

# **Chinese foreign direct investment in R&D in Europe: a new model of R&D internationalization?**

**Alberto Di Minin<sup>a</sup>, Jieyin Zhang<sup>b</sup>, Peter Gammeltoft<sup>c</sup>**

<sup>a</sup>Berkeley Roundtable on the International Economy, University of California, Berkeley, Laboratorio Main (Management ed Innovazione), Scuola Superiore Sant'Anna, Piazza Martiri Libertà, 33, 56127 Pisa, ITALY. E-mail: alberto@sssup.it

<sup>b</sup>Laboratorio Main (Management ed Innovazione), Scuola Superiore Sant'Anna, Piazza Martiri Libertà, 33, 56127 Pisa, ITALY, E-mail: ji.zhang@sssup.it

<sup>c</sup>Department of International Economics and Management, Copenhagen Business School, Porcelænshaven 24, DK-2000 Frederiksberg, DENMARK. E-mail: pg.int@cbs.dk

## **ABSTRACT**

Along with their mounting economic might, emerging economies are becoming the object of ever closer analytical attention. Yet the phenomenon of international research and development (R&D) from multinationals headquartered there still remains neglected. The current study analyzes Chinese companies' investment in R&D in Europe, focusing on three different aspects: technology exploration vs. technology exploitation as investment motive; locational strategies for R&D investments; and the dynamics of motives of overseas R&D units. The analysis proceeds to draw out differences between the R&D internationalization process of multinationals from developed economies and those from emerging economies. Evidence of Chinese R&D internationalization is provided through analyses of five cases of international R&D units set up by Chinese companies in Europe: ZTE Corporation, JAC Motors, Chang'an Motors, Hisense Group, and Hisun Group. Based on the analyses we find that the Chinese R&D units represent important differences from the conventional R&D internationalization process of developed-country multinationals. For example, Chinese R&D units seem to evolve often from a strategy of technology exploration abroad, over fusion of foreign technologies with R&D activities back home, into one of technology exploitation in foreign locations. Developed-country multinationals on the other hand have traditionally proceeded in the opposite direction, from exploitation to exploration abroad.

## **Keywords**

R&D internationalization, outward foreign direct investment, investment motives, emerging multinationals, China, Europe

## 1. Introduction

In a globalized economy, the knowledge creation processes of companies have become increasingly global. The technological learning and internationalization of the latecomer firms in Asia were explored in depth at the end of the 20th century (Hobday, 1995; Kim, 1997; Sachwald, 2001). Since the 21<sup>st</sup> century, the globalization of Chinese companies has gained academic attention (Child and Rodrigues, 2005; Deng, 2007; Fan, 2006; Gao et al., 2007; Hong and Sun, 2006; Taylor, 2002; Wong, 1999). In the past decades, foreign direct investment (FDI) into developing and transition countries has increased, and China has become the most attractive host country for FDI (UNCTAD, 2005). On the one hand, China has worked hard to attract foreign investment in R&D to enhance the technology capabilities of Chinese companies (Wu and Callahan, 2005). On the other hand, along with their increasing involvement in global competition, Chinese Multinational Corporations (MNCs) have also begun to expand overseas, especially since the mid-1990s (Tung, 2005). Chinese globalization owes much to the “going out” (*Zouchuqu*) strategy enforced by the Chinese government since 1999, which encourages Chinese science and technology (S&T)-intensive companies, in particular the successful ones, to go global for both technology upgrading and brand building (OECD, 2008).

Chinese companies have recently attained a key role within innovation in China, in the sense that they already accounted for 70.4% of the R&D funding source in China in 2007.<sup>1</sup> In recent years, both the Chinese government and Chinese academia have become more concerned about how to cultivate the R&D capabilities of domestic Chinese companies and compete with global MNCs. In 2006, the Chinese government implemented the National Medium and Long-Term Science and Technology Plan (2006-2020) as its central S&T policy. The policy emphasizes building up an innovation-oriented country and an enterprise-centered national technology innovation system by keeping to the path of “indigenous innovation with Chinese characteristics” (OECD, 2008). Meanwhile, Chinese scholars have also opened up in-depth discussion on the technology strategies of Chinese domestic companies (Gao et al., 2007; Wu

---

<sup>1</sup> In the same year, the other funding entities, including government funds, overseas funds and other funds, accounted for respectively 24.6%, 1.4% and 3.6% of the national R&D funding source in China (our elaboration of China science and technology statistics, <http://www.sts.org.cn/>).

and Callahan, 2005; Xie and White, 2006).

Recent studies have begun to show intense interest in the global technological learning and innovation activities of Chinese companies. Scholars adopt an “asset-seeking” perspective to emphasize that Chinese outward FDI serves the purpose of building competitive competence (Deng, 2007). Some of the studies adopt the “latecomer catch-up process” perspective to determine how Chinese companies can cultivate their innovation capabilities (Child and Rodrigues, 2005; Fan, 2006; Gao et al., 2007). Moreover, there are also some scholars who specifically focus on the contribution of overseas innovative activities to Chinese competitive advantage (Chen and Tong, 2003; von Zedtwitz, 2005). However, most of the studies analyze international R&D activities as part of Chinese outward FDI and adopt a macro-perspective to investigate this emerging phenomenon. Up to now, we know little about how Chinese MNCs deal with their much stronger counterparts in industrialized countries. What is missing in academia, and what we think is relevant, is an explorative discussion on Chinese R&D internationalization with first-hand evidence from Chinese overseas R&D subsidiaries in developed countries.

This paper attempts to understand the motives that impel Chinese MNCs to conduct international R&D activities in a highly competitive environment such as Europe. We want to explore the evolution of motives, and if there is any difference between Chinese MNCs and developed country MNCs in terms of R&D maturation determinants.

We will therefore focus on the following research questions: (1) To what extent have Chinese companies set up R&D units in Europe? (2) Why do Chinese MNCs establish Chinese R&D units in Europe and how do their motives dynamically evolve? (3) Are the R&D motives of Chinese companies different from those of MNCs from developed countries?

The paper is organized into six sections. The following (second) section looks at the received literature on R&D internationalization; the third section discusses the processes of internationalization and innovation of Chinese companies; the fourth section introduces the

research methodology and data collection process; the fifth section analyzes our case studies; and the sixth and final section concludes our study.

## **2. R&D investment motives, locational strategies and dynamics**

In this section we will draw out lessons from the received literature on the three aspects of R&D internationalization under study: technology exploration vs. technology exploitation motives; locational strategies; and the dynamics of motives and mandates of R&D units abroad. This will allow us to compare these lessons later with the observed behavior of Chinese R&D units in Europe.

### *2.1 Technology exploration vs. technology exploitation motives*

The motive for firms investing in R&D overseas is not a new topic. Based on the evidence from developed-country MNCs, different explanations of overseas R&D activities have been given. Cheng and Joseph state that “motivations reflect the organizational benefits that a firm could expect to obtain from investing in foreign R&D” (1993:4). A large body of studies classify R&D internationalization motives into dichotomous sets, such as push/pull factors, demand side/supply side factors, input-oriented/output-oriented factors, access to internal/external capabilities and so on (Blanc and Sierra, 1999; Gassmann and von Zedtwitz, 1998; Pearce and Papanastassiou, 1999; Shan and Song, 1997; Gammeltoft, 2006). The main debate around global investments in R&D can be narrowed down to a debate between the technology-driven motive (access to technology) and the market-driven motive (access to market) (von Zedtwitz and Gassmann, 2002). The market-driven motive for R&D decentralization can be explained as technological exploitation, i.e., exploitation of a firm’s technologies overseas by adapting those technologies to local circumstances in order to gain access to foreign markets. The technology-driven motive for R&D decentralization is defined as technological exploration, i.e., exploration of a firm’s technologies through access to overseas technology and know-how (Belderbos, 2003; Kuemmerle, 1997, 1999; Motohashi, 2006; Wu and Callahan, 2005).

