A Comparison on International R&D Strategies of Chinese Companies in Europe and the U.S.

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Europe and the U.S. are the two main overseas R&D destinations for Chinese companies. Our previous study of Chinese R&D presence in Europe shows counterintuitive evidence that Chinese companies behave in ways that traditional R&D FDI maturation models would have not predicted. Are our findings exclusive in Europe or applicable in other developed countries such as the U.S.? Also, do Chinese MNCs have different R&D behaviors from the R&D activities of developed country MNCs?

We adopt the method of “theory building from case study research” developed by Eisenhardt (1989). Based on 16 R&D units of 12 Chinese companies in Europe and the U.S., our analysis investigates and compares the R&D strategies of Chinese multinationals in Europe and the U.S., focusing on their strategic motives, R&D structure, and modes of learning, in order to understand the effect of global recession on Chinese international strategies.

We find that Chinese companies, we find similar motive that Chinese R&D investments are mainly driven by technology exploration, and Chinese R&D units perform as ambidextrous organizations. On the one hand, Chinese companies pursue economic benefits for short-term survival. On the other hand, they have a clear technology-centered sense that obtaining core technologies is the key factor for long-term development and maturation.

We discuss the R&D structure of Chinese companies from both horizontal and hierarchical perspectives. From a horizontal perspective, we find similar participative-centralized R&D structure between subsidiaries and HQ. Important decisions must be shared / coordinated with HQ. However, we find that both EU/US cases/subs take initiative in decision-making. Moreover, we also find similar informal coordination mechanisms used by Chinese companies for facilitating knowledge learning and transfer. From a hierarchical perspective, we find a hierarchical division of R&D labor existing in Chinese companies. Overseas R&D units undertake high-value added R&D activities while the domestic R&D activities in China are low-value added.

In Europe, we found many cases of “Primary School Model”/”Technical School Model”. Technological immaturity pushes Chinese companies to enter “primary schools”/“technical schools” which mean local technological counterparts, for skill training. After initially very close collaboration, we notice the emergence of experiential learning, i.e., soon after graduation from primary schools/technical schools, Chinese engineers pick up some fundamental skills and they can say “we can do the job by ourselves” in terms of some former “impossible tasks”. In the U.S., we found many case of “Ph.D. Student Models”, which means we did not found much evidence of
1. Introduction

Chinese research and development (R&D) presence outside China is a variegated and growing phenomenon that the academic world has somewhat neglected. In a dynamic global competitive environment, some bold emerging Chinese multinational corporations (MNCs) have expanded their technological investments abroad (Chen and Tong, 2003; Deng, 2007; von Zedtwitz, 2005; Xie and White, 2006), where Europe and the U.S. are the two main overseas R&D destinations for Chinese companies (von Zedtwitz, 2005; fDi market, 2008).1

As an important force of the third wave of outward foreign direct investment (OFDI) from emerging and developing countries, Chinese companies that have emerged since 1990s reveal different characteristics from the developed country MNCs as well as the first and the second waves of MNCs from emerging and developing countries (Andreff, 2003; Gammeltoft, 2008).2 It is interesting, as well as necessary, to investigate why and how Chinese MNCs find innovation opportunities and implement international R&D strategies in developed countries such as Europe and the U.S.

Our main research question in this study is can we find significant differences or similarities in the comparison of international R&D strategies of Chinese MNCs in Europe and the U.S.? Do Chinese MNCs have different R&D behaviors from the R&D activities of developed country MNCs? If so, how and why are they different?

More specifically, this paper aims to compare Chinese R&D investments in Europe and the U.S. from three main aspects:

1) Motive-Why do Chinese companies expand their R&D activities into developed countries (Europe and the U.S.)?
2) R&D structure-How do Chinese companies organize their global R&D structure in Europe and the U.S.?
3) Modes of learning-How do Chinese companies in Europe and the U.S. deploy their learning strategies?

The paper is structured into 7 sections. Following the introduction section, we review the literature on R&D internationalization from three aspects which are R&D motive, R&D structure and learning modes. In section 3, we briefly describe the presence of Chinese outward FDI in Europe and the U.S. Then, we explain our methodology and data collection process in section 4. In the subsequent section (section 5), we make a comparison between the cases in Europe and in the U.S.. Meanwhile, several propositions are emerged. In the next section (section 6), we further discuss and conclude our findings. Finally, both managerial and policy implications are provided to managers and policy makers.

2. Literature review

2.1 R&D motive

In order to remain competitive advantages, companies have to build global R&D networks for both new knowledge accessing and product commercialization (Kuemmerle, 1997, 1999). The early role of MNC R&D subsidiaries is conceptualized as a pure market strategy for product adaptation and supporting manufacturing in host countries by exploiting firm-specific capabilities at home (Almeida and Phene, 2004; Håkanson, 1990; Kuenmerle, 1999), i.e., technology exploitation. Soon after, accessing to technology, i.e., technology exploration, was identified as another important motive leading to R&D decentralization(Florida, 1997; Kuenmerle, 1999).

Developed country MNCs will cultivate their R&D capabilities and build strong home base before they locate...
their R&D activities abroad (Patel and Vega, 1999). With this prerequisite, Kuenmerle (1999) divides the R&D motives into home-base-exploiting (HBE) and home-base-augmenting (HBA). Moreover, a lot of literature shows R&D subsidiaries underwent a shift from HBE to HBA (Almeida, 1996; Bas and Sierra, 2002; Cantwell and Mudambi, 2005; Florida, 1997; Ronstadt, 1978). However, ‘there is little evidence to suggest that even these most internationalized firms routinely go abroad to compensate for their weakness at home’ (Patel and Vega, 1999). On the other hand, whether the evidence obtained from developed country MNCs can be applicable to the MNCs from emerging countries such as China is still doubtful. As latecomers, Chinese companies ‘lag behind technology frontiers (Xie and White, 2006)’ as well as lack international market experience. Chinese companies were born with technological disadvantages while stepping into global competition, even though they’ve already cultivated a certain degree of competitive advantage in domestic market. In such a disadvantaged situation, Chinese MNCs are supposed to take different R&D strategies with different motives.

2.2 R&D structure: a two-dimension review

2.2.1 The horizontal perspective: centralization vs. decentralization
R&D centralization/decentralization is not really a new topic since it has been discussed over the last few decades. Many empirical studies suggest that MNCs have switched from a HQ-centered organization to a more decentralized network, where dispersed MNC units are granted more autonomy than before (Asakawa, 1996; Birkinshaw, 1996). The presence of technological enablers and an ever-increasing pressure to adjust to the demands of the market have triggered the transformation from centralization to decentralization and are changing the roles of subsidiaries in the MNC organization (Zanfei, 2000). Such an organizational arrangement facilitates a better utilization of global resources and also encourages independent creativity of MNC units (Asakawa, 2001).

However, a decentralized R&D structure usually induces managerial challenges because of the tension between the local embeddedness and organizational integration of global R&D units (Asakawa, 2001; Bartlett and Ghoshal, 1990; Håkanson, 1990; Lehrer and Asakawa, 2002). As for Chinese companies, or other emerging multinationals, how to coordinate and control the decentralized R&D organization has become one of the key factors of R&D efficiency.

2.2.2 The vertical perspective: hierarchical division of R&D labor
A traditional explanation on the hierarchical division of R&D labor is that MNC R&D laboratories typically locate in developed countries for latest technologies (Florida, 1997; Håkanson and Nobel, 1993; Kuenmerle, 1999; Nobel and Birkinshaw, 1998; Pearce, 1999), and MNCs establish R&D laboratories in developing countries primarily for image building, local adaptation, product development, local manufacturing supporting (Dunning, 1994, 1998), as well as low-cost but high quality human resource (von Zedtwitz, 2004; Wu and Callahan, 2005). Although R&D globalization is a growing phenomenon and some explorative studies have shown preliminary evidence that “the R&D operations in developing countries, such as India and China, become central parts of MNCs’ global strategies, and are assigned higher value-added R&D activities” (Dossani and Kenney, 2009; Quan, 2005), old centers of excellence are still attractive and retain the dominance in cutting-edge technologies and industries (Cohen et al., 2009; Di Minin and Palmberg, 2007; Dunning and Lundan, 2009; Macher et al., 2007). Moreover, MNCs also have a consideration of IP protection in developing countries for such a hierarchical labor division (Cohen et al., 2009; Quan and Chesbrough, 2010).

