an efficient bureaucracy decreases the transaction costs of doing business by minimizing resources spent on for example red tape and bribing activities.

In the case of outgoing FDI, the regime for OFDI is of particular interest to assess the costs involved when undertaking outward FDI. The government can in several ways decrease the transaction costs of accessing foreign knowledge and technologies through outgoing FDI. Examples are tax incentives for investing abroad; cutting down on cumbersome red tape and elimination of corruption among bureaucrats and politicians (Dahlman and Nelson 1995: 91). These actions reduce the transaction costs of undertaking outgoing FDI both in terms of money and in terms of time consumed by red tape and bribing activities. The information costs increase if the firm has to bribe certain officials and obtain certain personal relationships with bureaucrats or politicians in order to get a permit to invest abroad. Moreover, the enforcement costs increase if the validity of permits issued by the government depends on continuous bribing activities and collusion with officials.

High transaction costs may discourage the firm from undertaking outward FDI. It is therefore of interest to somehow measure the transaction costs involved when undertaking outward FDI. This is not a straight forward procedure since it is hard to get an exact measurement of the transaction costs involved. Firstly, one could look into if there are any tax incentives for outgoing FDI, since such incentives reduce the transaction costs. Furthermore, the level of cumbersome regulations for investing abroad can be used as a proxy for transaction costs. Lastly, the general level of corruption among officials can be used as a proxy for transaction costs. It could be interesting to look into how hard it is to get a permit for outgoing FDI and how much such decisions are politically distorted by for example nepotism. Moreover, it could be fruitful to look into which firms that are investing abroad and which one that do not. This could tell us whether there is an equal distribution of opportunities to go abroad among firms.

A precondition for investing abroad is access to capital to finance the costly activities of going abroad or acquiring a foreign company. The firm's access to finance through the banking and financial system therefore to some extent determine the willingness of the firm to invest abroad. Also in this case, the level of red tape and corruption for getting access to finance matters for the cost of going abroad. If gaining access to capital is cumbersome and involves high transaction costs such as collusion and bribing, the cost of outgoing FDI goes up. Consequently, having well functioning financial markets, access to venture capital or other forms of funding could reduce the cost of outgoing FDI for the individual firm. It is consequently of interest to look into how the financial markets operate and which firms that can access capital.

3.2.1.2 Absorption of External Knowledge and Technology

To be able to absorb foreign technologies can be a key to catching up for a developing country. Absorption of foreign technologies by East Asian countries like Korea and Taiwan has been regarded as a decisive factor for the successful catching up process of these countries (Intarakamnerd et al. 2002: 1451). Examples like these illustrate that absorption has the potential to contribute to economic development and improved innovativeness. The effectiveness of absorbing foreign technology is determined by the competence of the national technical human capital base, i.e. the technical skills of the work force. Technological

capabilities are primarily embodied in people and not only in physical machinery (Dahlman and Nelson 1995: 96). Technology transfer is therefore not a passive process of just acquiring technology. It is rather a learning process requiring that the receiver of the technology understands and is able to learn the new technology (Dahlman and Nelson 1995: 88). Effective technology transfer does therefore not only require access to foreign technology but also a technical human capital base able to understand and assimilate foreign technologies to local needs. Technology transfer is consequently also about knowledge transfer and interactive learning (Dahlman and Nelson 1995: 89).

The absorptive capacity of an economy can be measured by assessing the competence of the national technical human capital base. This can be done by looking into proxies such as the general educational level of the population; the share of students enrolled in science and engineering; the share of scientists and engineers of the total population; the total number of R&D personnel; and the level of vocational training of employees (Dahlman and Nelson 1995: 97). The quality of research institutions and the spending for R&D in universities and firms also give an idea of the technical human capital base. Moreover, the efficiency of the human capital base is of interest. The efficiency can be measured by looking into the number of patents registered relative to the number of R&D personnel. Furthermore, the number of published scientific articles relative to the number of researchers can also be used as a proxy for the effectiveness of the technical human capital base. Good basic education and strong technical and engineering skills lay the foundation for continuously upgrading people's skills and building a human capital base that is able to learn new technologies.

Firm level absorption primarily depends on the R&D capabilities of the firm and the educational level of the staff. Furthermore, past research has shown that a firm's absorptive capacity is influenced by firm management and how the firm manages knowledge (Zahra and George 2002: 186). Management skills affect the functioning of the whole firm and as such the absorptive capacity of the firm. Moreover, management decisions about investments in R&D influence the firm's R&D capabilities and thereby its absorptive capacity. Furthermore, human resource management and the management of internal communication processes and in particular how knowledge is diffused and managed internally influence the absorptive capacity of the firm (Cohen and Levinthal 1990: 132). Absorption is therefore facilitated if the firm has proficient organizational and management skills. It is consequently of interest to look into the management skills of the firm in order to further assess the absorptive capacity.

To sum up, absorption of foreign technology and knowledge from outgoing FDI depends fundamentally on having access to a technical human capital base and the management skills of the firm. Technical human capital and competent management of knowledge resources are necessary to acquire foreign technology in an efficient way and to assimilate and implement foreign technology to local needs.

3.2.2 Diffusion

3.2.2.1 Interactions

According to the non-linear conception of innovation of the innovation system approach, firms innovate in interaction with other firms, research institutions and actors. The technological and innovative capabilities of firms develop over time and are not only a result of firm specific learning. Technological and innovative capabilities are also an effect of different kinds of interactions such as collaborations and competition between firms and other organizations. Learning takes place through these forms of interactions. Interactions are therefore a way to diffuse and adopt knowledge. If the knowledge acquired through outgoing FDI is to be diffused to other actors within the innovation system it is essential that the firm undertaking outward FDI is embedded in the innovation system, i.e. that the firm interacts with other actors in the national innovation system.

Public-private interactions constitute a crucial diffusion mechanism in an innovation system. This form of interaction depends ultimately on having an adequate knowledge infrastructure and its linkages to the industry (OECD 2007: 41). Industry-science relationships (ISRs) such as contractual research and public-private partnerships for research enable diffusion of technologies and knowledge. Technology and knowledge acquired through outgoing FDI by a firm can via public institutions be diffused to the private sector through public-private collaborations. The prevalence and quality of public R&D institutes and universities can tell us something about the innovation system's ability to diffuse knowledge and technology. Of interest are primarily the actual interactions between the public and private sectors and how to measure such interactions. One proxy to measure this form of interaction is joint research activities (OECD 1997: 10). The prevalence of research or technical collaborations between

firms and public R&D institutes and universities tell us something about the interactions between the public and private sector. Another proxy is the number co-publications by private firms in collaboration with a university or public research institute. A third way to measure private-public interactions is to use firm surveys to collect data on to what extent the firm interacts with the public research sector (OECD 1997: 11). Private-private interaction between firms is also a way of diffusing knowledge and technology acquired by one firm to other firms. Firms interact through for example R&D collaborations and technical alliances in order to pool technical resources, attain economies of scale and achieve synergies (OECD 1997: 7). The prevalence of R&D collaborations and other forms of inter-firm collaborations tell us something about the intensity of private-private interactions in an economy. Another useful proxy could be the number of jointly published articles by two or more firms.

3.2.2.2 Personnel Mobility

Personnel mobility is another way of diffusing knowledge within an innovation system. The tacit knowledge carried by the employee is diffused to the new employer when he or she finds a new employment. To measure the personnel mobility can be one way of further assessing the diffusive ability of the innovation system. Such an assessment could make use of labor market statistics or look into more qualitative studies on the mobility of labor. Of particular interest are the movement of science and technology (S&T) personnel and the flows of such personnel between the public and the private sector (OECD 1997: 19). Furthermore, formal and informal personal interactions and relationship networks are an important channel of knowledge transfer within the industry and between the public and private sectors. The prevalence of more informal interactions of this kind further tells us something about the diffusive capacity of the economy.