### *2.2 Locational strategies*

The asymmetry of technological capability between headquarters and host countries has been

considered by some scholars as a determinant of R&D internationalization (Almeida, 1996; Bas and Sierra, 2002; Kuemmerle, 1999). Early studies use the internalization theory to explain that a firm-specific advantage can best be exploited internally by overseas subsidiaries (Hennart, 1989; Rugman, 1981). With a globalized production process, overseas R&D facilities are needed to provide technical services to local manufacturing subsidiaries. Existing technological knowledge is transferred from the parent company and then exploited in a foreign market (Bartlett and Ghoshal, 1990; Håkanson and Zander, 1988). Product adaptation and satisfying local customers' demand have been proved by several empirical studies to be the primary functions of overseas R&D units (Håkanson and Nobel, 1993; Håkanson and Zander, 1988; Patel and Vega, 1999; Ronstadt, 1978). However, scholars soon perceived the difficulty of internalizing all the relevant technological resources (Blanc and Sierra, 1999; Pisano, 1990), and have argued that firms are able to obtain external technological resources and generate new technological capabilities by tapping into foreign advantageous knowledge bases in various locations (Florida, 1997; Kuemmerle, 1997, 1999).

### *2.3 Dynamics of motives and mandates of R&D units abroad*

Concerning the dynamics of R&D internationalization overseas, Ronstadt points out that R&D units “change purpose and continue operations at the same location” (1978:15). Subsequent studies further confirm the evolutionary tendency of the goals of overseas R&D units (Ambos, 2005; Asakawa, 2001; Cantwell et al., 2004; Florida, 1997; Lehrer and Asakawa, 2002). During the transition of motive from market-driven to technology-driven, overseas R&D units have a more active knowledge-learning (technological learners/absorbers) and knowledge-creation (technological creators/contributors) role (Almeida, 1996; Bas and Sierra, 2002; Kuemmerle, 1999). Technological learners/absorbers seek technologies in which they are weak in their home countries but strong in host countries, to offset their technological weakness (Bas and Sierra, 2002). Conversely, technological creators/contributors accumulate strong technological capabilities and participate in new knowledge-generation activities in host countries, thus complementing their multinationals' existing knowledge stock (Almeida, 1996; Bas and Sierra, 2002; Kuemmerle, 1999). Most of these studies define taxonomies and collect empirical evidence of R&D internationalization motives from the perspective of R&D investments

between developed countries, or from developed countries to developing countries. However, R&D investments from developing countries to developed countries have been neglected.

### **3. Internationalization and innovation of Chinese companies**

#### *3.1 Internationalization of Chinese companies*

Two waves of MNCs from the developing world have already been identified. Conventional theories explaining the reasons for the first wave of MNCs from developing countries focus on resource- and market-seeking, as well as asset exploitation in other developing countries (Lall, 1983; Wells, 1983). Theories discussing the second wave of MNCs from developing countries state that developing country MNCs expand their investment not only for resource-seeking and market-seeking in other developing countries, but also for asset-seeking and market-seeking in industrialized countries (Dunning et al., 1996; Mathews, 2002, 2006; Sachwald, 2001). More recently, some scholars have perceived the significance of the increase in outward FDI from BRIC countries, and have proposed defining a third wave of OFDI from emerging and developing countries (Andreff, 2003; Gammeltoft, 2008) that is based on the assumption that the latecomer MNCs from the BRICs are more prone to seek strategic assets, and resources (especially knowledge resources) when entering industrialized countries, in order to obtain new sources of competitive advantage (Deng, 2007, 2008; Hong and Sun, 2006; Rui and Yip, 2008).

As a latecomer in the global knowledge economy, China can obtain the critical resources and capabilities to move from the position of late-follower to the position of rapid-follower or even leader through different internationalization routes (Child and Rodrigues, 2005; Deng, 2008; Wong, 1999). Child and Rodrigues (2005) describe three internationalization routes taken by Chinese companies: (1) the OEM/JVs (original equipment manufacturing/joint ventures) route: many mainland Chinese companies choose to cooperate with foreign MNCs through JVs, OEM or technology licensing. They gradually get the technologies or capabilities they need and move up the value chain; (2) the mergers and acquisitions (M&A) route: acquisitions can not only facilitate the process of securing raw material/natural resource supplies, but also accelerate the processes of “gaining access to technology”, “securing research and development skills”, and

“acquiring international brands”. (3) the greenfield investment: an international expansion which aims not only at technology exploitation to satisfy the needs of the local market and gain global brand recognition, but also at better managerial control and global integration.

The most traditional internationalization pattern of Chinese MNCs is the first. The route of “Reverse Value Chain” strategy moves from OEM to original design manufacturing (ODM) and to original idea manufacturing (OIM) or Own Brand Manufacturing (OBM) (Child and Rodrigues, 2005; Hobday, 1995; Wong, 1999). However, following this pattern of internationalization renders Chinese MNCs highly dependent on the attitude of their foreign partners. Recently, increasing numbers of Chinese companies have leapfrogged over OEM and adopted the second (cross-border M&A) and the third (greenfield investment) international expansion patterns to tap into the resources and capabilities of advanced countries directly and effectively (Bonaglia et al., 2007; Deng, 2008; Globerman and Shapiro, 2009; Rui and Yip, 2008; Xie and White, 2006).

### *3.2 Chinese innovative activities: from imitation to innovation*

Technological change in developing countries entails a technological learning process that acquires and improves on technological capabilities from advanced industrial economies (Lall, 2000). Imitation is a natural learning strategy for latecomers in acquiring technologies and developing capabilities, although the knowledge related to a firm’s competitive advantage is hard to imitate (Hobday, 1995; Kim, 1997). Most of the technical activities in developing countries are still at the imitation or listening stage: focusing on assimilating and adapting comparatively obsolete technologies from developed countries, which are therefore unable to help developing country firms build a sustainable competitive advantage (Kim and Nelson, 2000; Lee and Lim, 2001).

Chinese domestic companies have to purchase and utilize core technologies and components from foreign MNCs, and this induces a strong dependence on technological support from foreign MNCs (Wu and Callahan, 2005). To achieve a sustainable competitive advantage,

Chinese companies try to go beyond imitation and over-dependence on foreign MNCs and to promote independent innovation. As Mathews states, “latecomer firms, like latecomer nations, are able to exploit their late arrival to tap into advanced technologies, rather than to replicate the entire previous technological trajectory” (2002: 470). Hobday (1995) examines the strategies used by East Asian latecomer firms in the electronics industry to obtain foreign technologies.<sup>2</sup> Setting up strategic partnerships with foreign MNCs is regarded as a more advanced way to acquire foreign technology, allowing latecomer firms to successfully grow in size and competitive competence.

To narrow resource gaps and raise R&D capabilities, Chinese latecomers firms expand into external resource networks and transfer knowledge inter-organizationally by establishing cross-border partnerships such as strategic alliances, technology-licensing agreements, joint ventures etc. with foreign multinationals in China (Miesing et al., 2007; Wu and Callahan, 2005; Zhao et al., 2004). Moreover, along with the heavily intensive competition between domestic companies and foreign multinationals in China’s market, Chinese companies have started to extend their technological learning strategies abroad in the form of outward FDI in developed industrial economies, instead of the traditional learning channel of inward FDI (Xie and White, 2006). However, China’s emerging R&D/technology-related investments overseas are not drawing as much academic attention as China’s domestic technological activities. Indeed, very few explorative and empirical studies have been conducted to date.

We have identified two pioneering studies in this unexplored field. Chen and Tong (2003) surveyed 28 Chinese MNCs, but the low response rate is insufficient for an explorative study (von Zedtwitz, 2005). Von Zedtwitz (2005) interviewed leading Chinese firms, six of which have overseas R&D units. These scholars gave a preliminary and general description of Chinese R&D internationalization both in developed countries and developing countries, but there have not been any subsequent analyses. By using several in-depth case studies, we would

---

<sup>2</sup> These mechanisms include FDI, licensing, sub-contracting, original equipment (OEM), own-design and manufacture (ODM), joint-ventures (JVs), foreign and local buyers, informal means, overseas acquisitions and strategic partnerships.

like to focus on China's R&D investments in Europe to clarify the technological activities undertaken by overseas R&D units, and the internal R&D motives of Chinese MNCs.