2.3 Learning mode
Organizational learning can be conceptualized as “the ways firm build, supplement and organize knowledge and routines around their activities and within their cultures, and adapt and develop organizational efficiency by improving the use of the broad skills of their workforce”(Dodgson, 1993: p. 377). Organizational learning, rather than knowledge transfer from the parent company to the host country, has been regarded as the core activity of international R&D subsidiaries (De Meyer, 1993; Lam, 2003). Organizational learning can be divided into dichotomous learning processes: cooperative learning and experiential learning (Hitt et al., 2005; Holmqvist, 2004). For the multinationals in the early stage of R&D internationalization, both cooperative learning and experiential learning are necessary organizational learning channels.

Experiential learning is an important channel of organizational learning. And in particular, international experiences have been regarded as the prime source of organizational learning for MNCs (Belderbos, 2003). The overseas R&D units can enhance their learning capability by obtaining the knowledge stock from the knowledge center (i.e. HQ) (Zhao et al., 2005). Furthermore, they can both explore new codified & tacit knowledge and exploit their existing knowledge stock by accumulating self-experience in different geographic locations.

Cooperative learning is another very effective organizational learning path for MNCs. By developing modern international market activities and increasing decentralized R&D operations, the dispersed R&D subsidiaries have more opportunities to interact with global knowledge pools. Self-accumulated experience is no longer the only learning mode for firms. Latecomer MNCs with a relatively low knowledge stock can tap into more advanced technologies and accelerate the learning process through cooperation.

Most Chinese companies are young and have only existed for a few decades. Learning in organizational networks has become a nature catching-up strategy for Chinese latecomers (Hitt et al., 2005; Zhao et al., 2004). It is necessary to observe the learning behaviors of Chinese companies in R&D, the most technology-intensive sector,
from both inter-organizational and intra-organizational perspectives.

3. The Presence of Chinese Outward FDI in Europe and the U.S.

Both Europe and the U.S. are the preferred FDI destination of Chinese MNCs. Hong Kong and the world’s tax havens including the Cayman Island and the Br.Virgin Island account for nearly 80% of Chinese outward FDI. In despite of these destinations, Europe and the U.S. are also popular destinations which attract 2.8% and 1.3% of Chinese outward FDI respectively (Figure 1).

Moreover, the total amount of China’s outward FDI stock in Europe and the U.S. are growing steadily even during the period of economic downturn in 2008 (see figure 2).

More specifically, Europe and the U.S. are the two most popular destinations for R&D investment of Chinese companies (see figure 3 and figure 4).

There is no official database can tell the exact story of Chinese global R&D investment. We therefore collect data on by combining a variety of secondary sources, such as fDi Markets (http://www.fdimarkets.com/), LexisNexis®Academic, Factiva, world investment reports, and official websites of Chinese companies. Up to now, we have identified 88 overseas R&D units established by Chinese companies.

According to this database, Europe (exclude Russia) and the U.S. are the hottest R&D investment destinations for Chinese companies. This finding conforms to the databases of fDi markets and von Zedtwitz (2005) though none of the database can exactly give the whole picture of Chinese global R&D investment. Here we list 10 units each in Europe and the U.S. in order to give a bit more details of Chinese R&D presence in these two destinations (see table 1 and table 2).
Table 1. Ten samples of the Chinese R&D units in the U.S.

<table>
<thead>
<tr>
<th>No.</th>
<th>Setup time</th>
<th>Company name</th>
<th>destination</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2001</td>
<td>Huawei Technologie s</td>
<td>Germany</td>
<td>Industry sewing machines/materiel handling systems</td>
</tr>
<tr>
<td>2</td>
<td>2003</td>
<td>ZTE</td>
<td>Germany</td>
<td>Storage &amp; transport equipment</td>
</tr>
<tr>
<td>3</td>
<td>2003</td>
<td>JIALI Technology</td>
<td>Germany</td>
<td>Diesel engine</td>
</tr>
<tr>
<td>4</td>
<td>2003</td>
<td>Weichai</td>
<td>Austria</td>
<td>Machine tool</td>
</tr>
<tr>
<td>5</td>
<td>2003</td>
<td>Changan Automotive Group</td>
<td>Italy</td>
<td>Automotive</td>
</tr>
<tr>
<td>6</td>
<td>2004</td>
<td>Dalian Machine Tool Group</td>
<td>Germany</td>
<td>Steel</td>
</tr>
<tr>
<td>7</td>
<td>2005</td>
<td>Shanghai Baosteel Group</td>
<td>Germany</td>
<td>Plastic machine</td>
</tr>
<tr>
<td>8</td>
<td>2005</td>
<td>HAITIAN</td>
<td>Germany</td>
<td>Motorcycle</td>
</tr>
<tr>
<td>9</td>
<td>2005</td>
<td>Qianjiang Motor GROUP</td>
<td>Italy</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>2005</td>
<td>SGSB GROUP</td>
<td>Germany</td>
<td></td>
</tr>
</tbody>
</table>

Source: Our database elaborated by various sources

Table 2. Ten samples of the Chinese R&D units in Europe.

4. Methodology

4.1 Multiple Case Study Approach

This paper employs a multiple case study qualitative method, due to the following reasons:

1. “How” or “why” question are more explanatory to use case studies since ‘such questions deal with operational links needing to be traced over time, rather than mere frequencies or incidence’ (Yin, 1994).

2. Without doubt, the international R&D activity of Chinese MNCs is such a new phenomenon that it has not received much academic research attention. The methodology of this multiple case study was specifically chosen for the exploration of this uncharted theoretical ground (Ghauri, 2004). Interview-based research is suited for exploratory and theory building studies, and there is a small population of possible respondents.

3. ‘Multiple case studies are appropriate when attempting to externally validate the findings from a single case study, through cross-case comparisons’ (Chiesa and Frattini, 2007; Eisenhardt, 1989a).

4. Furthermore, interview-based case studies allow researchers to develop a deeper relationship with informants (Daniels and Cannice, 2004).

4.2 Case Study Process and Data Collection

We adopt the process of theory building from case study research developed by Eisenhardt (1989).

1. Selecting cases: In order to collect the data we first identified the location and set-up time of the units established in Europe and the U.S. by combining a variety of sources. After research question formulation, we followed the logic of theoretical sampling and pre-selected cases which vary 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). The two baskets of cases are listed in table 3.

2. Crafting instruments and protocols: Multiple data collection methods are combined in this research. After the establishment of relationships with senior managers in the MNCs, face-to-face or in-depth telephone interviews were then conducted. Most of the interviewees are senior R&D managers of the R&D unit, as well as some engineers. Prior to the interview, we asked the respondents to fill out a questionnaire for the quantifiable questions, which were used for pre-testing the survey instruments (Helble and Chong, 2004) and to verify the validity of the interviews’ findings. We cross-checked and integrated the data from the questionnaires and interviews for both qualitative and quantitative evidence combination (Eisenhardt, 1989). Whenever the answers provided in the questionnaire or in the interviews were unclear, the respondents were contacted again and asked for clarification. The information and data that could not be obtained directly from some of the companies were obtained from secondary sources, such as LexisNexis® Academic (http://www.lexisnexis.com/), Factiva (http://www.factiva.com/) and official websites.

3. Entering the field: We followed the “constant comparison” grounded theory method developed by Glaser and Strauss (1967) that ‘data are collected and analyzed simultaneously’ (Suddaby, 2006). Every interview was taken field notes in Mandarin and then transcribed into English.

4. Analyzing data: First, case description of each R&D unit is made for familiarity of within-case data. Then, we did cross-case comparison for both similarities and differences analysis of with-in group data.