3.2.2.3 Government Policies and Legal Environment

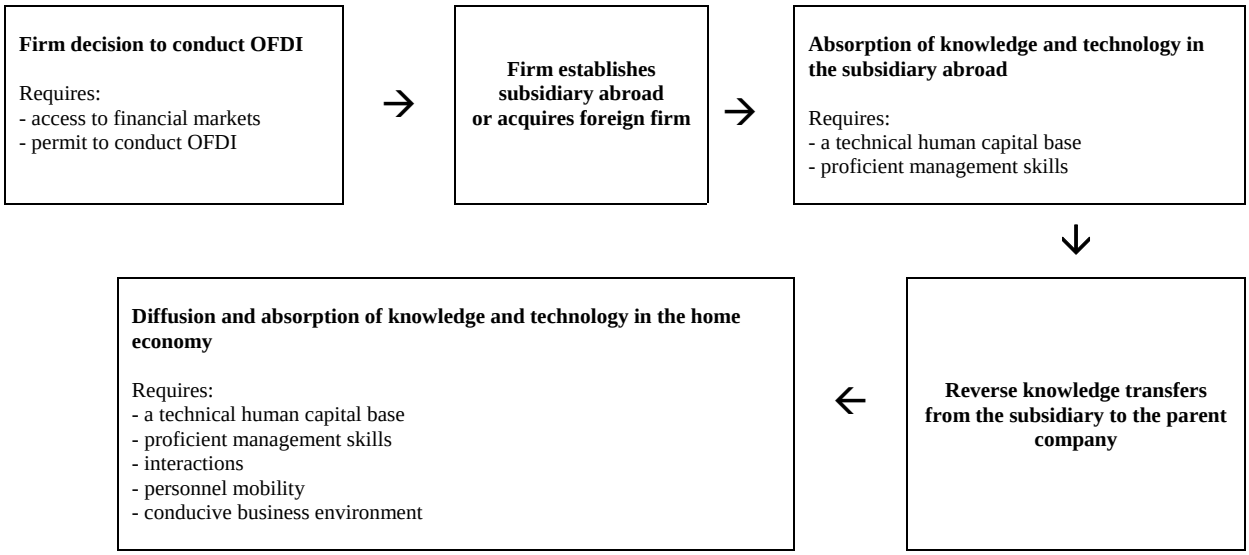
The government can encourage diffusion by creating a business environment conducive to diffusion. This could be done by reducing the transaction costs of R&D collaborations through for example tax incentives to facilitate inter-firm technological alliances or firm co-operations with the public R&D sector (Tavares and Young 2005: 9). Furthermore a well

functioning IPR and a sound legal environment play a crucial role to enable diffusion of knowledge and technologies. If interaction with other firms, R&D institutes and universities is associated with the risk of forgery and opportunistic behavior, the firm will be hesitant towards interactions of this kind. A weak IPR and unreliable legal institutions will increase the transaction costs of diffusion and discourage interactive learning between different actors in the innovation system (OECD 2007: 41).

3.2.3 Conceptual Model

Figure 3.1 below summarizes the analytical framework and highlights the preconditions that the framework define as critical if OFDI shall be a successful innovation strategy. In sum, the model highlight the preconditions for a firm to conduct OFDI; the preconditions for absorption of knowledge and technology in the subsidiary abroad; and the preconditions for diffusion and absorption of foreign knowledge and technology in the home economy.

Figure 3.1
Conceptual model of knowledge and technology transfers through outgoing FDI



4 Assessment

In the following part the analytical framework previously introduced will be applied on China's innovation system. The structure will therefore be informed by the analytical framework. The aim of the following analysis is to provide an assessment of outgoing FDI as an innovation strategy for China by making use of the analytical concepts absorption and diffusion.

4.1 Absorption

4.1.1 The Regime for Outgoing FDI

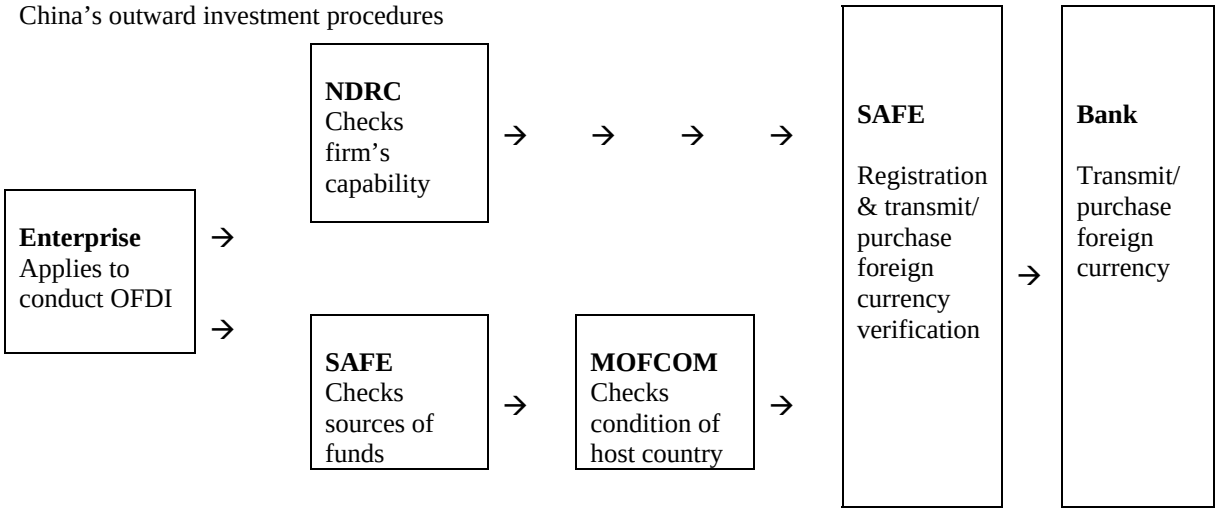
The Chinese government first allowed outward FDI in 1979 as a part of the opening up policy. The transformation from a centrally planned to a market-oriented economy has led to gradual deregulations of the OFDI regime and an increase of OFDI promotion activities of the government. The regulatory framework for OFDI has gone through several phases of change. From 1979 to 1985 a restrictive policy towards overseas investments was employed. State-owned, provincial and municipal enterprises were the only actors allowed to undertake OFDI projects (Berger 2008: 16). As a consequence, OFDI projects were small in number and size. From 1986 to 1991 the OFDI regime was cautiously liberalized which resulted in increasing OFDI flows. Private enterprises were now also allowed to apply for permission to establish subsidiaries abroad. From 1992 to 1997 OFDI flows increased as the Chinese government initiated promotion activities such as seminars and workshops for Chinese enterprises on how to invest abroad (Berger 2008: 17). However, various regulations for stricter and more rigorous screening and monitoring processes were also introduced. In 1998 China first announced its "Going Global Strategy", which was later in 2001 officially implemented in the Tenth Five-Year Plan for National Economy and Social Development. This marked the transition to more active encouragement of outgoing foreign direct investments by the government (Cai 2006: 627).

Since the decentralization of the economic system in 1984 the OFDI approval process has been increasingly decentralized (Cai 1999: 863). The State Council has assigned regulatory

authority to the Ministry of Commerce (MOFCOM) and the local government level. The central government has also given 22 cities and provinces the mandate to approve overseas investments of up to US$ 200 million without requiring approval from Beijing. However, the State Council is the final arbiter for investments that could have “significant macroeconomic or foreign policy implications” (Iyengar 2004). Moreover, according to the 2004 "Decision of the State Council on Reforming the Investment System", the central government approves resource extraction investments exceeding US$ 30 million and non-resource projects larger than US$ 10 million (The National Development and Reform Commission 2004). Other investment projects are approved by the investment departments of local governments.

Figure 4.1 below illustrates the procedure when applying for permission to conduct OFDI on the central level. The figure shows how all applications have to pass the National Development and Reform Commission (NDRC), which is a macroeconomic management agency under the State Council, the State Administration of Foreign Exchange (SAFE) and the MOFCOM before the firm is granted the permission to invest abroad and purchase/ transmit foreign currency.

Figure 4.1
China’s outward investment procedures



Source: Pamlin and Baijin 2007

4.1.1.1 Incentives

As a part of the “Going Global Strategy” the government has introduced several incentives to promote outgoing FDI in certain areas. Chinese enterprises investing abroad are exempted

from corporate income tax for five years after the beginning of an overseas project. Besides central government tax incentives some local governments grant preferential treatment for foreign investing enterprises (Berger 2008: 17).