#### **4. Research methodology and data collection**

The international R&D of Chinese MNCs is a new phenomenon and it has not been subjected to extensive academic research. While most studies have focused on the R&D investments of developed countries, in this paper we concentrate on the new topic of Chinese R&D internationalization and analyze the motives for R&D investments in developed countries.

Due to the small sample size and the low survey answer rate, questionnaire-based surveys have been proven unsuitable for quantitative empirical analysis of Chinese R&D internationalization (von Zedtwitz, 2005).<sup>3</sup> In this study, the key question we try to answer is why Chinese firms invest in developed countries. Yin points out that “how” or “why” questions have greater explanatory power in case studies since “such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence” (1994: 6). Moreover, Eisenhardt describes the process of building theory from case studies and points out that “this research approach is especially appropriate in new topic areas” (1989: 532). Therefore, we deliberately chose the multi-case study approach to explore this uncharted theoretical ground (Ghauri, 2004). Some scholars, indeed, use a single case study to investigate the international strategies of Chinese companies (Liu and Li, 2002; Low, 2007). The multiple-case study allows us to perform case analysis replication and cross-case comparison to demonstrate that the findings from a simple case study are either unique, or applicable to the other cases (Chiesa and Frattini, 2007; Eisenhardt, 1989; Eisenhardt and Graebner, 2007).

We adopted the process of theory-building from case study research (Eisenhardt, 1989; Eisenhardt and Graebner, 2007). After an extensive review of the literature, we defined our research questions by focusing on the theoretical gap around Chinese R&D internationalization.

---

<sup>3</sup> Von Zedtwitz (2005) identified a sample containing 37 Chinese R&D units abroad. There were only 11 units in Europe, although Europe is tied for the hottest location for Chinese R&D FDI with the U.S. In Chen and Tong's study (2003), only 28 questionnaires were completely answered, out of 279 sample companies.

We used the Chinese R&D units in Europe as our sample because Europe is one of the most popular outward direct investment (ODI) destinations for Chinese companies (OECD, 2008; von Zedtwitz, 2005), and because it has a diversified technological base and is a leading consumer market.

To collect the data we first identified the location and set-up time of the subsidiaries by combining a variety of sources.<sup>4</sup> In this phase, 26 R&D units set up by Chinese companies in Europe were identified. We followed the logic of theoretical sampling and pre-selected cases varying by industry, home and host location, unit size, set-up time and entry mode, in order to ensure that each case serves as a “distinct experiment” and provides evidence of various perspectives (Creswell, 1998; Eisenhardt, 1989).

After contacting the Chinese R&D units in Europe by email or telephone, we finally selected five R&D units which had accepted our request for a research interview. The five cases are listed and given basic description in Table 1. The interviews were conducted between April 2008 and February 2009.

Interview-based case studies allow researchers to develop stronger relationships with interviewees (Daniels and Cannice, 2004). We conducted face-to-face or telephone interviews with Chinese R&D managers and engineers, together with a quantitative questionnaire, and also used various secondary sources to collect the data while taking triangulation into consideration.<sup>5</sup> Both within-case narrative descriptions for familiarity with each case and cross-case comparison/analysis for pattern extraction were conducted subsequently. In the next section, we give a narrative description of each case.

---

<sup>4</sup> Secondary information collected in newspapers, and on the internet, personal interviews and the database compiled by fDi Markets, <http://www.fdiintelligence.com/>.

<sup>5</sup> We traced the latest information on Chinese companies from secondary sources such as LexisNexis®Academic (<http://www.lexisnexis.com/>), Factiva (<http://www.factiva.com/>) and official websites.

**Table 1: Description of cases**

| Case                  | A                    | B                               | C                               | D   | E  |
|-----------------------|----------------------|---------------------------------|---------------------------------|---|--|
| Company               | ZTE Corporation      | JAC Motors                      | Chang'an Motors                 | Hisense Group                             | Hisun Group  |
| <b>R&amp;D unit</b>   |                      |                                 |                                 |   |  |
| Entry mode            | Greenfield           | Greenfield                      | Greenfield                      | Greenfield                                | Acquisition  |
| Main R&D activities   | TV sets              | Automotive design & engineering | Automotive design & engineering | CDMA                                      | Electronic jacquard machines                           |
| Year founded          | 2002                 | 2005                            | 2005                            | 2007                                      | 2005   |
| Host location         | Kista, Sweden        | Turin, Italy                    | Turin, Italy                    | Eindhoven, Holland                        | Bavaria, Germany                                       |
| R&D employment        | <20                  | 30                              | 40                              | 10-20                                     | >50  |
| Interviewee           | Director of R&D unit | General manager of R&D unit     | Vice Director of R&D unit       | Vice Manager, Senior Engineer of R&D unit | Director of S&T Development Division of parent company |
| <b>Parent company</b> |                      |                                 |                                 |   |  |
| Industry              | Telecommunications   | Automotive                      | Automotive                      | Consumer electronics                      | Home textiles  |
| Employees             | 50,000               | 9,000                           | 28,000                          | 60,000                                    | 500  |
| Year founded          | 1985                 | 1999                            | 1996                            | 1969                                      | 1976   |

#### 4. Discussion of the five cases

We present five cases as a pilot study of Chinese R&D internationalization in Europe: ZTE Corporation, JAC Motors, Chang'an Motors, Hisense Group and Hisun Group.

MNC A (ZTE Corporation) is one of the first and largest Chinese telecommunications equipment providers. As early as 1996, MNC A began its march on the road to globalization (Xinhua Daily Telegraph, 2007). In recent years, MNC A has attempted to enhance its presence in Europe. It owns regional offices (8 in Western Europe and 11 in Eastern Europe) and branch offices in most European countries and it has signed a number of agreements with many important European telecom operators, such as France Telecom Group in 2005 and British Telecommunications in 2006.<sup>6</sup>

MNC A has 16 global, wholly-owned R&D centers across North America, Europe and Asia (Malik, 2009). The European R&D center in Kista, Sweden (hereafter, Unit A) was established in 2002 and it focuses on applied research and product development in 3G mobile

<sup>6</sup> <http://www.factiva.com/>

communication technology and long-term evolution (LTE). MNC A's decision to set up Unit A is proof of a strong technology-driven motive to receive foreign technological support and to compete in 3G technology R&D. "It is not enough to rely solely on the R&D forces in China to catch up with our competitors in a short time, unless we have good technological support" (interview, Case A). Sweden is a leader in telecommunication technology, from which MNC A can obtain the advanced R&D human resources it needs. After several years of development, Unit A has become a relatively mature R&D center, and it can handle the R&D activities of core 3G technologies. The European market is also a driver for MNC A to set up its R&D center in Europe. Close coordination with the marketing and sales functions of MNC A is one of the obligations of the R&D center in Sweden. Managers have to make detailed plans for product development and to communicate with global operators to gain an in-depth understanding of the different demands of its European operators. Alongside Unit A, there is an MNC A sales office covering the marketing operations of eight to ten European countries. No matter how competitive the bidding, or the technical solution of the products, the R&D center will offer its support.

Unit A also undertakes another important mission. It carries out a global telecommunication monitoring job, i.e. it monitors both the technology and the technological standards of the telecommunication operators. Unit A monitors global market trends and guides the MNC's R&D strategies. "Although this R&D center is located in Europe, we keep the whole world in view" (interview, Case A).

Both MNC B (JAC Motors) and MNC C (Chang'an Motors) are among the most renowned Chinese automotive companies. They maintain their traditional advantages in the commercial automobile market and have just started their R&D activities for passenger vehicles (including MPVs, SUVs and basic models). Their current export operations are mainly limited to developing regions such as Southeast Asia, South America, the Middle East, etc. Their main market is China, although they are already planning to expand their activities to other foreign markets such as Europe.

MNC B's Italian Design Center (hereafter, Unit B) and MNC C's European Design Center (hereafter, Unit C), both established in 2005 in Turin, Italy for automobile design, are the first international R&D centers of their companies. There are strong similarities in these two companies' international R&D motives, because of their similar backgrounds. Approaching centers of excellence for automotive design and development and engaging in automotive R&D activities are the primary motives for both companies. They simultaneously chose Turin as the location of their R&D units and they both cited the presence of industry leaders in car design (such as Fiat, Bertone, Pininfarina etc.) as motives for their decision. Both companies seek to promote close cooperation with their local technological partners. Unit B is viewed as an 'advance troop', not only for design and style, but also for outsourcing knowledge, integrating resources and monitoring trends in the automobile industry. "We came here to have good front-line control and localization management. Accordingly, we can also develop close cooperation with our local partners" (interview, Case B).