5. Shaping hypotheses and enfolding literature: Several hypotheses were put forward for emergent theory building. Both the conflicting and similar extant literature is compared for both internal validity building and theoretical sharpening.

Table 3. The basic information of the interviewed Chinese MNCs and R&D units.

5. Case Analysis and Comparison

5.1 R&D Motives

We find similarities in the establishing motives. When mapping the cases in our database according to their location selection and industry distribution in the U.S. and Europe, we discovered a clear strategy: settling down close to centers of excellence with specific technological advantages. In the U.S., Chinese companies prefer to invest in telecommunications, pharmacy, etc., and Chinese companies in Europe are more willing to invest in machinery, equipments and automotive industry (see figure 5 and figure 6).

According to our interviews, technology-exploration-motivated companies also account for the majority of our cases (see table 4). Most Chinese companies are still in infancy in terms of both technology and market knowledge in global market. In order to catch up and compete with their stronger counterparts from developed countries, they don’t have the patience to accumulate their technological capabilities at home, but take the initiative in seeking global technological resources. Foreign-market-related motive, by contrast, is placed at the second place.

As the interviewees stated, proximity to the centers of technological excellence enables Chinese companies to get connection with world’s latest technologies, strengthen the R&D capabilities and seize more innovation opportunities by conducting R&D in the areas with advanced technologies.

![Figure 5. Industry distribution of Chinese R&D investments in Europe.](image)

![Figure 6. Industry distribution of Chinese R&D investments in the U.S.](image)
This motive covers the cases in Europe and the U.S., who usually had either clear product development plans or specific technological requirements before deciding to expand the R&D operations into certain locations in developed countries. The dominant technology-driven motive of proximity to centers of excellence can be further broken down into the following five sub-motives.

**First**, Chinese companies intend to utilize local advanced R&D infrastructure and take advantage of a better technological environment by conducting R&D close to centers of excellence. Many interviewees of our cases mentioned local superiority of R&D infrastructure, facilities and equipments. Apparently, Chinese companies are already aware of the impact of surrounding environment on their innovation ability.

**Second**, being close to centers of excellence enables Chinese companies to track latest technology & product development. Different from the discussion of Chen and Tong (2003), technological scanning is no longer the main task but just one of the necessary components according to the interviewees. According to our cases, an overall grasp of the technology & product development

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### Table 4. The motivations of the cases in Europe and the U.S.

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Cases in Europe</th>
<th>Cases in the U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To utilize local R&amp;D infrastructure and take advantage of a better R&amp;D environment</td>
<td>Cases 1, 2, 3, 4, 5, 6, 7, 8, and 9</td>
<td>Case 2</td>
</tr>
<tr>
<td>Example: Case 2 SG decided to acquire an existing R&amp;D center since there is available local resource. The acquired R&amp;D center includes a high standard laboratory of new energy technology and SG is able to carry out its independent R&amp;D and design activities, and possess its own intellectual property of core technologies. “After the acquisition, we only retained the necessary assets based on our company’s requirements since it is impossible to find a ready-made R&amp;D center, possessing intangible assets and hardware facilities, which is totally suitable for our company. We re-established our R&amp;D team while we retained the whole hardware facilities.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Technological trend monitoring and technological information collection</td>
<td>Cases 1, 2, 3, 4, 5, and 1</td>
<td>Cases 1 and 4</td>
</tr>
<tr>
<td>Example: Case F Case F, the most recently established R&amp;D unit of the 9 European cases, mainly undertakes the tasks of information collection and technology monitoring. It has built informal but close and long-standing audio technological connections with the local senior engineers, R&amp;D and consulting companies, and universities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. To Strengthen interaction and cooperation with local technological partners</td>
<td>Cases 1, 2, 3, 4, 5, and 1</td>
<td>Cases 2, 3 and 4</td>
</tr>
<tr>
<td>Example: Case 3 Case 3 has established cooperative relationship with local chip manufacturers owing to “the U.S. is the world’s most powerful country in chip development and production.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Acquisition of specific technologies or specific product development</td>
<td>Cases E, G, and H</td>
<td>No evidence</td>
</tr>
<tr>
<td>Examples: Case G: large gantry machining; Case H: electronic Jacquard machinery; Case I: high-end motorcycle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. R&amp;D talents recruitment and Chinese talent cultivation</td>
<td>Cases 2, 3, 4, and 5</td>
<td>Cases 2, 3, 4 and 5</td>
</tr>
<tr>
<td>Example: Case 4 The engineers recruited in the U.S. are quite experienced and long-term exposed to the unique atmosphere in Silicon Valley. Their expertise/domain knowledge is valuable for Alibaba. “After all, the technology is very advanced in Silicon Valley. With the help from our R&amp;D experts, we may avoid detours and take a shortcut during the R&amp;D process. Moreover, these experts bring us some new visions. For example, the coding process in China is not standard, and we hope our U.S.-based engineers may gradually influence our company’s practices during the development process and improve the abilities of the domestic R&amp;D human resource.”</td>
<td></td>
<td></td>
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*Report from Liaoning Daily, 04-29-2009*
trend in developed countries is quite useful for future R&D project planning and operating.

**Third**, proximity to the centers of technological excellence provides Chinese firms with the opportunity to have close interactions with the leading local technology providers. This technology-oriented motive is strongly expressed by our cases as to establish new external knowledge networks and to take full advantage of external technological assistance by building/strengthening new/existing local cooperative relationships with famous MNCs as well as local specialized small and medium enterprise (SMEs).

The fourth reason is to acquire specific technology or to develop a strategic product by acquisition of local companies. In our cases, the U.S. companies in Europe and China companies bought local companies and retained the previous R&D facilities, aiming at specific strategic products that are critical for them to have a leg up on the competition. For instance, case G focuses on the R&D of large gantry machining; case H focuses on the R&D of electronic jacquard machinery; and case I focuses on the R&D of high-end motorcycles.

However, this motive is not expressed by case 2 in the U.S. Although case 2 was set up with the same entry mode of M&A as cases G, H, and I, SG reconstructed the acquired R&D center by re-recruiting R&D personnel.

"After the acquisition, we only retained the necessary assets based on our company’s requirements since it was impossible to find a ready-made R&D center possessing intangible assets and hardware facilities, which was totally suitable for our company. We re-established our R&D team while we retained the whole hardware facilities (interview, case 2)." "We recruited new technical director and R&D staffs to replace the whole previous R&D team which was not very suited to the R&D projects that we would like to launch⁵, and so far the recruitment hasn’t stopped (interview, case 2)."

SG has a clear R&D strategic blueprint and a relatively strong technological capability. What they need is not a particular technology or product, but advanced R&D facilities, high skilled R&D specialists, and an acute sense of the technology and market trends.

**Last but not least**, high quality specialized human resources are among the most important technology-driven motives for setting up overseas R&D units in Europe and the U.S. Recruiting and cooperating with local, high-level human resources has been viewed as one of the main reasons for the enhancement of R&D capabilities through the establishment of overseas R&D centers.

In most of our U.S. cases (except for case 1), all the employees are locally recruited, which clearly reflects the reality of the plenty of talents in the U.S. Using the local human resources with advanced technological knowledge is the most effective way for the R&D units to tap into the local knowledge networks. Human resource localization helps to achieve local R&D embeddedness.

In addition, plentiful, local, and high-quality human resources also help high-skilled R&D human cultivation of Chinese firms. This motive is quite significant in the European cases such as cases B, C, E, G, H and I.