Moreover, export credits are granted to Chinese enterprises exporting production equipment, technology know-how, parts and components, as well as raw and processed materials. Several state owned banks prioritize outward investments. Since October 2004 the NDRC and the Export-Import Bank of China provide credit support to special overseas investment projects. The NDRC and the China Export and Credit Insurance Company have also established preferential insurance rates for overseas investment projects that are prioritized by the government (Cai 2006: 630). Furthermore, since September 2005 the NDRC and the Chinese Development Bank give financial support for certain key investment projects promoted by the Chinese government. Extensive foreign exchange control by the Chinese government has constrained companies wishing to invest abroad, but a decision by the SAFE in 2005 allows enterprises investing abroad to purchase foreign exchange up to US$ 3 billion without permission (Cai 2006: 629). This further facilitates the procedure for investing abroad.

Besides promotion of outgoing FDI at the domestic level, the Chinese government has also had a liberal policy approach towards bilateral investment treaties (BIT). China has been active in signing BITs and had in June 2007 signed 120 treaties, which makes China the second largest contracting party to BITs in the world (Berger 2008: 26). The BITs encourage OFDI by incorporating dispute resolution mechanisms and the provisions for compensation for losses in the case of war and civil strife for overseas investors. In this way the BITs increase the level of investment protection for the enterprises investing abroad and could make such investment less risky and costly.

4.1.1.2 Who Invests Abroad?

Despite decentralization, the role and influence of the Chinese central government remain strong in guiding OFDI. The government has actively guided outgoing FDI to targeted sectors, industries and countries (Wang 2002: 194). Resource seeking OFDI to regions and countries rich on natural resources such as Africa, Australia and Canada have been encouraged since the 1990s. Since the “Going Global Strategy” was implemented in 2001

strategic asset seeking to developed countries by telecom- and more high technological companies have been prioritized (Morck et al 2008: 338). Since various agencies within the state administration are required to approve outward FDI project from China, the government can remain influential in deciding where to invest and which firms that can invest. The central government also maintains its influence through the control over foreign exchange by the SAFE (Buckley et al 2007: 503).

The statistics on which firms that actually invest abroad indicate that it is questionable whether there is an equal opportunity among firms to conduct OFDI. China's outward foreign direct investments are mostly conducted by state-controlled enterprises which enjoy government sanctioned monopoly status (Morck et al 2008: 337). Table 4.1 below shows the firms conducting the largest overseas investments in year 2005 and 2004. According to the table, the biggest sources of Chinese outward FDI are the most profitable listed State Owned Enterprises (SOEs). Lenovo and Huawei are the only large OFDI conductors that are not explicitly state controlled (Haier is collectively owned). Furthermore, almost all of the largest overseas investors on the list have a sanctioned monopoly in some major industry, such as for example natural resources or telecommunications. There are some SMEs and private-sector firms that also conduct outgoing FDI, but the volumes are too small to register (Interview, Shanghai Innovation Centre 15-04-2008). The CEO of a SME producing semiconductors in Shanghai emphasized that the bureaucratic burden of getting a permit to invest abroad is too heavy (Interview 14-04-2008). His biggest concern was the dealings with the SAFE when transferring money out of China. He regarded using unofficial channels as more feasible if his company wanted to transfer money abroad.

Table 4.1
Largest Companies Ranked by Outward FDI

No	Year 2004	Year 2005
1	China Mobile	China National Petroleum Corp.
2	China National Petroleum Corp.	China National Offshore Oil Corp.
3	China National Offshore Oil Corp.	China Mobile
4	China Resources (Holding) Co. Ltd.	China Resources (Holding) Co. Ltd.
5	COSCO	COSCO
6	CITIC	SINOPEC
7	SINOPEC	CITIC
8	China Telecom	China Merchant Group
9	Guangdong and Hongkong Investment Holding	China National Cereal, Oil and Foodstuff
10	China Merchant Group	China Construction Corp.

11	China NetCom	China Aviation
12	China Construction Corp.	China Telecom
13	Lenovo Holding	SinoChem
14	China Aviation Group	Chine NetCom
15	China Power Investment Group	China Shipping
16	China Minmetals	Guangdong and Hongkong Investment
17	SinoChem	Shanghai Auto Group
18	China National Cereal, Oil and Foodstuff	Shum Yip Holding Company
19	China Shipping	Lenovo Holding
20	Sino Transportation Group	China Power Investment Group
21	Shanghai Auto Group	China Minmetals
22	China Huaneng Group	Sino Transportation Group
23	Beijing Orient Electrics Group	TCL
24	China World Best Group	Beijing Orient Electrics Group
25	TCL Group	China Huaneng Group
26	Guangdong Hangyun Group	China Poly
27	Shanghai Bao Steel	Shanghai Bao Steel
28	Beijing Jade Bird Group	China Shou Gang Group
29	China Nonferrous Metal Mining Group	China Nonferrous Metal Mining Group
30	China Road and Bridge Corp.	China North Industrial Group

Source: Morck et al 2008

The fact that the largest OFDI players overlap to a large extent with the most profitable SOEs in China is not completely unreasonable, since OFDI is a costly activity that is more likely to be undertaken by larger enterprises in expansion. However, the statistics primarily reflects the fact that SOEs generally enjoy preferential treatment in the OFDI regulatory regime since these companies receive generous support from state-owned banks (Berger 2008: 18). OFDI projects are conducted in close relationship with the local or central government. Government guidelines and recommendations have to be followed in order to get an approval to invest. A survey in year 2000 among 170 enterprises investing abroad showed that three quarters of the enterprises were actively guided by the government in selecting in which country to invest (Wang 2002: 198). State assistance of this kind is built into the OFDI regime. Furthermore, by allowing political intervention in overseas investments that may have “significant macroeconomic or foreign policy implications”, the government reserves itself the right to intervene in decisions in an arbitrary way. Outward FDI is part of the Chinese government’s industrial policies to promote certain industries and sectors. Since OFDI is a channel to access both natural resources and foreign knowledge and technology, it is a considerable industrial policy tool to improve the performance in prioritized sectors and industries. Equal opportunities to conduct OFDI among firm are therefore not an interesting option for the government, since it would impair OFDI as an industrial policy tool.

4.1.2 China's Financial System

China's financial markets are dominated by banks and most of firm's finance comes from the banking system. More than three quarters of all commercial loans comes from the big four state-controlled banks - the Bank of China, the Industrial and Commercial Bank of China, China Construction Bank, and the Agricultural Bank of China. Most of the loans go to the state sector - 73% of the short-term bank loans between 2001 and 2004 went to SOEs (Morck 2008: 344). The lending to private firms has increased in absolute terms but remained on a 0.3 percent level of the total lending credit for the years 2000 to 2004 (China's Statistical Yearbook 2006: Ch. 20-7).

The state controlled banks lack experience in lending on a commercially viable basis and also lack commercial incentives to lend to more creditworthy clients. The Commercial Bank Law from 1995 states that loan decision shall by guided by economic policy priorities, and in this context lending assistance to SOEs is essential. Over half of China's SOEs are loss making and are therefore in need of continues financial support from the state controlled banks to stay alive (Mako and Zhang 2003). The state banks have traditionally provided SOEs with soft budget constraints (see Kornai 1980) to keep them alive and to maintain social stability by avoiding a massive liquidation of SOEs that would result in large numbers of unemployed. The bank sector is an important political tool for the government on both a central and a local level. It is used to address these kinds of social stability concerns and to further control who can grow big in China. Poor lending decisions continue to be made, even if the government is trying to address soft budget constraints and the large volume of non-performing loans it has resulted in (Naughton 2007: 464).

Furthermore, lack of competition in the banking sector contributes to the absence of incentives to lend to the most profitable firms. The central bank, the People's Bank of China, sets monetary policies including interest rates (Naughton 2007: 451). This makes it hard for smaller private banks to compete with large state controlled banks. Furthermore, oversight of lending decisions is deficient and procedures for assessing credit worthiness and cash flows are limited. Credit personnel lack skills in this area and in some cases it is the bank officer that has to bear personal responsibility if a loan is defaulted (Lu & Yao 2003: 3).