During the interviews, both companies emphasized their desire for high-quality local R&D human resources. On the one hand, Unit B and Unit C are keen on utilizing abundant highly skilled local R&D specialists (automotive designers and engineers) for sophisticated R&D projects. On the other hand, they also emphasize their own R&D talent cultivation and reserve strategies. Take Case C for example. Unit C currently has approximately 20 Chinese employees (including designers and engineers) sent from headquarters, as well as 20 local designers and technicians working in its R&D center on a full-time basis. As the interviewee for Case C said: "In any case, the Italian designers are more skilled. We cooperate with the local companies and we invite their engineers and designers to work with us for our R&D projects" (interview, Case C).

MNC D (Hisense Group) is an emerging market leader in China's electronics industry and it is now one of the leading producers of LCD televisions, with a high market share in China. In 2005, MNC D successfully developed the digital visual media processing chip independently, which represents the first occasion when the core technology of a TV set made in China was not monopolized by foreign companies (Hisense, 2005, 2008). On September 19<sup>th</sup> 2007, MNC D

established the first LCD module production line on the Chinese mainland. It was the first time a Chinese company did not have to purchase an LCD module from foreign companies. MNC D obviously devoted time and effort to enhancing its independent innovation capabilities. As a domestic LCD-TV giant, MNC D is also setting up a globalization strategy. At present, MNC D owns TV production bases in Hungary, France and South Africa, and sales offices in the USA, Europe, Australia and Japan. In the past few years, MNC D has focused on the European and North American markets, which are viewed as the biggest LCD-TV markets. MNC D has set up R&D centers in both the USA and Europe. The R&D center we interviewed is MNC D's fifth global R&D center as well as its first European R&D center (Unit D, hereafter).<sup>7</sup>

Established in 2007 with 10-15 R&D employees in Eindhoven, Holland, Unit D mainly engages in the R&D of LCD televisions (styling, development and testing), set-top boxes and the technologies related to digital TV. The primary motive expressed by the interviewee is to utilize the local "mature" technology chain to produce localized TV products and to satisfy the demands of European customers. As the interviewee of Case D said, the development of new products that can satisfy European customers is based on a profound understanding of the local culture, the technological development level, and the consumption behavior. Setting up Unit D in one of the European hubs for electronics products gives Chinese engineers an excellent opportunity to interact closely with local customers. The general manager of the international marketing division of MNC D made a before-and-after comparison during an interview:

"Previously, we had to send our prototypes to each of our European customers for confirmation. If any of the customers raised some specific issues regarding local user habits, we had to continuously communicate with them by e-mail. Now we can contact our customers face to face, which tremendously improves our work efficiency, and further enhances the quality of product configuration and product adaptation to the local market" (Qingdao Finance Daily, 2007).

Meanwhile, the interviewee also explained MNC D's technological needs in Europe. Setting up

---

<sup>7</sup> MNC D has six R&D centers located in the Chinese cities of Qingdao (headquarters), Shenzhen, Shunde, the USA, and the city of Eindhoven (Netherlands).

a European R&D unit also significantly extends MNC D's technology strategy towards Europe's technological frontier, and allows for external help concerning core technologies. After evaluating the technical personnel sources, suppliers, investment costs, traffic conditions, geographical location, and language environment, MNC D finally chose Eindhoven as the location for its first European R&D center. Obviously, the setting up of Unit D was determined by the European market to a large extent. Meanwhile, Unit D is also eager to explore and appropriate new technologies, and it has established cooperation relationships with local companies that can supply specific core technologies. However, up to now technological learning has mainly been limited to peripheral R&D activities, given the existing technological gap and strong intellectual property(IP) protection (interview, Case D).

As early as 1996, MNC E (Hisun Group) started to use an electronic jacquard loom bought from a German textile machinery company manufacturing one of the world's top three brands of electronic jacquard looms. However, the high prices of these looms are not sustainable for a Chinese company purchasing for the domestic market. A jacquard loom with 2,688 needles costs 40,000 euro and one with more than 100,000 needles costs 100,000 euro (Zhuang, 2008). In order to reduce the cost, MNC E dedicated its R&D activities to developing its own electronic jacquard loom by copying the sample machine bought from the German company. In 2004, MNC E successfully developed its own CCJB electronic jacquard loom, and by then it had filed for 5 state patents for the key technologies and parts created during product development (Zhuang, 2008). At the same time, the German company with the world's top technology for jacquard machines was facing a financial crisis.

With the deliberate intention of mastering the advanced technology of electronic jacquard looms, MNC E ultimately purchased the German company for \$4.98 billion in 2005. The interviewee for Case E explained that although MNC E acquired the assets of the German company, such as its product lines, the motive to buy weighed heavily on technology-related factors: (1) the second generation of electronic jacquard machines, and (2) world-leading R&D capabilities in jacquard machinery. Subsequently, MNC E increased the capital for its German subsidiary in 2006 and 2008, so that total investment has been over \$11 billion (Zhoushan

China, 2008). With the aim of utilizing the strong R&D capabilities on the German side and the cost advantage on the Chinese side, MNC E established a joint-R&D center with the acquired German company in 2006, focusing solely on the development of electronic jacquard machines.

Along with enhancing its capability in the technology, the Chinese parent company can strengthen its ability to produce components and parts for electronic jacquard machines domestically. Indeed, MNC E has closed its European product line and shifted its production base to a domestic economic development zone in Zhejiang Province, while its German company has been transformed into a technology center(Wang, 2009). The dual advantage of both technology and cost facilitates the marketing strategy of MNC E in the global arena.

## **5. Analysis of the cases**

In the following section we analyze the five cases of Chinese R&D investments in Europe according to the three aspects of R&D internationalization under study: technology exploration vs. technology exploitation motives; locational strategies; and the dynamics of motives and mandates of R&D units abroad.

### *5.1 Market-driven (technology exploitation) vs. technology-driven (technology exploration)*

As mentioned previously in our literature review, not only China but also the other emerging countries lack two main resources to compete with developed countries: lead user markets and technological innovation (von Zedtwitz and Gassmann, 2002; Wong, 1999). It is commonly said of MNCs from advanced Western countries that it is better to practice marketing in the host countries and technical innovation at home. This means international R&D activities from developed countries are mainly market- or technology exploitation-oriented, which has been proved by many empirical studies (Håkanson and Nobel, 1993; Håkanson and Zander, 1988; Patel and Vega, 1999).

As for Chinese companies, external sources of knowledge are a major consideration (Deng, 2007; Hong and Sun, 2006; Zhao et al., 2004). Seeking resources, in particular natural resources, has been one of the main strategic considerations for China's outward FDI since the

very beginning. Parallel to resource-seeking investments, Chinese companies have been spurred to obtain access to advanced foreign technologies and managerial know-how with a view to establishing themselves in international markets. In this case, the main motive of Chinese R&D internationalization is technology-driven.

In the cases we studied there is a straightforward technology-driven motive in the decision to establish R&D centers in technology-intensive areas, though the R&D units are relatively small and the technology base camps mostly still remain at headquarters. Chinese companies are no longer satisfied with the functional orientation of overseas R&D units which are confined to technology monitoring or technology listening, but view them as active knowledge learners/absorbers. Case A was originally positioned to catch up with the competition in 3G mobile communication technology, while Cases B and C specialize in the domain of automotive design. Definite requirements for specific technologies force Chinese companies to set up R&D units in advanced countries where they can have close interactions with the leading local technology providers. Meanwhile, these R&D centers try to enhance their local embeddedness and to plug into local innovation systems. Case A is characterized by highly localized and qualified human resources, and it recruits worldwide R&D human resources, which even include the Chinese national director of Unit A. MNC A has already participated in local innovation activities and contributed new knowledge in Europe: between 2004 and 2009 it filed a total of 192 patent applications in Europe. Moreover, the acquisition of Case E was specifically aimed at the core technology of electronic jacquard looms. MNC E does not just have access to the pre-manufactured advanced jacquard machine, but also to the follow-up product research and development capability.