The evidence gathered in our research among Chinese companies in Europe also suggests the co-existence of the two goals of both technological exploration and technological exploitation. In our cases, some have a dual motive, while others are largely motivated by their hunger for advanced technologies. Cases B, C, and E in Europe and cases 4 and 5 in the U.S. are representative cases with an exclusive technology-driven motive. Cases A, D, F, G, H and I in Europe and cases 1, 2, and 3 in the U.S. are pursuing both technology exploration and technology exploitation simultaneously. Cases A, D, F, and I as well as case 1, 2, and 3 have normally occupied a steady share of the domestic market and have attained a certain degree of independent R&D capabilities. Expansion into the markets of developed countries has become an integral part of their internationalization strategy, while the pursuit of technological progress is still the major task of the company. These Chinese companies boldly step out to seek both survival and development in developed countries’ markets. However, lacking in both international market experience and technological know-how, their competitive disadvantages force them to establish R&D branches in developed countries. As for cases G and H, acquisition of local companies brought them not only technological resources but also market resources. To consolidate and expand the existing market share become a consequent task for cases G and H after acquisition.

We did interviews with Hisense’s R&D units in Europe and the U.S. (case D and case 1), which can shed some light on the “Ambidexterity” of motive. The establishments of case D and case 1 have a strong market-driven motive of leveraging self-knowledge stock to support local market exploitation and assist new product development and adaptation for local market. As the interviewee of case D stated, “At this moment, how to survive in the global market and increase market share has become the primary issue to resolve.” Case 1 was just split out from Hisense USA in 2008, and the interviewee expressed a similar motive: “We (Hisense) export products, such as TV sets, to the U.S. market. If we didn’t set up a R&D branch here, all the R&D activities would be centralized in China, and you would never know if these products exported to the U.S. are suitable to the local market or meet local demands because the first hand information delivered from the U.S. market lags behind. In such a case, both the marketing and sales in the U.S. and even the whole operation of Hisense would be influenced.”

Meanwhile, Hisense clearly recognized their technological deficiencies in the long-term global competition. "In general, Chinese TV industry hasn’t mastered LCD panel technologies very well, even though our company has got ahead in China”, the interviewee of case D expressed like this. In order to seek new competitive advantages, case D and case 1 also undertake technological exploration tasks. Case D emphasized that “our (Hisense) aim requires us to insist on upgrading our technologies and product quality constantly”. The interviewee of case 1 mentioned their geographical advantage on collecting technological information. “After all, there are many big companies here, launching their

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⁵ The new staffs in U.S. branch include many Chinese employees, Chinese American and Chinese student studying in the U.S. see http://auto.sohu.com/20090305/n262629933.shtml
Compared to the European counterpart, the R&D unit of Hisense in the U.S. mainly assists the HQ to launch new products and serves for the North American market. Whereas, as we already mentioned before, monitoring and collecting the latest technological information for the headquarters is still one of the main functions of the unit.

**Proposition 1:** We find that Chinese overseas R&D units in the U.S. and Europe are acting as ambidextrous organizations motivated by both technology exploitation and technology exploration. Moreover, some cases in the U.S. and Europe suggest the predominant motive as technology exploration.

### 5.2 R&D structure

#### 5.2.1 Centralization vs. decentralization

In terms of the discussion on R&D structure of MNCs, the existing studies show that different motives would lead to different R&D configurations, and firm’s market and technology orientations were related to their management styles (Behrman and Fischer, 1980; von Zedtwitz and Gassmann, 2002). The topic on centralization/decentralization of R&D organization has been discussed in the past decades with different definitions and taxonomies (Asakawa, 2001; Bartlett et al., 1990; Cheng and Bolon, 1993; Chiesa, 1996; Fischer and Behrman, 1979; Gassmann and von Zedtwitz, 1999; Lehrer and Asakawa, 2002). In this paper, we take the distribution of decision-making power as the measurement of centralization/decentralization that a centralized/decentralized R&D organization where decision-making power is retained at headquarters/R&D units (Fischer and Behrman, 1979).

The traditional explanation states that firms with a technology-exploration (technology-driven) motive tend to be more centralized than the firms with a technology-exploitation (market-driven) motive (Behrman and Fischer, 1980; Cheng and Bolon, 1993). From an evolutionary perspective, there are two different routes of R&D structure evolution arriving at the same end: (1) the route from centralization to decentralization and to convergence (Asakawa, 2001; Behrman and Fischer, 1980); (2) the route from decentralization to centralization and to convergence (Lehrer and Asakawa, 2002). Here, ‘convergence’ means that R&D unit is in a state of both embeddedness in local R&D networks in host countries and integration within MNC.

In this study, we find out that most of the Chinese cases with greenfield investment entry mode have a certain degree of autonomy, while the final decision-making authority is still held by the headquarters (See table 5). This R&D configuration can be viewed as participative centralization and has much to do with the R&D project settings and the allocation of R&D resources within Chinese companies. The Chinese R&D units interviewed usually have a small size and do not possess all the resources needed for R&D. These characteristics determine that Chinese overseas units cannot fulfill a whole R&D project independently. In such a case, headquarters starts up new R&D project and assigns tasks to different R&D units. Overseas R&D units take orders from headquarters and work jointly. Here is a metaphor given by the interviewee of case C that vividly depicts the HQ-subsidiary relationship in Chang’an: ‘The HQ regards our R&D center as a ‘department’ but not a relatively independent subsidiary. Because the resources owned by Chang’an not only existed in our R&D center. The kind of centralization is better for HQ to do integrative resources allocation.’

In most instances, Chinese R&D units utilize their geographical advantages to give weighty advices and proposals on new products/technologies, local human resource recruitment, local partner choosing etc. to their headquarters. They have a certain degree of autonomous right on specific matters, especially those businesses related to local operations, though the final decisions still need to be approved by headquarters. Here, case 2 shows a great initiative in decision-making of new projects or product development in overseas market. “SG launches different projects for the North American market and Chinese market. If the project aims at the North American market, the US R&D branch will conduct market analyses and determine whether the new technology can be commercialized... We certainly still conform to the HQ since the investment is finally decided by the HQ.”

**Proposition 2a:** We find similar participative-centralized structure between R&D units and HQ. Important decisions must be shared / coordinated with HQ. However, we find that both EU/US units/subs take initiative in local R&D operations such as new projects or product development in overseas market.

A centralized structure can also be viewed as a formal coordination mechanism that commonly used by HQ to supervise R&D subsidiaries. Moreover, standardized and routinized procedure or planning and report systems submitted by R&D units to headquarters are always utilized by Chinese companies with the purpose of integrating HQ and the subsidiary. Besides formal managerial instruments, informal coordination and communication mechanisms are also used between R&D subsidiaries and HQ to accelerate the internal experiential learning and new knowledge creation, as well as bi-directional transfer of new knowledge and information. From table-6 we find that there is close coordination between the overseas R&D units we interviewed and their Chinese headquarters, and informal coordination mechanisms are commonly used by Chinese companies in order to facilitate learning and knowledge transferring. According to our cases, the most common informal mechanisms used by Chinese companies are communication tools and professional transfer.

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6 Fischer and Behrman (1979) defined four R&D coordination patterns as absolute centralization, participative centralization, supervised decentralization and total freedom. Participative centralization is defined as “R&D commitment and total resources used are determined as a result of negotiation between parent and foreign affiliate. Parent decides; foreign affiliate gives its advice or proposes decision.”
1. **Communication tools.** In order to solve distance problems and conquer know-how exchanging barriers, informal contacts through Internet/intranet, e-mails, telephone and various other IT-related platforms have become the main daily means of communication between R&D subsidiaries and HQs. In our cases, video meeting/teleconference has become an effective tool to connect R&D subsidiaries and HQ. For example, Qianjiang motor equipped itself with a professional translation team. The Chinese engineers in the HQ are able to communicate smoothly and regularly with its Italian designers and engineers in case I through video conference/teleconference. Chinese companies seem to quite satisfy with these convenient means for contact and communication. As the interview of case 2 said, “We rely on engineering-related IT technology to transfer knowledge back and forth. We communicate with our HQ each month through reporting, teleconference, and the company’s own office platform. Our communication deals with all aspects including the proposals, discussions, and so on. We have a good communication platform that helps to resolve different matters.”