Consequently, it is safer for a bank officer to lend to large SOEs. This has resulted in generally discriminatory behavior to SMEs that intrinsically have a higher risk of default than SOEs, which are usually large (Ayyagari et al 2008: 8)

While China's banking system is large, the capital markets have remained relatively underdeveloped. Capital markets represent an alternative to bank financing and include the stock and the bond markets. The Chinese equity and bond markets are smaller than most other countries; both in terms of market capitalization and in terms of total value traded as a percentage of GDP (Ayyagari et al 2008: 9). Equity market capitalization accounts for only 17 percent of the GDP (excluding state-owned non-tradable stocks), while the proportion is around 60 percent in other developing countries. Furthermore, equity markets are primarily used by the government as an instrument to privatize and to restructure SOEs, rather than as a source of raising capital by firms with growth opportunities. Raising capital to finance investments like OFDI on the stock exchange is constrained by complicated listing procedures. The firm does not only have to meet the preconditions for being listed, it also has to compete for the favor of regulators in gaining permission to be listed (Naughton 2007: 471). The regulatory framework for listing procedures was set up to protect the rights of the government as owner of listed SOEs. Durnev et al (2004) showed that compared to other transition economies, China has one of the poorest functioning stock markets with weak property rights, corporate opacity and political rent-seeking (Durnev et al 2004: 575). Share holder protection is weak, which further makes raising money on the stock market unattractive. Bond markets in China are limited and underdeveloped. The corporate bond market in China is highly regulated and lacks institutional investors and credit rating agencies that price the debts accurately (Ayyagari et al 2008: 9). The market for government treasury bonds is larger, but still not significant compared to the banking sector. As shown in table 4.2 below, treasury bonds constitute about 9 % of the funds raised in domestic financial market, while corporate bonds account for 6 % in year 2005.

Policy makers have been reluctant towards financial innovations that might draw substantial amounts of funds from the banking sectors (Naughton 2007: 453). Control over the financial sector has been an important industrial policy tool and a means to maintain government control of the economy during reform and the gradual transition to market economy. Banks have maintained the dominance of the financial system. As shown in table 4.2 below, the

banking sector accounted for roughly 80 % of the funds raised in 2005. The stock market has declined as a source of funding in the 2000s and account for 6 % in 2005.

Table 4.2
Sources of funds raised in domestic financial market (percent)

Year	Bank lending	Treasury Bonds	Corporate Bonds	Stocks
2000	72.8	14.4	0.5	12.3
2001	75.9	15.7	0.9	7.6
2002	80.2	14.4	1.4	4.0
2003	85.2	10.0	1.0	3.9
2004	82.9	10.8	1.1	5.2
2005	78.1	9.5	6.4	6.0

Source: Naughton 2007: 452

Cumbersome regulation and political favoritism of state owned firms make it hard for private firms to raise money through formal financial channels. Private companies are basically shut out of the formal financial system. Informal lending therefore plays a significant role for these companies financing. In addition to informal associations, there are private money houses and underground lending organizations who operate like banks (Ayyagari et al 2008: 8). However, informal lending comes with an interest rate around 20% or more, which makes it a very expensive and unsustainable source of funding (Roberts 2004).

The gradual opening up of China's banking system to foreign competition and the country's accession to the WTO are measures to improve the governance and professional supervision of China's banking system. The China Banking Regulatory Commission has also passed new laws encouraging banks to lend to SMEs (Ayyagari et al 2008: 9). However, in the present state, China's financial system cannot accommodate the need for funding by private firms and SMEs, since banks favor large companies and in particular SOEs. There is a critical lack of capital for financing new ventures and also a lack of both the expertise and the legal and regulatory conditions for an adequately functioning venture capital system (OECD 2007: 18). There are domestic venture capital firms set up by the government at a national and provincial level, but these are run by government officials who do not always have the adequate skills and training. Furthermore, there is a shortage of firms willing to invest in high-risk ventures.

4.1.3 Costs Associated with OFDI

The Chinese government maintains its control over which companies that can invest abroad primarily through the financial system and the highly state controlled banking sector. Furthermore, the government can further control outgoing investments through the approval procedure for OFDI. This makes OFDI only feasible to larger firms and primarily SOEs that enjoy state support. Easing the bureaucratic burden for investing abroad without giving more firms access to credit does not change firm's proneness to invest abroad nor reduce the cost of OFDI. Furthermore, all the incentives set up to encourage OFDI are reserved for the firms that are actually able and allowed to invest abroad.

As discussed in the previous section, financing large and risky investments such as OFDI is difficult in China due to politically distorted and poorly functioning financial markets. Political favoritism and discrimination toward private firms and SMEs make the costs for accessing credit high. Both bank lending decisions and listing procedures are distorted by political interests which makes political ties and collusion a facilitating factor for accessing finance. Nee and Opper (2007) found, using data from the World Bank Investment Climate Survey 2003, that government assistance and political ties are common among firms having a bank loan. As shown in table 4.3, government assistance and political ties in the form of having a CEO holding a party position are more common among firms having secured a bank loan. The only exceptions are listed and collectively owned firms with CEOs holding party position. This shows how personal relationships between political and economic actors may give an information advantages or provide legitimacy and credibility to entrepreneurs that could help to secure bank loans (Nee and Opper 200: 107).

Table 4.3
Political ties and credit access by ownership form

		SOE	Collectively Owned Firm	Listed Firm	Private Firm	100% individual ownership firm
Proportion of firms having a bank loan	Without government assistance	18.30%	12.29%	47.62%	15.33%	15.94%
	With government assistance	44.32%	46.43%	62.96%	42.37%	42.24%
Proportion of firms having a bank loan	CEO without party office	15.97%	14.88%	66.66%	16.99%	16.72%
	CEO with party office	24.83%	14.02%	40.00%	32.17%	32.17%

Source: Nee and Opper 2007: 113

The politicized nature of China's financial sector increases the transaction costs of financing investments such as OFDI. Establishing political ties can be a costly activity involving for example bribing. A corrupt system of this kind increases the information costs and makes firms hesitant to undertake large investments. The OFDI statistics in table 4.1 above suggests that a similar discriminatory pattern prevail for the OFDI regime as in the financial sector. SOEs enjoy preferential treatment in the OFDI regulatory regime by having easier access to credit. This further implies a close link between the government control of the financial markets and the OFDI regime.

The potential absorption of foreign knowledge and technology that could be possible if more firms were given the chance to invest abroad is lost due to political distortion and discrimination in financial markets. Private companies with otherwise great overseas opportunities may be kept away from the opportunity of investing overseas. The OECD's Economic Survey of China showed that the private sector is more efficient than public firms and therefore is a more sustainable engine of growth (2005: 86). This further highlights the need to ease capital constraints in the private sector and give private firms the opportunity to expand overseas, in order to make use of the full potential of OFDI as a means of technology and knowledge transfer. In sum, the cost of absorption of foreign technology and knowledge could be lowered through less political distortion and more equal access to finance and overseas investment opportunities. More marketized financial markets could make absorption through OFDI more efficient by allowing the most innovative and expansive firms to invest abroad. This would reduce the present high transaction costs of investing abroad and create a more leveled and predictable playing field.