*Finding 1: We find evidence of Chinese R&D investments in Europe driven by technology exploration.*

The interviewees of Cases A, D and E all expressed a dual motive involving both technology and market expectations, though their cases come from different contexts. Case A is changing from a technology-latecomer to a technology-emulator in the global competition for 3G

telecommunication technology. Enhancing technological capability increases the chances of serving European telecom operators and enables MNC A to provide high-end localized products that meet customer demand. As for Case D, the initial intentions were to support European production bases and develop localized products, although seeking technological backing from the upstream product-chain partners is regarded as an important motive as well. MNC E was in a similar situation as MNCs A, B and C in terms of technological backwardness before acquiring the German company. After the M&A, MNC E also obtained relevant market resources such as brand and distribution channels, while acquiring technical knowledge about electronic jacquard machines. Acquisition accelerates the process of local embeddedness. At present, Case E is mainly involved in integrating the R&D resources it obtained and exploiting the market share of the enterprise it bought.

Our cases suggest that Chinese companies have not only internationalized their operations to seek technological knowledge, but that many Chinese overseas R&D units are created for both market and technology determinants.

*Finding 2: Chinese overseas R&D units in Europe may undertake tasks of technology-exploration and technology-exploitation simultaneously with a dual motive driven by market and technology.*

## 5.2 Locational strategy

Several studies have shown that MNCs from developed countries conduct overseas R&D activities in those technological fields where they have a strong technological home base (i.e. adopting a home-base-exploiting strategy and a home-base-augmenting strategy) (Almeida, 1996; Bas and Sierra, 2002; Kuemmerle, 1997, 1999; Patel and Vega, 1999).<sup>8</sup> In addition, MNCs with a relatively weak technological home base may also adopt a technology-seeking strategy in host countries with stronger technological capabilities, or adopt a market-seeking strategy in host countries where technological capabilities are also relatively weak (Bas and

---

<sup>8</sup> Kuemmerle argues that R&D units “generally originate from a base location in which product strategies are developed and core technologies are developed and updated” (1999: 3). He conceptualized the motives of FDI in R&D as home-base exploiting and home-base augmenting.

Sierra, 2002).<sup>9</sup> In other words, in host locations where technological capabilities lag behind those of the investing companies, MNCs will tend to undertake technology-exploitation and market-seeking-related activities rather than technology-augmentation.

In our study, Cases A, B, C, and E are all established in locations where there is absolute superiority in R&D capabilities in some specific technological field. These cases all fit into the technological-seeking motive in the initial stages of development. However, we have found that Case D adopts a strategy that cannot be positioned in any of the categories summarized by Bas and Sierra (2002).

MNC D possesses a competitive advantage in the domestic market. MNC D ranked No.1 in terms of market share in the domestic market for flat-panel TV sets in China for six successive years: 2004-2009 (Hisense, 2004, 2010). Although MNC D owns its LCD module and factory, it still has not mastered the core LCD technology owned by large MNCs such as Philips. MNC D set up its European technology center and integrated it with MNC D's local production and distribution facilities to better serve the European market. In the process of localized product development, the European R&D unit receives strong support from its HQ, and at the same time turns to those local upstream suppliers with strong technical competence, such as NXP semiconductor and STMicroelectronics. Unit D cooperates with these famous companies to co-develop new TV products targeted at the European market, and buys core technologies/patents from them. At the same time, these companies provide technical support and professional engineers to help Unit D perform its R&D for the development of new products.

*Finding 3: The Chinese companies possessing domestic competitive advantages in terms of technology capability may also be involved in technology-exploitation activities in Europe where the technology is relatively stronger, but they still need technological assistance*

---

<sup>9</sup> An MNC makes technology-seeking investments abroad with the purpose of “offsetting home country weaknesses in a given technological field by selecting a host country with proven strength” (Bas and Sierra, 2002: 592); while market-seeking investments are made in activities in which “it is relatively weak in its home country and the host country is also relatively weak” (Bas and Sierra, 2002: 594).

*from local partners.*

### *5.3 Evolution of motives for Chinese R&D internationalization*

A number of empirical studies have identified an evolutionary transition from technology exploitation to technology exploration (Ambos, 2005; Bas and Sierra, 2002; Cantwell et al., 2004; Florida, 1997; Ronstadt, 1978). The overseas R&D units of Chinese companies in Europe also reveal a different R&D internationalization pattern from that which the international business literature predicts. Our cases suggest that these units are moving from technology exploration to technology exploitation. Technology exploration is still the most important goal of the Chinese R&D subsidiaries in Europe, according to our evidence. However, along with the maturation of technology, these previously technology exploration-dominated Chinese R&D subsidiaries also tend to be involved in more R&D activities that combine technology-exploration with technology-exploitation.

As we observed, exploring technology-related knowledge and developing new products in Turin to serve the domestic market in China is the main task for Cases B and C in their first internationalization phase. At this moment, these two Chinese automotive companies are still struggling to compete with global automotive MNCs for a larger Chinese market share and neither company has begun to sell its products to the European market. However, entering the markets in developed countries is part of their future plans, even given the global economic downturn. Take Case C as an example. MNC C established a new factory in Mexico in 2009, which is its sixth overseas factory. The vice-president of MNC C recently depicted its future R&D plan during a media interview as follows: “According to our overall plan, our global R&D employees will increase to 5000 in 2014. We insist on utilizing global resource and exploiting the global market. In the future, our global R&D units will satisfy local customers rather than just develop and upgrade existing domestic products like we are doing now. The mission of our global R&D units will gradually change.” (Netease, 2009)

The R&D internationalization process of MNC A also shows explicit evidence of the evolution

from technology-seeking to home-base exploitation. MNC A uses an international market strategy that first enters developing-country markets and then expands to developed countries. MNC A entered the markets of South Asia and Africa from 1998-2001; it marched into India, Russia, and Brazil between 2002-2004 (ZTE, 1998, 2006). By contrast, its international R&D strategy shows a different trend. MNC A set up its R&D centers in the countries with the most advanced telecommunication technologies. It opened its first R&D institute in the USA in 1998 (ZTE, 1998), and another in Sweden at the beginning of the 21<sup>st</sup> century. Unit A has been dedicated to the exploration of the most advanced wireless technologies in Sweden ever since it was established seven years ago. At that time, Unit A was a pure technology-seeker due to its technological inability in China, which forced the company to seek opportunities for technological progress. Gradually, MNC A has caught up with the competition in 3G technology and built up a relatively strong home base, allowing Unit A to be a technology contributor, rather than simply a technology seeker, in Europe.

Along with its technological development and the growth of its market share at home and in other developing countries, MNC A is also gradually shifting its attention to the European market. Since 2005, MNC A has emerged as a 3G competitor in Europe by signing many cooperation agreements with important European telecommunication operators and companies such as France Telecom, Cabletel, and Telenor. In the meantime, Unit A is also adjusting its position, and it is now becoming not merely a technology explorer but an R&D center with a dual role (both technology explorer and technology exploiter) within the global R&D system of MNC A. Unit A helps MNC A grasp the opportunities to catch up and become competitive in the wireless technologies market and to take the lead in 3G technology R&D.

Differently from the newly-established R&D units, MNC E soon internalized the core technologies it needed through M&A. Even though the renowned brand and the worldwide sales network of the German company were part of the acquisition, the primary intention of MNC E was to have its technology-related resources. That goal is still being pursued, along with the process of integrating the acquired German company's technological knowledge into MNC E's knowledge network. As the interviewee of Case E said: "The German company had

previously expanded into several markets such as Europe and South America. Particularly, 70% of the market share in Turkey was occupied by the German company. After the acquisition, our company stepped into the global market and followed up on the occupied market share. We mainly consolidate and exploit our existing markets including Germany and other European countries by producing machinery components and parts in China, and by cost reduction” (interview, Case E).