2. **R&D human resource transfer.** R&D human resource transfer facilitates close interactions and mutual learning between R&D subsidiaries and HQ. Our cases can be grouped into two situations based on the technology level differences that exist between R&D subsidiaries and headquarters. The cases belonging to the first situation, i.e., cases A, G, H and I in Europe and cases 2, 3, 4 and 5 in the U.S., have a relatively higher technology level than their headquarters. Cases A, 2, 3, 4 and 5 stress localized human resource recruitment and have achieved a high degree of foreign embeddedness. Cases G, H and I all retained the preexisting R&D branches, regulars and patented technologies after acquisitions of local firms. For these cases involved in the first situation, large technological gaps exist between R&D subsidiaries and HQ. Short-term professional transfers from HQ to overseas units are mainly motivated by technological learning and training since the units have stronger R&D capabilities (see figure 7, situation 1). Meanwhile, local specialists recruited in R&D units are also sent back to HQ either for specific technology requirements of HQ or for skill training of Chinese R&D employees. In this situation, a reverse intra-firm knowledge flow from R&D unit to HQ occurs when the process of bi-directional R&D human resource transfer continues.

In the second situation, cases B, C, D, E and F in Europe and case 1 in the U.S. have relatively equal technological capabilities compared to their headquarters since the main labor force of these R&D units is Chinese domestic employees who dispatched from the HQ. Regarding these R&D units, utilizing local technological assistance is necessary owning to their inability in some key R&D capabilities. Due to their proximity to the technological frontiers, a high percentage of Chinese R&D professionals are transferred from the headquarters to the units with specialized R&D tasks, aiming at collaboration with external partners or exposure to external knowledge networks. Compared to the first situation, these cases in the second group foster the strategy of active learning from local technological/market experts in the U.S. and Europe in order to offset their technological/market weakness in China (see figure 7, situation 2). Due to high frequency of R&D personnel transferring, information/know-how can be brought back to HQ easily.

There are three main factors influence a Chinese company to chose to be in situation 1 or situation 2. (1) Suitable R&D resources. Cases G, H, I and 2 all aim at the R&D of specific products, and they all find suitable R&D resources such as technologies and equipments that they need. These cases chose to first internalize the relevant R&D resources and then digest internally. Otherwise, Chinese companies have to choose situation 2, turning to external R&D assistance. (2) Suitable high-quality human resources. Case A, and cases 2, 3, 4 and 5 all have a high percentage of local recruited R&D employees, especially local Chinese immigrants, who can teach the domestic Chinese human resource internally. In such a case, learning will happen in situation 1. Actually, there are plenty of high-quality human resources in both the U.S. and Europe. However, to find suitable R&D employees are still difficult for some Chinese companies. For instance, the case 1 interviewee explained their situation like this, “First, it is not easy to recruit local specialists in TV industry in the U.S., especially who meet our specific requirements. Second, the local specialists don’t quite know the situation of R&D in the HQ. Sofar Hisense USA has locally recruited marketing staff. They can help us to understand the U.S. market better.” (3) Cost-efficiency. Cost is another important consideration for some cases (e.g., case E) to keep an external cooperation relationship with local partners in Europe but not to internalize external R&D resources such as recruiting local high-cost human resource on a regular base. Project subcontrac or temporarily hiring specialists from local companies according to the requirements of projects seem more cost efficient for those Chinese companies who choose to be in situation 2.

![Figure 7. Two situations in R&D human resource transfer.](image)
### Table 5. R&D structure of our interviewed Chinese companies.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Centralization vs. decentralization</th>
<th>Main coordination &amp; communication mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case A</td>
<td>Case A participates in the decision-making process.</td>
<td>1. A direct contact channel from senior management in HQ to junior technicians</td>
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<tr>
<td></td>
<td>&quot;Since we are close the European market, the HQ has to consider our suggestions. Our centre participates in the discussion of product planning and personnel demand plan held in the headquarters every year.&quot; &quot;After the personnel demand has made clear, we have a considerable autonomy to find the suitable personnel by ourselves. Finally, we will report the candidates to the headquarters and the headquarters will do interviews with the candidates in terms of certain technological fields.&quot;</td>
<td>2. Project report/suggestion to the HQ on a regular base</td>
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<td></td>
<td>The headquarters takes charge of platform planning, grasping the overall situation. And the R&amp;D unit takes charge of sub-project planning, grasping the details. &quot;HQ gives us more autonomy so that we have more space to bring into play our capability. As our company deepens the collaboration with the western technological experts, we believe that they also will have more understanding of the Chinese market. I am basically satisfied with the autonomy degree of our R&amp;D centre.&quot;</td>
<td>3. Formal conference for project/product planning</td>
</tr>
<tr>
<td></td>
<td>The R&amp;D unit has a low autonomy degree. &quot;Our R&amp;D centre doesn’t have much autonomy degree. We cannot decide which project to do. If we want to do a project, we can prepare a plan and submit to HQ who will decide and arrange the project.&quot;</td>
<td>4. Human resource transfer</td>
</tr>
<tr>
<td></td>
<td>&quot;We have a better understanding of local technological suppliers and a better grasp of local products. We are able to make a judgment on which technology/product can better adapt to the European market. We should give our professional feedbacks to our headquarters. If we already have made decision, we should report to our HQ, if we halt between two opinions, the headquarters will help us make decision.&quot; &quot;Our HQ controls the whole product development process. We co-develop new product with our HQ, and most of the work are undertaken by the HQ.&quot;</td>
<td>5. Technical analysis report to HQ on a regular base</td>
</tr>
<tr>
<td>Case D</td>
<td>&quot;Big plans are decided by the headquarters. Case E does not have right to make decision but comply with the order given by the HQ. &quot;Each discussion has to be passed by the headquarters. The local cooperative partners are also decided by the headquarters. As for the specific contacts, the HQ will give the unit a specific authority. The R&amp;D units will take charge of the concrete communication and operation within the scope of the authority’s power.&quot;</td>
<td>1. Manager/engineer transfer</td>
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<td></td>
<td>&quot;The latest generation of product is developed by the German side. Hence, the German side takes the lead. The German side sends technical specialists to the headquarters for cooperation on key component production in China. Our Chinese side mainly participates in providing components to the Germany side for new products.&quot; &quot;I think the Chinese side should participate more in decision-making and decrease the degree of autonomy on the German side.&quot;</td>
<td>2. Short-term transfer</td>
</tr>
<tr>
<td></td>
<td>&quot;Normally, our HQ makes decision for us, and we participate in the decision. We tell our HQ which new products are relatively popular. Certainly, we really hope more projects will be moved to the U.S. R&amp;D branch, and then we will make a more rapid response to local customers. Moreover, market information can be directly collected through face-to-face communications with our customers. However, we should never go fast since the Chinese side still maintains a stable and steady operating style.&quot;</td>
<td>3. Budget control</td>
</tr>
<tr>
<td>Case F</td>
<td>&quot;SG launches different projects for the North American market and Chinese market. If the project aims at the North American market, the US R&amp;D branch will conduct market analyses and determine whether the new technology can be commercialized.&quot; &quot;We certainly still consist with the HQ since the investment is finally decided by the HQ.&quot; &quot;If the project aims at Chinese domestic market, the whole R&amp;D platform will accordingly be located in China. The US R&amp;D branch will provide suggestions to the HQ, and the finally decision will be made by the HQ.&quot;</td>
<td>4. Formal regulation</td>
</tr>
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<td></td>
<td>&quot;Qianjiang motor entered the high-end motorcycle market in developed countries via the acquisition of Benelli. &quot;We have a high degree of autonomy in terms of high-end motorcycle projects. However, the final decision is still made by the headquarters.&quot;</td>
<td>5. Teleconference on a regular basis</td>
</tr>
<tr>
<td>Case G</td>
<td>&quot;We report and discuss the results of local market investigation with our HQ. The decision-making power is grasped by the general manager in the HQ.&quot;</td>
<td>1. Project planning and schedule</td>
</tr>
<tr>
<td></td>
<td>&quot;The subsidiary can make decisions on the cooperation with local partners itself, and the HQ only controls the cost. &quot;Before launching a project, the subsidiary will firstly report to HQ with a budget plan. After the HQ makes a decision based on the budget, the subsidiary will handle the details of the project.&quot;</td>
<td>2. Teleconference and E-mail</td>
</tr>
<tr>
<td>Case H</td>
<td>&quot;The headquarters takes charge of platform planning, grasping the overall situation. And the R&amp;D &amp; &amp; unit takes charge of sub-project planning, grasping the details. &quot;HQ gives us more autonomy so that we have more space to bring into play our capability. As our company deepens the collaboration with the western technological experts, we believe that they also will have more understanding of the Chinese market. I am basically satisfied with the autonomy degree of our R&amp;D centre.&quot;</td>
<td>3. Short-term transfer</td>
</tr>
<tr>
<td></td>
<td>&quot;We report and discuss the results of local market investigation with our HQ. The decision-making power is grasped by the general manager in the HQ.&quot;</td>
<td>4. Short-term transfer</td>
</tr>
<tr>
<td></td>
<td>&quot;The subsidiary can make decisions on the cooperation with local partners itself, and the HQ only controls the cost. &quot;Before launching a project, the subsidiary will firstly report to HQ with a budget plan. After the HQ makes a decision based on the budget, the subsidiary will handle the details of the project.&quot;</td>
<td>5. Manager/engineer transfer</td>
</tr>
<tr>
<td>Case I</td>
<td>&quot;Normally, our HQ makes decision for us, and we participate in the decision. We tell our HQ which new products are relatively popular. Certainly, we really hope more projects will be moved to the U.S. R&amp;D branch, and then we will make a more rapid response to local customers. Moreover, market information can be directly collected through face-to-face communications with our customers. However, we should never go fast since the Chinese side still maintains a stable and steady operating style.&quot;</td>
<td>1. Manager/engineer transfer</td>
</tr>
<tr>
<td>Case J</td>
<td>&quot;We have a better understanding of local technological suppliers and a better grasp of local products. We are able to make a judgment on which technology/product can better adapt to the European market. We should give our professional feedbacks to our headquarters. If we already have made decision, we should report to our HQ, if we halt between two opinions, the headquarters will help us make decision.&quot; &quot;Our HQ controls the whole product development process. We co-develop new product with our HQ, and most of the work are undertaken by the HQ.&quot;</td>
<td>2. Teleconference</td>
</tr>
<tr>
<td>Case K</td>
<td>&quot;We report and discuss the results of local market investigation with our HQ. The decision-making power is grasped by the general manager in the HQ.&quot;</td>
<td>3. Short-term transfer</td>
</tr>
<tr>
<td>Case L</td>
<td>&quot;Normally, our HQ makes decision for us, and we participate in the decision. We tell our HQ which new products are relatively popular. Certainly, we really hope more projects will be moved to the U.S. R&amp;D branch, and then we will make a more rapid response to local customers. Moreover, market information can be directly collected through face-to-face communications with our customers. However, we should never go fast since the Chinese side still maintains a stable and steady operating style.&quot;</td>
<td>4. Short-term transfer</td>
</tr>
<tr>
<td>Case M</td>
<td>&quot;Normally, our HQ makes decision for us, and we participate in the decision. We tell our HQ which new products are relatively popular. Certainly, we really hope more projects will be moved to the U.S. R&amp;D branch, and then we will make a more rapid response to local customers. Moreover, market information can be directly collected through face-to-face communications with our customers. However, we should never go fast since the Chinese side still maintains a stable and steady operating style.&quot;</td>
<td>5. Manager/engineer transfer</td>
</tr>
</tbody>
</table>
5.2.2 Hierarchical division of R&D labor