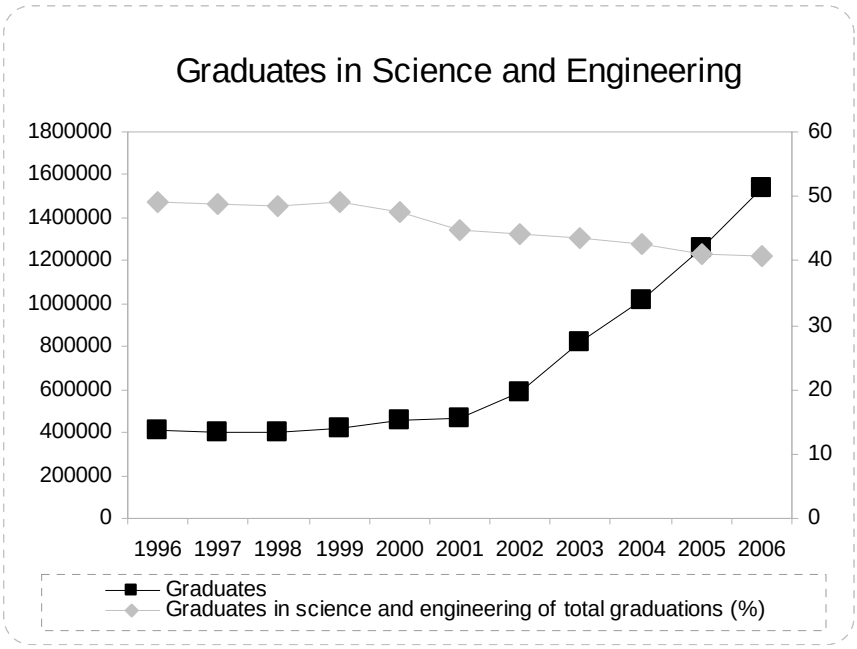
4.1.4 The Technical Human Capital Base

China's educational system has made great improvements since the beginning of reforms in 1978. The adult literacy level has increased from 64% to 93%; the average number of years of education for the total labor force has increased from 5.81 to 7.99; China's primary enrollment ratio has increased from 93.9% to 98.9% (China's Statistical Yearbook, various years). However, the overall educational attainment of the population is still low compared to OECD countries. In OECD countries the average years of education of the total labor force

are 11.67 and 24% of them have an education at the college level or above. The corresponding figure for China is only 4.7% (Naughton 2007: 363).

Furthermore, China has made great efforts to build a technical human capital base. As shown in figure 4.2 the number of graduates in Natural Science and Engineering has increased dramatically in the 2000s. The nation now has one of the world's largest forces of scientists and engineers. Table 4.4 shows that in absolute terms, China's number of researchers in R&D is second only to the U.S. Also compared to Japan and Germany, China has a larger stock of researchers in R&D in absolute terms. Furthermore, when it comes to the number of S&T journal articles published per year, China is second only after the U.S in absolute terms. However in relative terms as a share of the population, China significantly lags the US and other OECD countries such as Japan and Germany for both researchers in R&D and published S&T articles.

Figure 4.2



In terms of total expenditure for R&D as % of GDP, China has the highest ratio in the developing world and places itself well above the average upper middle income country (see Table 4.4). It is however still below the world average (1.6%) and the average of developed countries (2.2%) (Zeng and Wang 2007: 9). For all other relative indicators in Table 4.4 below, China places it self above the average lower middle income country. When it comes to the total share of enrolments in science and engineering, the enrolment rate for China is greater than in the US and other OECD countries with the exception of Korea (see table 4.5).

However, 43% of the graduates in 2004 within science and engineering attained a three years technical schooling that provides training equivalent to the community college in the US (Naughton 2007: 362). This kind of statistics complicates international comparison. It however indicates that part of China's technical human capital base is less skillful and educated compared to the developed world, despite officially reported high enrolment ratios.

Table 4.4
Science and Technology Indicators – International Comparison

	China	United States	Western Europe	India	Lower Middle Income Country	Upper Middle Income Country
Researchers in R&D (2006)	926.252.00	1.334.628.00	28.676.20	n/a	56.925.71	35.863.55
Researchers in R&D / Mil. People (2006)	714,61	4.628.20	3.774.82	n/a	693,59	967,41
Total Expenditure for R&D as % of GDP (2006)	1,34	2,68	1,93	0,61	0,39	0,61
Scientific and Technical Journal Articles (2005)	41.596.00	205.320.00	5.704.00	14.608.00	1.335.03	2.199.96
Scientific and Technical Journal Articles / Mil. People (2005)	31,89	692,46	634,44	13,35	14,63	76,84

Source: World Bank Knowledge Assessment Methodology 2008 (accessed 2008-08-06)

Table 4.5
% of total student enrolments in science and engineering (2004)

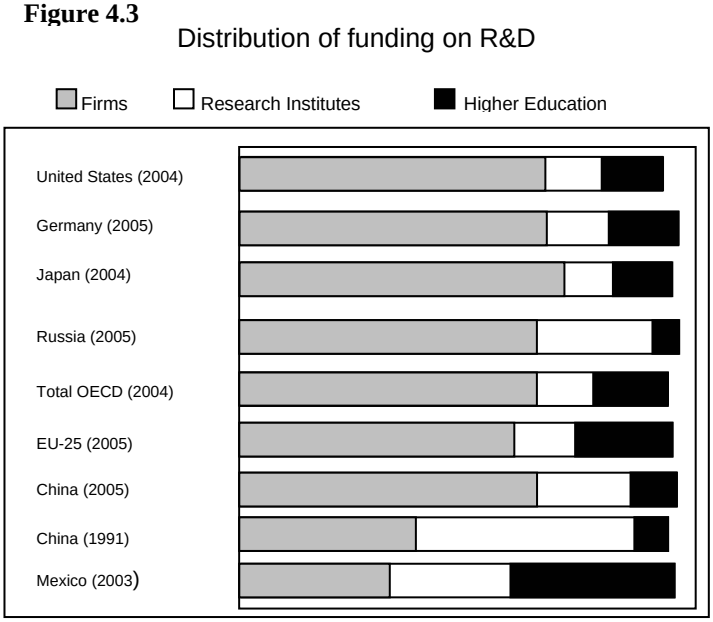
China	41.3
World	22.8
G7	21.6
Japan	19.8
Korea	41.1
India	22.1

Source: OECD 2007

Chinese enterprises are spending more on R&D. The business sector accounted for 62.4% of total R&D funding in 2003. Figure 4.3 gives the impression that China's private sector is the backbone of China's R&D activities, and that China in this respect is on the same level as OECD countries when it comes to private sector innovation and R&D activities. However, public enterprises undertake most of the R&D in the private sector. The amount being done by non-public enterprises is just about 10% of the total R&D effort, and a large share of the 10% is being done by foreign multinational companies (Zeng and Wang 2007: 10). It is consequently mostly SOEs that invest in R&D. This could indicate that these companies dispose a technical human capital base ready to absorb foreign technologies. However, it also reflects the government's commitment to increase China's innovativeness. SOEs are state controlled and a vehicle to implement government policies such as China's Fifteen-Year Plan for Science and Technology that states China's aim of becoming world leader in innovation (see Schwaag Serger and Breidne 2007). SOEs are generally low

performers when it comes to innovation. Hu and Jefferson (2006) found, using a firm-level data set of large and medium size industrial enterprises, that SOEs patent relatively less than non-state enterprises (Hu and Jefferson 2006: 28). Many SOEs lack incentives to innovate due to soft budget constraints and the inherent risk associated with innovation. A survey among CEOs of SOEs showed that the CEOs were more concerned about how government officials evaluated their performance than the actual performance of the firm (Sun 2000). This is mainly the result of the fact that CEOs of SOEs are politically appointed and therefore are interested in having good relations with political officials who nominate CEOs. Another survey showed that SOEs lack sufficient skills in innovation, effective human resource management, and strategic planning (Bai and Enderwick 2005: 42). This has partly to do with a general lack of managerial competence among SOEs (this topic will be further addressed below in the section on management skills). The Chinese government has even publicly recognized that SOEs have very low independent innovation capacity and that only a small number of SOEs possess innovative skills (China Daily 2005-11-18). The group of SOEs is not completely homogenous. China has some profitable and innovative large SOEs, many of which are centrally administered and publicly listed. But just over half of China's SOEs are loss-making (Mako and Zhang 2003). The weak innovative performance of SOEs raises doubts about whether large investments in R&D among SOEs indicate that these firms actually have a competent technical human capital base. Large investments in R&D do to some extent just reflect industrial policies of the government, and not the actual conditions in SOEs.

Figure 4.3



Source: OECD 2007

China's efforts to build a technical human capital base are paying off in terms of increased returns to R&D efforts. China's patenting has increased dramatically over the last decade in terms of both patent applications and patents granted. In 2004 the number of invention applications filed were 1 705, an increase of 32% compared with the previous year. This ranks

China as 14th in international application percentage and as second among developing countries (Zeng and Wang 2007: 11). Applications filed in the United States by Chinese residents went up from 695 in 2001 to 2 043 in 2005. However, in term of patent applications per thousand researchers China lags significantly behind the advanced economies. This raises doubts about the efficiency of the current work force and how able the technical human capital base is to absorb knowledge and technologies. Enforcement of intellectual property rights in China is however poor which deters companies from applying for official patents. Consequently, patenting in China is not the most accurate indicator to measure the output and efficiency of the technical human capital base. However, scientific articles published per thousand researchers are also comparably low in China. This further indicates that China's large technical human capital base may suffer from inefficiencies.