In the light of Cases A, B, C and E, we find Chinese companies seem to prefer to catch up on technological aspects and consolidate and enlarge their market share in China first, and then expand into the international market. The process appears to involve companies first seeking and exploring technologies abroad. Next, they transfer these back and fuse them with domestic R&D activities to enhance their R&D capabilities in China. Finally, the new capabilities and technologies are exploited in development of products for global markets, and may also be transferred out to foreign locations.

*Finding 4: The motives of Chinese R&D internationalization commonly evolve from pure technology-seeking to (a) home-base augmenting and then (b) home-base exploitation.*

Another evolutionary strategy identified is that related to human-resources. Motivation moves from seeking external technological assistance to cultivating high-quality, Chinese domestic R&D human resources. As for the technology exploration-dominated R&D units, recruiting qualified local R&D personnel according to a firm’s need is important for new knowledge (Kuemmerle, 1999). Moreover, the cost of the R&D human resource is also an important location determinant for overseas R&D activities (Kumar, 2001). In many studies, Chinese low-cost and technologically well-trained human resources are the main reason why MNCs from developed countries relocate their R&D activities to China (von Zedtwitz, 2004; Wu and Callahan, 2005).

However, some scholars point out that while China has a large stock of human resources for science and technology, the efficiency of the R&D-related workforce lags far behind that of

advanced countries (OECD, 2008). Chinese designers and engineers are criticized for their lack of originality or creativity because “the Chinese education system and culture don’t encourage individualistic expression and creativity” (Von Zedtwitz, 2006). This deficiency forces Chinese companies to turn to external high-quality, but expensive, knowledge-based human resources in the host country (Von Zedtwitz, 2006). This argument is supported to some extent by Chen and Tong (2003), who provide evidence that “recruiting highly skilled personnel and absorbing new knowledge” are two of the major motives that provoke Chinese MNCs to engage in overseas R&D activities.

In the cases we studied, the recruitment of highly-skilled researchers and engineers from the local environment was emphasized by the interviewees. In their opinion, using local human resources with advanced technological knowledge is the most effective way for the R&D units to access the local knowledge environment. As for MNCs B and C, the key factors of success are highly skilled and creative designers and engineers. Both companies clearly recognize their disadvantages and tap into European automotive R&D human resource networks through their overseas R&D units. As an ex-designer who worked for a long time in foreign design companies, the interviewee for Case C has his own human resource network. “We can even organize a project team with hundreds of employees by outsourcing automotive designers and engineers from various local small and medium-sized enterprises (SMEs) and other channels, which is very flexible” (interview, Case C). The local R&D human resource thus plays a pivotal role for Chinese overseas units so that they can accomplish increasingly sophisticated R&D projects.

Chinese engineers and designers are offered an excellent opportunity to learn through cooperation with foreign technology leaders since R&D internationalization is also regarded as “a tool to improve the technical learning capability of the firm” (De Meyer, 1993:119). Chinese companies can have the opportunity to “learn from cooperation” or “teach through cooperation” with local specialists in order to cultivate their own high-end but low-cost R&D talents. Due to the technological inadequacy of passenger vehicle R&D, Unit B makes use of the cooperation form of contracting-out. “In order to teach our R&D employees, we send them to the

cooperative companies to learn automotive development processes” (interview, Case B). The interviewee for Case C also indicated that “We employ the local designers to work together with our Chinese designers as a team, and level up the skills of our own designers during the cooperative R&D projects. Our biggest achievement with a project is cultivating our own R&D talents” (interview, Case C).

*Finding 5: Specialized human resources in Europe drive Chinese companies to set up overseas R&D units not only to get external technological assistance but also to cultivate the development of high-quality Chinese human resources.*

## **6. Conclusion**

International R&D from emerging countries is a new phenomenon and it has not yet attracted much attention from scholars. As the modes of a growing domestic market change, and as home-base technology competences evolve, we bring forward new evidence of the important, unique, and dynamic role of R&D units abroad. The international business literature can only partially explain this evidence.

Our findings suggest a new model of R&D internationalization, which deviates from the typical trajectory followed by MNCs from developed countries (see Table 2).

**Table 2: A comparison of international R&D strategies between Chinese MNCs and developed country MNCs**

| Debates   | The international R&D strategies used by MNCs from developed countries   | The international R&D strategies used by Chinese MNCs in Europe  |  |
|---|--|--|--|
| <b>1. The debate between technology exploration and technology exploitation</b> | <p><b>Technology-exploitation-dominated strategy:</b><br/>MNCs mainly exploit existing firm-specific technical capacity in foreign environments in order to adapt products, processes and materials to foreign market and provide technical support to off-shore manufacturing plants (Håkanson and Zander, 1988; Håkanson and Nobel, 1993; Patel and Vega, 1999)</p>          | <p><b>(1) Technology exploration-dominated strategy:</b><br/>Evidence from case A, case B, case C, and case E</p> <p><b>(2) A strategy driven by both technology-exploration and technology-exploitation motives:</b><br/>Evidence from case A, case D, and case E</p>   |  |
|   | <b>2. The locational strategies</b>  | <p><b>Four types of strategy (learning)</b>( Almeida, 1996; Bas and Sierra, 2002; Kuemmerle, 1997,1999; Patel and Vega, 1999):</p>   | <p><b>(3) A technology-exploitation strategy (market-orientation) in host countries where technological capabilities are stronger than those in home country:</b><br/>Evidence from case D</p> |
| <p>Technology-orientation</p>   |  | <p>(1) Technological-seeking FDI in R&amp;D: MNCs with a relatively weak technological capability invest in host countries where technological capability is relatively strong</p>   |  |
|   |  | <p>(2) Home-based-augmenting (HBA) FDI in R&amp;D: MNCs with a relatively strong technological capability invest in host countries where technological capability is also relatively strong</p>  |  |
| <p>Market-orientation</p>   |  | <p>(3) Home-based-exploiting (HBE) FDI in R&amp;D: MNCs with a relatively strong technological capability invest in host countries where technological capability is relatively weak.<br/>(4) Market-seeking FDI in R&amp;D: MNCs with a relatively weak technological capability invest in host countries where technological capability is also relatively weak.</p> |  |
| <b>3. The evolutionary strategies</b>   | <p><b>An evolutionary strategy: the R&amp;D motive transits from technology exploitation to technology exploration :</b><br/>A shift from technology-exploitation motives to technology-exploration motives (Almeida, 1996; Bas and Sierra, 2002; Florida, 1997; Ronstadt, 1978; Cantwell et al., 2004, Ambos, 2005).</p>  | <p><b>(4) An evolutionary strategy: the R&amp;D motive transits from technology-seeking to (a) home-based-augmenting and to (b) home-based-exploitation :</b><br/>Evidence from case A case B, case C and case E</p>   |  |
|   | <p><b>A low-cost strategy of R&amp;D human resource:</b><br/>Low cost manpower is one of the major determinants of location of overseas R&amp;D activities (Kumar, 2001). Obtaining technological well-trained but low-cost human resource is one of the major reasons for foreign MNCs to set up R&amp;D facilities in China (von Zedtwitz, 2004; Wu and Callahan, 2005).</p> | <p><b>(5) An evolutionary strategy of R&amp;D human resource: the motive transits from seeking external technological assistance (high-quality and high-cost) to cultivating Chinese domestic high quality R&amp;D human resource (high-quality but low- cost):</b><br/>Evidence from case B and case C</p>  |  |

Where the theoretical implications of our study are concerned, there is a body of literature investigating FDI in R&D from developed countries. From a different perspective, we observe the phenomenon of R&D internationalization from emerging countries to developed countries, and in particular we focus on the motives of Chinese FDI in R&D in Europe. Our multi-case study shows that technology exploration is still the most important motive driving Chinese companies to expand their R&D activities into developed countries. Chinese companies take the initiative to go overseas and learn from their stronger counterparts in developed countries. Overseas Chinese R&D units emphasize their role as knowledge-seekers and learners/absorbers for new and relevant technology. Along with technological competence upgrading, Chinese R&D units gradually fit into the local innovation system and act as knowledge contributors/creators. For Chinese companies with a relatively strong technological home-base and for the ones catching up through technological learning, entering the markets of developed countries may be a secondary yet important motive for overseas R&D expansion to advanced countries. Indeed, our cases support this finding because Chinese R&D units in Europe also engage in technology-exploitation activities and participate in local market competition. From all this, we propose a maturation process for Chinese R&D internationalization, whose motive evolves from pure technology-seeking to home-base exploration and finally to home-base exploitation. This evolution is the opposite to the common path described in studies on FDI in R&D from developed countries.