A recent study argues that R&D organization is hierarchical for the purpose of IP protection (Quan and Chesbrough, 2010). In this paper, we find similar evidence that Chinese companies place high-value added R&D activities in their R&D units in developed countries, and the low-value added activities are retained at home. However, IP protection is not the main consideration of Chinese companies according to our evidence. Sufficiency of low cost and skilled labor force but insufficiency of advanced talents is a real picture of technical human resource in China. Therefore, the lack of labor skills and core technologies in China is the most important reason that induces hierarchical division of R&D labor in Chinese companies.

For many of our cases, such as cases A, B, C, E, G, and H as well as cases 2, 3, 4, and 5, their primary mission is high-value added technologies/products, while their domestic R&D sectors assume technological application and development, product commercialization and production industrialization (see table 6). To a large extent, this division of R&D tasks aims to compensate for the disadvantage of the Chinese firms’ low technological/design level, while taking full advantage of the low-cost of production. This is different from developed-country-based MNCs that put low-value-added R&D activities in China due to IP concerns, as found in the previously mentioned research (Quan and Chesbrough, 2010).

### Table 6. Hierarchical division of R&D labor in Chinese companies.

<table>
<thead>
<tr>
<th>Domestic R&amp;D activities in China</th>
<th>Low-value added R&amp;D activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Product development for domestic market</td>
<td></td>
</tr>
<tr>
<td>● Technology commercialization</td>
<td></td>
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<tr>
<td>● Industrialized production</td>
<td></td>
</tr>
<tr>
<td>● Technical adjustment/adaptation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overseas R&amp;D activities in the developed countries</th>
<th>High-value added R&amp;D activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Basic/applied research on new technologies</td>
<td></td>
</tr>
<tr>
<td>● Conceptual/prototype design</td>
<td></td>
</tr>
<tr>
<td>● New product development for local/global market</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Local suppliers in developed countries</th>
<th>Technological assistance and supply:</th>
</tr>
</thead>
<tbody>
<tr>
<td>● (1) Core technologies/components</td>
<td>(1) Core technologies/components</td>
</tr>
<tr>
<td>● (2) Peripheral technologies/components unrelated to the core competence of the company</td>
<td></td>
</tr>
</tbody>
</table>

The case of ZTE shows a hierarchical division of labor. The R&D organization of ZTE can be viewed as a matrix (see figure 8). The overall planning of global new product development is coordinated by the HQ. All the R&D units cooperate together to develop new products in order to avoid wasteful resource replication.

“As for each type of technology (see the columns), we have specialized teams of various technical levels from junior to senior. When the HQ decides to start a new product project (see the rows), we will select the appropriate R&D personnel from not only domestic R&D centre but also our global R&D units to organize a R&D team according to technological sophistication since the development of new product needs diverse of technologies (interview, case 3).”

The specialists in the U.S. unit act as the leader of the projects, taking charge of the overall planning and design of new products, while the detailed implementation and development activities are assumed by the domestic engineers in China.

“The R&D human resources we recruited are specialists who always have a strong background and an overall point of view (or a broad perspective) in a particular technological field. In fact, these specialists or talents are appointed to important positions such as senior system engineer, project manager or trailbreaker in specific technological field to take charge of new product design (interview, case 3).”

In such an arrangement, ZTE can effectively leverage its global R&D resources to utilize not only specialists at a senior level for integrated planning, but also plenty of skilled engineers with a cost advantage.

Moreover, technological assistance and supply from local partners in host countries are necessary since a company can internalize the most relevant, but not all, knowledge resources. Therefore, ZTE US R&D units engage in chip design, and meanwhile buy some core technologies from local large chip manufacturers such as Lsi, IBM and ST. The interviewee of case 3 explained like this, “The process of chip design & development involves many IP cores. However, as a peripheral (although important) part of chip development, these IP cores and the subsequent wafer processing are not related to our core competence. Therefore we directly buy IP cores and outsource wafer processing to the local specialized chip manufacturers.”

**Proposition 2c:** We find hierarchical division of R&D labor in Chinese companies. Chinese overseas R&D units undertake high-value added R&D activities while domestic R&D activities in China are relatively low-value added.

### 5.3 Modes of Learning

China is still a “student” of high technology, lagging far behind developed countries/economies such as Europe and the U.S. Mainland China ranked 37 in Global Innovation Index 2008-2009, where the U.S. occupied the first place, and another 5 European countries, including Germany (2nd), Sweden (3rd), the U.K. (4th), Switzerland (7th), Denmark (9th) and Holland (10th), also reached in top 10.