There are some bottlenecks obstructing China's ambition to further develop a technical human capital base. The Chinese educational system does not encourage innovative thinking or entrepreneurship. It is rather oriented towards passive learning and exam-based performance (OECD 2007: 27). Other more specific bottlenecks are shortages of skilled and innovative technical staff; low business investments in formal training and vocational training; and generally low quality in university teaching. The quality of university education suffers from insufficient funding. Rapidly increasing enrolment ratios and maintained levels of public funding have had a general negative effect on the quality of education (Schwaag Serger and Breidne 2007: 143). Introduction of tuition fees as a funding mechanism has led to inequalities in access to quality in education. Furthermore, academic corruption such as nepotism, bribery, and the exchange of favors is a problem that threatens the quality of the university education. The appointment of academic positions and the distribution of funding are distorted by various forms of academic corruption. This has a negative effect on China's R&D infrastructure as a whole and the effectiveness of China's R&D system (Schwaag Serger and Breidne 2007: 144).

Despite some bottlenecks China's technical human capital base is growing, partly due to strong commitments by the Chinese government to increase the nation's innovativeness. This is evident when looking at the large investments in R&D, high enrolments and graduation rates in science and engineering, and the fact that China has one of the world's largest forces of scientists. On the input side China is well ahead of other developing nations. Increasing number of patents indicate that China's technical human capital base is improving. However,

low levels of output in terms of patenting and S&T articles in relative terms indicate that China's technical human capital base is inefficient compared to more developed countries.

4.1.5 Management Skills

The heritage of the planned economy has left China with a shortage of management resources and a general deficiency of management skills among Chinese firms. A survey among 3000 Chinese CEO nationwide showed that only 23.9 percent of the respondents had a university degree (Sun 2000). For SOEs, political ties still play an important role when appointing CEOs. The government exercise indirect control of SOEs through the appointment of CEOs. This structure leads to agency problems, where the CEOs follow political interests rather than quality concerns and market demands (Clarke 2003: 2). Furthermore, the human resource management in SOEs has been guided by a top-down approach where the government instructs SOEs to employ R&D personnel in order to reach policy goals. This has resulted in investment in R&D activities that does not reflect market demands and that are generally inefficient. Low levels of innovative output indicate that SOEs are inefficient producers and users of knowledge (OECD 2007: 17). This raises doubts about the absorptive capacity of SOEs.

Private firms also suffer from a shortage of qualified managers. Especially domestic private firms experience difficulties competing with foreign firms in recruiting personnel with managerial competencies. Furthermore, many private firms are family businesses that usually do not handle human resources effectively or undertake large investments to upgrade technical skills. Private firms are however, more market-oriented by having stronger incentives to manage human resources sensibly in order to increase firm performance and to become attuned to market signals. Overall, the state-owned sector has the most serious shortage of management skills. SOEs are likely to have skills in production, technical and engineering, but lack sufficient skills in marketing, innovation, effective human resource management, and strategic planning (Bai and Enderwick 2005: 42). A similar pattern prevails for all types of firms in China, where the most deficient skills are effective human resource management, financial management, intellectual property management, marketing and strategic planning, according to a survey by Bai and Enderwick (2005). In sum, a general lack

of human resource management skills and skills in management of knowledge capital impedes the absorptive capacity of Chinese firms.

4.2 Diffusion

4.2.1 Interactions

ISRs such as contract research, public-private partnerships for research and public-private co-operation in training and education have increased since the 1990s and grown rapidly in the 2000s in China. Leading universities have been very active in developing linkages with the private sector. The university sector's increasing business linkages are illustrated by the fact that universities account for about 20% of the patents granted by the Chinese Office of Intellectual Property. In terms of R&D collaborations with the business sector, business-funded R&D expenditure accounted for 36% of total R&D expenditure in the university sector in 2003 (OECD 2007: 36). Industrial enterprises and universities also participate in a range of national government supported S&T programs such as the 863 Program, the Torch Program, the Spark Program and the S&T Achievement Spreading Program. Furthermore, about 3 500 universities run S&T enterprises. This further illustrates the university sector's links with the private sector.

A large part of the business orientation in universities stems from government efforts to promote applied sciences. Moreover, during economic reform Chinese firms have had a shortage of research capabilities and needed to seek assistance to improve their technological skills (Xue 2006: 12). During the same period universities have been suffering from a shortage of funding, which has further stimulated contractual research and other forms of collaborations between the business sector and universities.

Of all forms of university-industry linkages, technology contracts have become the most common (Xue 2006: 15). Among all technology contracts between universities and the business sector, technology development collaborations are most prevalent, accounting for 38% of all technology contracts in 2004. This category represents "joint research" in which enterprises assign universities with technology tasks, or collaborate with universities to do joint research for a specific topic. The number of co-publications of scientific papers between

universities and industry is another indicator of industry-science linkages. As shown in table 4.6 the number of co-authored papers between industry and universities has increased rapidly in absolute terms but slightly decreased in relative terms between 2000 and 2003.

Table 4.6
Co-authored papers between industry and university from 2000 to 2003

2000		2001		2002		2003	
Published papers	% of total published papers	Published papers	% of total published papers	Published papers	% of total published papers	Published papers	% of total published papers
5366	10.5	6424	12.1	7766	9.0	8988	9.0

Source: Liu and Lundin 2005

Outsourcing of S&T activities is increasing in China. A survey among 22 000 enterprises in 2003 showed that 30% of the companies outsourced some of their S&T activities (Motohashi and Yun 2007: 1254). From 1996 to 2003 S&T outsourcing has increased among all types of firms. In 2002 outsourcing was most prevalent among SOEs and listed firms. One third of the SOEs and listed firms in the survey outsourced some of their S&T activities. Furthermore, as shown in table 4.7, most of the outsourcing went to the public sector (universities and public research institutes) for all types of firms except foreign firms. Overall the average ratio of outsourcing to total S&T activities was about 7% in 2002. About half of that amount went to the public sector. However, the level of public-private sector S&T collaborations is lower than in developed countries. For example, more than half of all Japanese firms are conducting joint research projects with universities (Motohashi and Yun 2007: 1260).

Table 4.7
S&T outsourcing among different firm types (2002)

	No. of firms in data set	Amount of S&T outsourcing/total S&T (%)		
		University and public research institutes	International org.	Domestic firms
SOEs	4 485	3.8	0.3	2.8
Collective Firms	1 005	4.2	0.2	1.5
Foreign Firms	1 204	1.6	3.4	1.7
Listed Firms	3 729	4.3	0.5	2.0
Private Firms	523	3.7	0.4	1.2

Source: Motohashi and Yun 2007

During the 2000s there has been a rapid increase in the numbers of technology business incubators (TBIs) and the number of firms operating within such incubators (see table 4.8). Many of the firms are spin-offs from publicly funded research (OECD 2007). Examples of university spin-offs are firms like Lenovo, Shenyang Sunshine Pharmaceutical Co. Ltd., Beijing Shuanglu Pharmaceutical Co. Ltd. and Anhui Anke Biotechnology Co.Ltd. (Liu and

Lundin 2005: 5). Roughly one-quarter of the 750 R&D centers in China are estimated to be joint units with universities or research institutes. This further indicates intensive interaction between the private and public sector.