With respect to the implications of our study for practice, Chinese companies are regarded as potential global R&D players through their R&D internationalization. This study opens a window for both scholars and managers to observe this overlooked phenomenon and explores the reasons that spur Chinese companies to engage in R&D-related activities in advanced regions such as Europe. Our evidence shows that technology-seeking is no longer the only reason why Chinese companies expand their R&D to Europe, although utilizing local technology resources is still the most important motive. Chinese overseas R&D units no longer remain outside the European innovation system as mere technology monitoring centers. They now have the potential to be active participants in R&D projects that create new knowledge and exploit local markets. Chinese companies have made their first move in Europe for advanced

knowledge sourcing. It is important for European technological participants to get ready to respond to Chinese technological newcomers, and seek more cooperation opportunities based on reciprocity and mutual benefit.

Finally, concerning policy implications, responding to recommendations by both national and regional governments has been recognized as a driving factor for R&D localization. Some of the Chinese interviewees indicated that support from the Chinese government and preferential policies for international R&D is an external impetus, but maintained that political factors play a secondary role in their decisions on R&D expansion. At present, Chinese outward FDI mostly flows to developing countries such as those in Asia and Latin America (OECD, 2008). Chinese policy makers give strategic suggestions to Chinese companies on the advantages of different countries or regions, and encourage Chinese companies to invest in these destinations with intensive technological resources for independent intellectual property rights.

Moreover, we also noted that the Chinese interviewees seldom mentioned the support and incentives they receive from local European governments. Such indifference may signal a parallel lack of interest and awareness on behalf of European policy makers. We believe that the lack of a strategy for dealing with and responding to Chinese R&D investment in Europe and its evolution is undesirable, and potentially harmful for the EU's own innovation system.

### **Acknowledgments**

We thank the case companies and the interviewees for their kind cooperation, without which this research could not have been conducted. We would also like to extend our gratitude to two anonymous reviewers and participants of the 2008 conference on 'Emerging Multinationals' at Copenhagen Business School for all their constructive recommendations.

## References

- Almeida, P., 1996, Knowledge sourcing by foreign multinationals: patent citation analysis in the US semiconductor industry. *Strategic Management Journal*, 155-165.
- Ambos, B., 2005, Foreign direct investment in industrial research and development: a study of German MNCs. *Research Policy* 34, 395-410.
- Andreff, W., 2003, The newly emerging transnational corporations from transition economies – comparison with Third World outward foreign direct investment. *Transnational Corporations*, 73-118.
- Bartlett, C., Ghoshal, S., 1990. Managing innovation in the transnational corporation in: Bartlett, C., Doz, Y., Hedlund, G., (Eds.), *Managing the Global Firm*. Routledge, London, 215-255.
- Bas, C. L., Sierra C., 2002. 'Location versus home country advantages' in R&D activities: some further results on multinationals' locational strategies. *Research Policy* 31, 589-609.
- Blanc, H., Sierra, C., 1999, The internationalisation of R&D by multinationals: a trade-off between external and internal proximity. *Cambridge Journal of Economics* 23, 187-206.
- Bonaglia, F., Goldstein, A., Mathews J., 2007. Accelerated internationalization by emerging markets' multinationals: the case of the white goods sector. *Journal of World Business* 42, 369-383.
- Cantwell, J., Dunning, J., Janne, O., 2004, Towards a technology-seeking explanation of US direct investment in the United Kingdom. *Journal of International Management* 10, 5-20.
- Chen, J., Tong, L., 2003. R&D Internationalization and the Reformation of Chinese S&T System, <http://www.law.gmu.edu> (George Mason Law School) 1-36.
- Cheng, J. L. C., Bolon, D. S., 1993. The Management of multinational R&D: a neglected topic in international business research. *Journal of International Business Studies* First Quarter, 1-18.
- Chiesa, V., Frattini, F., 2007. Exploring the differences in performance measurement between research and development: evidence from a multiple case study. *R&D Management* 37, 283-301.
- Child, J., Rodrigues, S. B., 2005. The internationalization of Chinese firms: a case for theoretical extension? *Management and Organization Review* 1, 381-410.
- Creswell, J., 1998. *Qualitative Inquiry and Research Design: Choosing Among Five Traditions*. Sage Publications, Thousand Oaks.
- Daniels, J., Cannice, M., 2004. Interview studies in international business research, in: Marschan-Piekkari, R., Welch, C. (Eds.), *Handbook of Qualitative Research Methods for International Business*. Edward Elgar, Cheltenham, 185-206.
- De Meyer, A., 1993. Management of an international network of industrial R&D laboratories. *R&D Management* 23, 109-120.
- Deng, P., 2007. Investing for strategic resources and its rationale: the case of outward FDI from Chinese companies. *Business Horizons* 50, 71-81.
- Deng, P., 2008. Why do Chinese firms tend to acquire strategic assets in international expansion? *Journal of World Business* 44, 74-84
- Dunning, J., Van Hoesel, R., Narula, R., 1996. Explaining the "new" wave of outward FDI from developing countries: the case of Taiwan and Korea? *Research Memoranda* 9.
- Eisenhardt, K., 1989. Building theories from case study research. *Academy of Management Review*, 532-550.
- Eisenhardt, K., Graebner, M., 2007. Theory building from cases: opportunities and challenges. *Academy of Management Journal* 50, 25-32.
- Fan, P., 2006. Catching up through developing innovation capability: evidence from China's telecom-equipment industry. *Technovation* 26, 359-368.
- Florida, R., 1997. The globalization of R&D: results of a survey of foreign-affiliated R&D laboratories in the USA.

Research Policy 26, 85-103.

Gammeltoft, P., 2006. Internationalisation of R&D: trends, drivers, and managerial challenges. *International Journal of Technology and Globalisation* 2, 177-199.

Gammeltoft, P., 2008. Emerging multinationals: outward FDI from the BRICS countries. *International Journal of Technology and Globalisation* 4, 5-22.

Gao, X., Zhang, P., Liu, X. 2007. Competing with MNEs: developing manufacturing capabilities or innovation capabilities. *The Journal of Technology Transfer* 32, 87-107.

Gassmann, O., von Zedtwitz, M., 1998. Organization of industrial R&D on a global scale. *R&D Management* 28, 147-161.

Ghuri, P., 2004. Designing and conducting case studies in international business research, in: Marschan-Piekkari, R., Welch, C., (Eds.), *Handbook of Qualitative Research Methods for International Business* Edward Elgar, Cheltenham, 109-124.

Globerman, S., Shapiro, D., 2009. Economic and strategic considerations surrounding Chinese FDI in the United States. *Asia Pacific Journal of Management* 26, 163-183.

Håkanson, L., Nobel, R., 1993. Foreign research and development in Swedish multinationals. *Research Policy* 22, 373-396.

Håkanson, L., Zander, U., 1988. International management of R&D: the Swedish experience. *Management* 18, 217-226.

Hennart, J., 1989. The transaction cost theory of the multinational enterprise, in: Pitelis, C. N., Sugden, R. (Eds.), *The Nature of the Transnational Firm*. Routledge, London.

Hisense, 2004. *Hisense History (technology history)*. [Online] <Available at: [http://www.hisense.com/en/about/hsht/prht/200810/t20081024\\_1929.html](http://www.hisense.com/en/about/hsht/prht/200810/t20081024_1929.html)>

Hisense, 2005. *Hisense History*. [Online] <Available at: <http://hxdq.hisense.com/gsjz/fzdsj/yw/>>

Hisense, 2008. *Company Facts*. [Online] <Available at: [http://global.hisense.com/about/cofa/200812/t20081230\\_8350.html](http://global.hisense.com/about/cofa/200812/t20081230_8350.html)>

Hisense, 2010. *Hisense wins four awards in Chinese flat-panel TV industry*. [Online] <Available at: Available at: [http://www.hisense.com/en/news/atct\\_1\\_1/201002/t20100202\\_21583.html](http://www.hisense.com/en/news/atct_1_1/201002/t20100202_21583.html)> [Accessed 21 January 2010].