According to the 21 Chinese companies on the list of 1000 non-EU companies by level of R&D investment, more than 60% of the Chinese companies with a high R&D invest level belong to low or medium-low R&D intensity sectors (see figure 9).

Learning from their advanced counterparts located in developed countries has been identified as an important strategy according to our cases. Meanwhile, we also found that Chinese companies behave different learning modes in Europe and the U.S.
5.3.1 “Primary School Model” in Europe

In Europe, we found many cases of “Primary School Model”/“Technical School Model”. Technological immaturity pushes Chinese companies to enter “primary schools”/“technical schools” which mean local technological counterparts, for skill training. After initially very close collaboration, we notice the emergence of experiential learning with their headquarters, i.e., after graduation from primary schools/technical schools, Chinese engineers soon pick up some fundamental skills and they can say “we can do these by ourselves”.

These R&D units with the entry mode of greenfield investment (cases B, C, and E) let their Chinese R&D employees gradually undertake more R&D activities that previously can only be fulfilled by external R&D specialists.

As soon as cases B, C and E entered Europe, they found suitable “primary schools” respectively. For instance, case B found Pinifania, case C found IDEA, and case D found AVL. The insufficiency of in-house technological capabilities led to a state of “walking on crutches” since the very beginning. Cases B, C, and E bring their “students”, i.e., the R&D employees in China, to these “schools” to receive training. In the initial stage, cases B, C and E depend largely on the “primary schools”. However, after a period of training, Chinese “students” graduate from the “schools” and start to undertake some R&D tasks with the technical skills they’ve learned. These graduated “students” can either work in the R&D units or return back to the headquarters, performing as the backbone of R&D force in China. JAC’s mode of external cooperation has shifted from whole project outsourcing to subcontracting. “At this moment, we turn more on our own R&D capabilities and undertake the majority of the tasks. We control the operation of the entire project which our designers and engineers are increasingly involved in. We cooperate with local companies when we are shorthanded or run into technical difficulties. We now have cooperation with large companies such as Pinifania, as well as local cost-effective SMEs. Actually, our cooperation with Pinifania has relatively decreased since our cooperation mode has changed from outsourcing to project cooperation (interview, case B).”

“We have a close cooperative relationship with the headquarters because we do the same projects. Meanwhile, we undertake more responsibilities since we’ve built some degree of R&D capacity (interview, case B).”

Another example is Weichai. The primary school of case E is run by Weichai and AVL LIST GmbH (AVL) in cooperation. Case E has no local recruited employees but only “visiting students” dispatched from China. The “students” usually will graduate and return back to China within 2 years. After the diploma project of Euro III series diesel engines, Weichai independently designed and developed Euro IV and V series diesel engines only with the external support from some key component suppliers. Moreover, AVL also quit playing the role of cooperator of case E, but act as an external cooperator.

As for those R&D units with the entry mode of M&A (cases G, H, and I), part of the R&D activities previously undertaken by the acquired foreign company gradually shift back to China. Acquisition of local company allows cases G, H and I to build their “primary schools” internally. As the interviewee of case G said, “We purchase overseas technologies, and more importantly, we should assimilate the imported technologies.” In order to accelerate the assimilation-process, the retained previous R&D specialists become the “tutors” of Chinese R&D employees, and both “tutors” and Chinese
“students” have a bi-directional transfer for technological teaching and learning. Along with the internal learning process, the technological capability in headquarters has upgraded. Chinese “students” are now able to undertake some tasks that they cannot complete before. The interviewee of case G stated that “At the moment, we can already develop some of the key components by ourselves even though the specification is still incomplete and the components are of average quality. We’ve made large technological progress in contrast to our former selves.”

DMTG, Hisun and Qianjiang all implement their plan to shift part of the functions of their acquired companies to China, including product development, commercialization and production, (see figure 10). In particularly, Hisun shut down the European assembly lines and transform the acquired company into an absolute R&D center. All the production resources have been integrated into the parent company in China. Similarly, Qianjiang has upgraded its technologies in terms of high-end motorcycles. Many spare parts & components which were never produced by Qianjiang before, therefore, are domestically manufactured now. The interviewee of case I gave the explanation for technology/manufacturing improvement. “One aspect is manufacturing equipment. We directly buy manufacturing equipments from Europe. Another aspect is technological interaction. The Italian side and the Chinese side continuously keep communicating and cooperating with each other, especially regarding to the project progress. Our Italian specialists will also be dispatched to personally guide the production in China (interview, case I).”

Figure 10. “Primary School Model” of cases G, H and I.

5.3.2 “Ph.D. Students Model” in the U.S.

In the U.S. we found many case of “PhD student models”, which means we did not find much evidence of experiential learning. However, there are still many close collaborative learning activities in local knowledge networks. In order to constantly keep integration with cutting-edge technologies, Chinese companies would like to act as “Ph.D. students” and be embedded in local innovation system. Moreover, US-based R&D units open a window to let Chinese engineers talk to “professors” directly.

As the oldest R&D unit(s) among our cases in the U.S., ZTE (case 3) is still going on study for its doctorate, and receiving only one doctoral degree cannot satisfy ZTE anymore. When ZTE graduates from one major, it will study for the next doctoral degree (See figure 11). This is largely because new telecommunication technologies are upgrading frequently, and every technology or product has a lifecycle. While new technologies are continuously emerging and old technologies are maturating, these prior R&D branches are going through a functional shift from technological R&D to market service. For instance, the R&D branch in San Diego has lost its original functional position of high-end CDMA talent base since CDMA technologies have become matured. These CDMA specialists who work in San Diego gradually changed their role of technological explorer to serve market exploitation in the U.S..

ZTE US now has shifted their focus from telecommunication system & equipment to microelectronics. At present, China has cultivated a strong R&D capability of system equipment and even goes beyond the U.S.

“At this moment, micro-electronics has turned into the core competitiveness of telecom industry. We have to possess the R&D capability to develop microelectronic components, microelectronic chips, etc. in order to take leadership in system equipment. We have many low-end microelectronic chip providers but lack high-end microelectronic chip providers. If we wait for someone else's R&D outputs, we will lag behind. Therefore, we now have put considerable efforts into the R&D of high-end chips (interview, case 3).”

The other cases (except for case 1) we observed in the U.S. are newly established compared to ZTE. However, these cases all reveal the characteristics of “Ph.D. candidates”. These R&D units are integrated into local innovation system and their ties to the U.S. seem to be closer and uneasily cut off compared to the “primary school model”/“technical school model”.

First, “Ph.D. candidates” recruit local high-level specialists in certain technological fields but do not dispatch Chinese engineers from headquarters to form their R&D team. An example is Alibaba. Currently, all the R&D employees in the U.S. are locally recruited. “Actually, we had intended to bring all the recruited specialists back to China. It is very challenging if the R&D team disjoints with our mainstream business operations. However, we have to consider their ties to the U.S. (e.g. family). In addition, there is also an advantage that we can keep the breath with latest technology if we set up an R&D branch in Silicon Valley (interview, case 4).”

“If possible, we still hope these specialists can stay in China for one year in order to bring back technologies from the U.S. It is an overall goal. Anyway, our knowledge center is based in China (interview, case 4)”
Second, “Ph.D. candidates” also interact with local technological “mentors” based on a long-term consideration.

After the acquisition, SG on the one hand replaced the whole previous R&D team with new recruited technical director and R&D staffs, and on the other hand built up long-term collaborative relationship with local technological providers. In order to maximize business benefits, SG US unit introduces local technological partners into the new product development process at an early stage, and these technological cooperators will finally become the future suppliers of SG US when the co-developed new products are put into production.

“Our local partners participating in the development of our new products at an early stage are our potential suppliers. Our cooperation with these potential suppliers mostly can be viewed as a simple buyer-seller relationship so that both sides maintain a certain degree of independence with a mutual objective. In a vehicle system project, our partners focus on their expertise such as some core automotive technologies, and we specialize in our areas of competence (interview, case 2).”