Table 4.8
Science and Technology Industrial Parks (STIPs) and Technology Business Incubators (TBIs)

	2000	2004	2005
Number of firms in STIPs	20 796	38 565	41 990
Employees in STIPs (thousand)	2 510	4 480	5 210
Number of TBIs	110	464	534
Number of firms in TBIs	8 653	33 213	39 491
Employees in TBIs (thousand)	144	552	717

Source: OECD 2007

During the planned economy, R&D was conducted by research institutes and universities, while manufacturing was conducted by firms. Interactive technology transfers have therefore traditionally occurred from research institutes and universities to firms. Interactive technology transfers between firms are as a result still rare in China (Chang and Shih 2004: 535). The ratio of firms with inter-firm collaborations increased between 1998 and 2000. However, less than 0.5% of all firms in China had some kind of inter-firm collaboration in year 2000 (Zhou 2003: 40). This is low compared to more developed economies such as the United States, where inter-firm linkages of various kinds are very common. Inter-firm collaborations are more common in science and technology industrial parks (STIPs) (OECD 2007: 41). There are in total 53 STIPs in China and the number or firms in these parks has grown rapidly in the 2000s and doubled from year 2000 to 2005 (see table 4.8). This may indicate that private-private interactions are growing in China. However, the proxy is very indirect and too imprecise to draw any conclusions from. Data on the total number of joint articles published by two or more firms between 1992 and 1997 show that the number of jointly published articles increased from 1.8% in 1992 to 3.7% in 1997 as a percentage of all articles published (Liu and White 2001: 1107). This indicates a slight trend toward more private-private collaborations throughout this period. Informal private-private interactions between professionals are also rare in China.

Furthermore, there are pronounced disparities in terms of economic growth, access to technical personnel and R&D activities between the coastal and the inland regions of China. Preferential government policies, favorable geographical location, and better infrastructure have benefited the development of more technology intensive firms in the Eastern coastal

region. Disparities in technical skills and R&D personnel between different regions constitute a general obstacle for the diffusion of technology and knowledge throughout China's national innovation system (Liu and White 2001: 1111). Consequently, inter-firm linkages such as subcontracting that could diffuse technology and knowledge from more technologically advanced Eastern firms to inland firms in the West is hampered. A deficient common market due to regional trade barriers further complicates diffusion throughout the country through private-private interactions.

In sum, evidence on improved diffusion through private-private interaction is slightly ambiguous and indirect, but indicate that private-private interaction and various forms of firm linkages are underdeveloped in China. Public-private interactions are a more developed and an important vehicle for technology and knowledge transfers in the Chinese innovation system. Interactions between the business sector and public institutions are intense. In international comparison China is well ahead of the developing world. The World Economic Forum's Global Competitiveness Report 2007-2008 ranks the intensity of university-company research collaborations in various countries from 1 to 7, where 1 represents non-existing collaborations and 7 represents intense collaborations. As shown in table 4.9 China places it self just below the average high income country. This further indicates that private-public interactions are intense and comparably well developed with regard to China's status as an emerging economy in transition.

Table 4.9
University - Company Research Collaboration (1-7) (2007)

China	Japan	Korea, Rep.	United States	Western Europe	India	High income country	Upper Middle Income Country	Lower Middle Income Country
4.1	4.9	5.4	5.6	4.49	3.5	4.29	3.3	2.75

Source: World Bank Knowledge Assessment Methodology 2008 (accessed 2008-08-11)

4.2.2 Personnel Mobility

During the socialist planned economy there was virtually no labor mobility in China. The state assigned jobs and employment was usually assigned on a life time basis. Up to the early 1990s all university graduates were assigned employments in state-funded organizations. Graduates could not choose where to work and could not freely change jobs (Liu and White 2001: 1099). Reforms have gradually reduced the role of the government's labor bureau in

allocating human capital. Today individuals may quit and change jobs relatively freely. The labor market has become more mobile, but the movement of personnel is still low. In international comparison, the movement of researchers is lower in China than in OECD countries (OECD 2007: 42). Both relationship networks and personnel mobility are scarce in China's innovation system (Chang and Shih 2004: 534). Transfers of tacit knowledge through labor mobility are therefore generally low and an underdeveloped means of diffusion.

Regional disparities are also an obstacle for labor mobility. R&D personnel in China are mainly located in the Eastern regions such as Beijing, Jiangsu, Guangdong, Zhejiang, Shandong, and Shanghai, that accounted for more than 40% of China's R&D personnel in 2005 (Chinese Academy of Sciences 2007). S&T talents are drawn to the more developed regions which further widen the gap in number of R&D personnel between developed and less developed regions. Disparities of this kind impede labor mobility throughout the country. Labor mobility varies across China, and is more prevalent among well-educated young workers (see Fu and Gabriel 2001: 4). During the central planning era population movements were restricted and controlled through a combination of the household registration system (hukou), rural commune controls, and food rationing. The abolishment of communes and food rationing in the 1980s reduced constrains on migrations. The hukou system has been reformed in the 2000s but still constitutes a migration barrier (Brooks and Tao 2003: 17). This system further consolidates regional disparities and distorts the labor market by causing a mismatch between the location of available skills and the location of demand for those skills.

According to the Chinese Information Center of S&T Statistics, the flows of employees from public research institutes to private enterprises increased between 1998 and 2005. Inflows of new employees in public research institutes were mainly from universities. Labor movements from the public to the private sector of this kind stimulate diffusion of knowledge and technologies acquired through various forms of research collaborations with the private sector. The increased volumes of R&D activities in the private sector that have been observed in recent year could further stimulate labor movements from public research institutes and universities to the private sector. Such a development could unleash more of the diffusive potential in labor mobility as a means to knowledge and technology transfer. In sum, labor mobility in China is limited and this also applies for S&T personnel. Lack of a coherent labor market hampers personnel mobility and knowledge transfers throughout the innovation system. Personnel mobility as a means of diffusion is therefore underdeveloped.

4.2.3 Government Policies and Legal Environment

In terms of having a business environment conducive to diffusion, China's weak IPR and inadequate legal environment constitute the main obstacles for diffusion. China enacted in 1993 a patent law which was fully in compliance with the TRIPS-agreement under the WTO and hence, in line with the international standards. However, infringement of intellectual property rights is still common and lack of enforcement is a great concern. Central government officials regularly announce their commitment to intellectual property rights, but local officials are far more lenient and hinder efficient enforcement (Branstetter and Lardy 2006: 25). Furthermore, the judicial system and the enforcement of contracts in China are generally unreliable and weak. In international comparison the time required to resolve a contractual dispute is long. The time for settling a relatively small claim is about 8 months, which is 70% longer than in high income OECD countries (OECD 2005: 94). The legal expenditures associated with claims are more than twice as high compared to the OECD area.

Moreover, the enforcement of court decisions is still distorted by government interference in many regions. The judicial system is insufficiently independent which allows political interference of various kinds. Funding for and promotion of judges are determined by local politicians and the courts are subordinated to the local people's congresses (OECD 2005: 94). This has resulted in biased court decisions in favour of parties with political connections on the local level. In addition, poor training and a low educational level of judges tend to further make decisions arbitrary. The decentralised federalist system makes the corrective mechanisms weak on the local and provincial level, and the prospects to appeal against a decision are small. Informal dispute resolution mechanisms have evolved as a complement to the courts, but enforcement is also problematic through this system.

If actors perceive that there is a high risk in cooperating, such as for example the risk of opportunistic behavior by a partner and that there are no effective legal or other safeguards for such behavior, actors will avoid cooperative behavior. Currently universities and research institutes have strong incentives to implement new technology themselves, even if the overall potential return is less than if the technology was sold or licensed to a manufacturer (Liu and White 2001:1109). Consequently, weak incentives of this kind for firms and R&D actors in

the public sector to collaborate and share ideas, knowledge and technologies are an obstacle to diffusion and increased interactions within the national innovation system. The risk of transferring knowledge and technologies are too high and uncertain. Furthermore, a weak legal environment hinders Chinese firms from expanding across provincial borders, since local courts are less reliable in upholding contracts. Consequently, potential knowledge transfers from more developed to less developed regions through various forms of collaborations are lost.

In terms of incentives to increase the diffusive capacity of the innovation system, the Chinese government has actively encouraged firms to establish themselves in science and technology industrial parks. Moreover, STIPs offer policy incentives to encourage new joint firm formation in the parks (Hu 2005: 80). For example, new formed firms are exempted from corporate income tax for two years. Incentives of this kind reduce the costs of collaborating and could thus stimulate diffusion. However, such incentives are overshadowed by a weak IPR and inadequate legal environment for firms. In sum, China's weak IPR and poorly functioning judicial system discourage interactive learning between actors in the innovation system. This makes collaborations and interactions too costly and risky for firms and public research institutions.