Hobday, M., 1995. East Asian latecomer firms: learning the technology of electronics. *World Development* 23, 1171-1193.

Hong, E., Sun, L. 2006. Dynamics of internationalization and outward Investment: Chinese corporations' strategies. *The China Quarterly* 187, 610-634.

Kim, L., 1997. *Imitation to Innovation: The Dynamics of Korea's Technological Learning*. Harvard Business School Press, Cambridge, MA.

Kim, L., Nelson, R., 2000. *Technology, Learning and Innovation: Experiences of Newly Industrializing Economies*. Cambridge University Press, Cambridge.

Kuemmerle, W., 1997. Building effective R&D capabilities abroad. *Harvard Business Review* (March-April), 61-70.

Kuemmerle, W., 1999. The drivers of foreign direct investment into research and development: an empirical investigation. *Journal of International Business Studies* 30, 1-24.

Kumar, N., 2001. Determinants of location of overseas R&D activity of multinational enterprises: the case of US and Japanese corporations. *Research Policy* 30, 159-174.

Lall, S., 1983. *The New Multinationals: the Spread of Third World Enterprises*. John Wiley & Sons, London.

Lall, S., 2000. Technological change and industrialization in the Asian newly industrializing economies: achievements and challenges. *Technology, learning and innovation: experiences of newly industrializing*

economies, 13-68.

Lee, K. , Lim, C., 2001. Technological regimes, catching-up and leapfrogging: findings from the Korean industries. *Research Policy* 30, 459-483.

Liu, H., Li, K., 2002. Strategic implications of emerging Chinese multinationals: the Haier case study. *European Management Journal* 20, 699-706.

Low, B., 2007. Huawei Technologies Corporation: from local dominance to global challenge? *The Journal of Business and Industrial Marketing* 22, 138-144.

Malik, S. A., 2009. Global FTTx Trend Analysis. Vietnam Comm 09, Vietnam.

Mathews, J. A., 2002. Competitive advantages of the latecomer firm: a resource-based account of industrial catch-up strategies. *Asia Pacific Journal of Management* 19, 467-488.

Mathews, J. A., 2006. Dragon multinationals: new players in 21st century globalization. *Asia Pacific Journal of Management* 23, 5-27.

Miesing, P., Kriger, M., Slough, N., 2007. Towards a model of effective knowledge transfer within transnationals: The case of Chinese foreign invested enterprises. *The Journal of Technology Transfer* 32, 109-122.

Netease, 2009. *An Interview with the Deputy Director of Chang'an (Chinese)*. [Online] <Available at: <http://auto.163.com/09/1103/14/5N6VSNQNO00083RP3.html>> [Accessed 3 November 2009].

OECD, 2008, OECD Reviews of Innovation Policy: China. OECD Publishing.

Patel, P., Vega, M., 1999. Patterns of internationalisation of corporate technology: location vs. home country advantages. *Research Policy* 28, 145-155.

Pearce, R., Papanastassiou, M., 1999. Overseas R&D and the strategic evolution of MNEs: evidence from laboratories in the UK. *Research Policy* 28, 23-41.

Pisano, G., 1990. The R&D boundaries of the firm: an empirical analysis. *Administrative Science Quarterly* 35, 153-176.

Qingdao Finance Daily, 2007. *Hisense Set up a European R&D Center (Chinese)*. [Online] <Available at: Available at: [http://news.qingdaonews.com/epaper/cjrb/html/2007-05/28/content\\_819444.htm](http://news.qingdaonews.com/epaper/cjrb/html/2007-05/28/content_819444.htm)> [Accessed 28 May 2007].

Ronstadt, R., 1978. International R&D: the establishment and evolution of research and development abroad by seven US multinationals. *Journal of International Business Studies*, 7-24.

Rugman, A., 1981. *Inside the multinationals: the economics of internal markets*. Croom Helm, London.

Rui, H., Yip, G., 2008. Foreign acquisitions by Chinese firms: A strategic intent perspective. *Journal of World Business* 43, 213-226.

Sachwald, F., 2001. *Going multinational: the Korean experience of direct investment*. Routledge, New York.

Shan, W., Song, W., 1997. Foreign direct investment and the sourcing of technological advantage: evidence from the biotechnology industry. *Journal of International Business Studies* 28.

Taylor, R., 2002. Globalization strategies of Chinese companies: current developments and future prospects. *Asian Business & Management* 1, 209-225.

Tung, R. L., 2005. Perspectives – new era, new realities: musings on a new research agenda from an old timer. *Asia Pacific Journal of Management* 22, 143-157.

UNCTAD, 2005, *World Investment Report (WIR) 2005: Transnational Corporations and the Internationalization of R&D*. United Nations New York and Geneva.

von Zedtwitz, M., 2004. Managing foreign R&D laboratories in China. *R&D Management* 34, 439-452.

von Zedtwitz, M., 2005. International R&D strategies in companies from developing countries – the case of China. *UNCTAD*, 1-11.

Von Zedtwitz, M., 2006. Internationalization of R&D. Perspectives from outside and inside China, presentation

at MOST, (OECD Conference, Chongqing, October).

von Zedtwitz, M., Gassmann, O., 2002. Market versus technology drive in R&D internationalization: four different patterns of managing research and development. *Research Policy* 31, 569-588.

Wang, L. W. 2009. 'Hisun Establish a Partnership with Shanghai NEWTECH (Chinese)', *Zhoushan Daily*, [internet], <Available at: <http://www.hisunchina.com/Article/News/Media/00000221.htm>>. [Accessed 16 June 2009]

Wells, L., 1983. *Third World Multinationals: the Rise of Foreign Investment from Developing Countries*. MIT Press, Cambridge, MA.

Wong, P. K., 1999. National innovation systems for rapid technological catch-up: an analytical framework and a comparative analysis of Korea, Taiwan and Singapore. DRUID's summer conference on National Innovation Systems (Rebild, Denmark).

Wu, J., Callahan, J., 2005. Motive, form and function of international R&D alliances: evidence from the Chinese IT industry. *Journal of High Technology Management Research* 16, 173-191.

Xie, W., White, S., 2006. From imitation to creation: the critical yet uncertain transition for Chinese firms. *Journal of Technology Management in China* 1, 229-242.

Xinhua Daily Telegraph, 2007. *ZTE: 'going out' with a global view of 3G (Chinese)*. [Online] <Available at: [http://www.zte.com.cn/cn/press\\_center/press\\_clipping/200703/t20070305\\_139824.html](http://www.zte.com.cn/cn/press_center/press_clipping/200703/t20070305_139824.html)> [Accessed 16 March 2007].

Yin, R. K., 1994. *Case Study Research: Design and Methods* (2<sup>nd</sup> ed.), Applied Social Research Methods Series, Vol. 5. Sage Publications, Thousand Oaks.

Zhao, Z., Anand, J., Mitchell, W., 2004. Transferring collective knowledge: teaching and learning in the Chinese auto industry. *Strategic Organization* 2, 133-167.

Zhoushan China 2008. *Electronic jacquard machines put into mass production in the German company of Hisun (Chinese)*. [Online] <Available at: <http://www.zhoushan.gov.cn/html/78080.html>> [Accessed 26 June 2008].

Zhuang, L. Y. 2008. 'Zhoushan's Integration with Global Economy-The Case of Hisun (Chinese)', *Zhoushan Daily*. [internet], <Available at: <http://www.hisunchina.com/Article/News/Compnay/00000201.htm>>. [Accessed 10 November 2008]

ZTE, 1998. *History Profile*. [Online] <Available at: [http://www.zte.com.cn/en/about/corporate\\_information/history/](http://www.zte.com.cn/en/about/corporate_information/history/)>

ZTE, 2006. *ZTE's Independent Innovation and Road to Internationalization (Chinese)*. [Online] <Available at: <http://www.fmprc.gov.cn/chn/pds/ziliao/zt/ywzt/wzst/jjywj/t242429.htm>> [Accessed 10 March 2006].