5 Conclusion

The aim of this thesis has been to deliver an assessment of Chinese OFDI as an innovation strategy and to elaborate on the policy implications of such an assessment. This has been done by assessing the diffusive and absorptive capacity of the Chinese innovation system. The benefits and limitations of using outward FDI as an innovation strategy for China and the policy implications of the study will be further addressed in the following paragraph.

This assessment has shown that one major constrain for using outgoing FDI as an innovation strategy are the high costs associated with conducting OFDI. Financing OFDI is too difficult and costly in China. Politically distorted and poorly functioning financial markets characterized by political favoritism and discrimination towards private firms and SMEs make the costs for accessing credit high. Both bank lending decisions and listing procedures are distorted by political interests, which increase the transaction costs of accessing credit. The potential absorption of foreign knowledge and technology that would be possible if more firms were given the chance to invest abroad is lost due to these high costs of accessing credit. More competition in the banking sector is a first step towards a reformed marketized financial sector. Fundamentally, the Chinese government's control of financial markets to pursue industrial policies has to be eased. Outward FDI is a part of the Chinese government's industrial policies to promote certain industries and sectors. The current practice of giving SOEs preferential treatment when investing abroad reflects how SOEs are being used as vehicles to implement industrial policies. This assessment has shown that SOEs are generally not the best suited firms to absorb foreign technologies. Many are poor performers when it comes to innovation and human resource and knowledge management. This may hamper the eventual absorptive effects from reverse knowledge transfers from SOEs investing abroad. If OFDI shall be a successful strategy to increase China's innovativeness, the firms investing abroad must be able to absorb foreign knowledge and technologies in an efficient way. If firm level absorption in the company is low, the eventual positive effects on the innovativeness of the home economy are likely to be low. According to the analytical framework of this assessment, firms with the best educated R&D staff and with the best management skills shall be given the opportunity to invest abroad if China wants to maximize the returns to OFDI in terms of acquired foreign knowledge and technology. This further underlines the need to marketize and liberalize China's financial markets in order not to further waste resources on

firms with poor overseas opportunities. More marketized financial markets could make absorption through OFDI more efficient by giving firms with the best opportunities credit access and the opportunity to invest abroad.

Furthermore, China's recent outward FDI surge is probably also to a certain extent a political manifestation of China's ambition to become an economic superpower. Patriotism-inspiring initiatives such as takeovers of foreign companies and flagship overseas projects legitimize the continuation of the political status quo and thus the one party rule. Furthermore, Party Secretaries and Party Committee members may use OFDI conducted by SOEs to advance their personal careers as bureaucrats. All outward FDI from China is not unjustified, but the current state of the banking sector does suggest a high likelihood of wasteful investments. Over the longer term, redirecting capital away from more efficient firm will compromise both sustained economic growth and political stability in China (Morck et al 2008: 344).

This assessment has shown that China's innovation system's absorptive capabilities are fairly well developed. China's commitment to build a competent technical human capital base is demonstrated by large investments in R&D and high enrolment and graduation rates in science and engineering. China therefore has good preconditions for using OFDI as an innovation strategy, since a competent technical human capital base creates preconditions for absorption of foreign knowledge and technology. There are however still improvements that can be made. Preferential state allocation of R&D funding to SOEs has to be dealt with. SOEs have generally weak skills in innovation and human resource- and knowledge management. By allocating R&D funding to the most talented firms the Chinese government can help to improve the innovative skills among Chinese firms, and avoid wasting resources on inefficient and technically unskilled firms. Furthermore, the Chinese government has to deal with deficiencies in the quality of university teaching and the comparably low levels of efficiency among R&D personnel. By improving the quality of education and by promoting a more equal access to quality education, China could further improve its R&D infrastructure and create better preconditions for absorption. Additionally, the lack of management skills among Chinese managers has to be addressed. The large number of Chinese students enrolling in courses abroad could be one means to improve China's management skills. The government is actively trying to attract Chinese students studying abroad through for example tax incentives and science parks dedicated to returning students. To attract skilled labor

educated abroad could be a vital measure to improve both China's technical human capital base and the management skills among employees.

Comparably intense interactions between the business sector and public research institutions in China create preconditions for diffusion of technologies and knowledge acquired by firms investing abroad. Furthermore, outsourcing of S&T activities was particularly prevalent among state owned and listed firms in 2002. This may facilitate diffusion of foreign technologies and knowledge acquired by SOEs conducting outward FDI. Despite quite intense interactions and linkages between the business sector and public research institutes and universities, there are impeding factors to address in order to increase the diffusive capacity of China's innovation system. Regional disparities in terms of access to technical personnel and R&D capabilities among firms is a general obstacle for increased labor mobility and firm collaborations. Furthermore, China's weak IPR and poorly functioning judicial system discourage interactive learning between actors in the innovation system by making collaborations and interactions too costly and risky for firms and public research institutions. These impediments has to some extent to do with China's federalist system. China's fiscal federalist system comes with a great degree of autonomy for the local governments. The local government is entitled to keep some of the fiscal revenues from the businesses in the region. This gives the local government incentives to promote local businesses and set up market preserving policies (see Montinola et al 1996). However, this also gives the local government weak incentives to enforce regulations that could damage local businesses. The incentives to enforce IPR and contractual laws are therefore weak, since enforcement could lead to revenue losses and fines for local businesses and hence reduce local government's incomes. This has contributed to biased court decisions and general arbitrary enforcement of contractual laws and IPR (see OECD 2005, Yusuf and Evernett 2002). Furthermore, the fiscal federalist system has also contributed to the establishment of protectionist policies on the local level. Inefficient firms are kept alive by erecting trade barriers that keep competitors on a distance. Social stability concerns such as unemployment that may arise when inefficient industries are being exposed to competition from firms in other regions motivate protectionist policies of this kind.

Overall, the Chinese diffusive capacity could be enhanced if China had a developed common market with free movement of factors. Local protectionism hinders firms from expanding across provincial borders, which thereby hinders potential diffusive effects associated with such expansions. This has the potential effect of consolidating regional disparities. A more

developed common market could stimulate and facilitate interactions and labor mobility. To build a common domestic market by combating localist tendencies will be a grand political bargaining that the central government has to pursue. The economic costs of reforming the fiscal federalist system have increased as local governments have become more economically strong and autonomous through increasing volumes of extra budgetary revenues. The central government needs to somehow compensate local governments for the losses such a reform would entail. Consequently, reforming the federalist system by abolishing protectionist policies will be costly. Furthermore, tearing down domestic trade barriers and protectionist policies will result in the liquidation of inefficient firms that cannot survive the competition from firms in other regions. The result will be large number of unemployed and the risk of social unrest that may threaten the one-party regime. This raises the costs further of reforming the federalist system. It is promising that China has formally expressed its commitment to build a common market through its WTO-accession obligations. However, the high costs of such reforms decrease the political will of actual implementation which will probably delay any rapid advancements.

Another general policy implication of this assessment is that the heavy reliance on active industrial policies by the Chinese government constrains the potential benefits of using OFDI as an innovation strategy. The legacy of decades of top-down control over all aspects of the economy contributes to this lingering tendency of government control and intervention in the economy. Moreover, industrial policies is a powerful political tool of intervention and control of the economy. Less state intervention and more market allocation may open up Pandora's Box of increased social unrest, unemployment and proliferating social stratification. Industrial policies may in this respect be a too powerful tool of state intervention for the Chinese government to abolish. Moreover, the East Asian Model of economic development successfully pursued in countries like South Korea and Taiwan entails an active role by the government in formulating industrial policies and guiding domestic firms to implement such policies. This may further motivate the Chinese government to continue its active employment of industrial policies.

This assessment suggests that the recent increase of Chinese OFDI has the potential to increase China's innovative capabilities. The assessment shows that China has preconditions to make OFDI a successful innovation strategy, and to encourage asset seeking OFDI can therefore be advantageous. However, this assessment has not tested the causality between

OFDI and innovativeness. The next step to further assess OFDI as an innovation strategy is to try to establish casualty between increasing flows of OFDI by Chinese firms and increased innovative output by domestic Chinese firms. This would be of interest not only with regard to the case of China, but also in order to assess asset seeking OFDI as an innovation and developing strategy for developing countries in general.

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