Through such cooperation, SG US R&D branch obtains multiple advantages: (1) cost advantage. “First of all, such a cooperative approach is appropriate from a cost perspective. We can make the best of external human resources without expanding the scale of our current R&D team, and consequently we also gain cost advantages (interview, case 2).” (2) Face-to-face interaction with “professors”. “Secondly, our own resources are limited, and we need external ideas and comments. During the cooperation with external partners, i.e., potential suppliers, we broaden our thinking and enlighten our minds.”

Last but not least, for the Ph.D. student model, technology exploitation of local market in the U.S. is also an important goal for some Chinese companies. For example, SG US unit plans to further enlarge the scale in order to implement integrative operation from R&D to production and sales. “After we establish this R&D center, our next step in the U.S. is to embark on assembling production. In this case, we will first realize industrial application of new technologies in the U.S., which will be later copied to China for further large-scale production (interview, case 2).”

In such a case, knowledge learned by the “Ph.D. students” is kept and applied to the U.S. market firstly by the Chinese R&D branches and is later transferred back and applied in China due to the different levels of market maturation between the U.S. market and China’s domestic market. This is different from the “primary school” model.

Proposition 3: We find many cases of “Primary School Model” in Europe. After initial very close collaboration, we notice emergence of experiential learning in Chinese R&D units. Meanwhile, we also find the “PhD Students Model” in the U.S. that we do not have much evidence of experiential learning in the U.S. cases. However, we find that many R&D units in the U.S. maintain collaborative learning and highly embedded in local innovation system.

6. Summary and Discussion

6.1 R&D Motive

Two R&D strategies used by Chinese companies have been identified: (1) A strategy of technology exploration in industrialized countries/economies where technological capability is relatively stronger can be adopted by young Chinese companies at an early stage of globalization in order to offset technological weakness at home. This strategy is contracted to the traditional internationalization theory that a strong ‘home base’ with both developed product strategies and core technologies is a necessary precondition for overseas knowledge exploiting and augmenting in those destinations where technological capability is superior to that of MNCs (Kuemmerle, 1999). Utilizing advanced infrastructure, technologies and R&D human resources in developed countries to offset technological weakness at home is applicable for many Chinese companies whose main business is still confined to the domestic market. While facing ever-growing competitive pressure from both home and abroad, how to maintain and enlarge market share in China and seek technology development have become a centrifugal force which accelerates the R&D decentralization process of Chinese companies even before a strong ‘home base’ is built up. (2) An ambidextrous R&D strategy of pursuing a dual motive, i.e., technology exploration and technology exploitation, at the same time. During the international expansion process of emerging multinationals, an ambidextrous behavior has been identified as a unique strategy for simultaneously achieving two disparate goals (Luo and Rui, 2009; O’Reilly and Tushman, 2004). Our evidence is quite similar to the co-orientation dimension of the ambidextrous model that put forward by Luo and Rui (2009) who stated that Chinese companies set both short-term and long-term goals for technology exploration and technology exploitation. On the one hand, short-term financial pressure forces them to seek survival and strive for economic benefits in developed country market, leveraging their existing competitive advantages at home, such as cost advantage. In this case, Chinese R&D units are responsible for adapting their technologies/products to the local market and providing technical support for sales. On the other hand, Chinese companies also clearly recognize that the pacing factor for long-term sustainable development is to obtain core technologies. We think this is an important reason to explain why we didn’t find any cases that play a one-fold role of technology exploitation.

6.2 R&D structure

We discuss the R&D structure of Chinese companies from both horizontal and hierarchical perspectives.

According to our cases, no matter the oldest R&D unit or the youngest one, most Chinese companies remain a participative centralized structure while seeking a balance between internal connectivity and external autonomy. In most of our cases, the overseas R&D units take initiatives in local human resource recruitment and local partners-seeking as well. Moreover, they also have much say in starting a new project. Based on the interviews, such an
autonomy arrangement has much to do with their proximity to technology and market. However, the final decision-making power is still in the hand of Chinese headquarters. There could be several reasons for such an authority distribution. Different from the mature R&D units of developed country MNCs, we found many Chinese R&D units keep a small-scale structure (see table 4, the row of R&D employees) which is only composed of a small amount of elites in certain technological fields, while the majority of R&D resources, including a large number of low-cost as well as skilled R&D labor force are stored by HQ in China. These R&D units cannot to be independent of HQ though they are close to advanced technology and human resource.

Such a small-scale structure is designed in order to occupy advantages of both cost efficiency at home and advanced as well as high-cost technologies and specialists in host countries. Chinese companies therefore construct a specialized hierarchical division of R&D labor that low-value added R&D activities are conducted in China and the overseas R&D units are only responsible for part of high-value added activities. In such an inverted pyramid structure, overseas R&D units play as a member of a whole project team and only can undertake part of the high-value added activities. Consequently, how to appropriately allocate R&D resources and coordinate dispersed R&D units has become the key task of Chinese headquarters. Our evidence shows the common managerial methods used by Chinese companies to coordinate overseas R&D units. Besides formal coordination mechanisms, informal coordination and communication mechanisms, including IT-related communication tools, human resource transfer and project-based teamwork are more effective for learning and knowledge transferring.

6.3 Learning mode

We find different learning modes of Chinese companies when they invest in R&D in the U.S. and Europe. According to our cases, many Chinese companies in Europe prefer to take the “primary school model” while the cases in the U.S. choose the “Ph.D. student model”. There is continuous cooperative-learning going on in the U.S. cases, while a process of ‘labor substitution’ has been started in the E.U. cases. The “primary school model” cases train their Chinese R&D employees by cooperating with local advanced counterparts. However, such kind of cooperation weakens R&D employees by cooperating with local advanced partners. Moreover, we don’t find evidence that these cases are isolated from local innovation system. For some cases, technological advantages also lead to direct exploitation of local market even before the new technologies are applied in China’s domestic market.

In order to seek for the reasons why different learning modes are used by Chinese companies in Europe and the U.S., we try to use secondary sources of data to give some reasonable explanations from a macro-perspective. We propose that learning mechanisms (both static and dynamic) of Chinese R&D abroad is inferred by other variables as follows:

1. First of all, we have to admit that our cases in the U.S. (except for ZTE) are younger than the cases in Europe. It is hard for us to observe the long-term evolutionary process of Chinese companies in the U.S.

2. We propose that such different learning modes reflect certain difference, such as different knowledge levels, in the U.S. and the European market.

(1) Much newer knowledge emerging in the U.S. market/system than in the European market/system. Chinese companies in the U.S. are still catching up since the U.S. has a more innovative and open environment in cutting-edge technologies. According to the 2009 industrial R&D investment scoreboard, the total amount of R&D investment from the U.S. companies is €159.2bn which is higher than the total amount of €122.3bn invested by the E.U. companies. Moreover, The U.S. reinforces its leading position in high R&D-intensity sectors such as ICT-related industry and Pharmacy & Biotech industry, which account for 69% of the US companies’ R&D investment. By comparison, almost half of the R&D investment from the E.U. companies derive from medium-high R&D sectors (EC, 2010).

(2) Cross border movement of qualified human resource from China to the U.S. The U.S. is a traditional country of immigrants, which is an attractive place for Chinese intelligentsia. For example, Chinese and India immigrants have become the largest groups of high-technology, high-skill immigrants and recently substantially increase in the region of Silicon Valley (Saxenian et al., 2002). Chinese immigrants have various professional ties to their native countries, and prone to keep a close relationship with Chinese companies and even Chinese government. In this case, we propose that the collaborative climates in the U.S. are more specific and suitable for Chinese companies than that in Europe.

7. Conclusions and implications

Recently, more and more MNCs from emerging and developing countries are investing in developed countries rather than other developing countries. International business scholars have noticed this new phenomenon and are urged to systematically explore the differences between the new wave of third-world-MNCs and the old waves, as well as the differences between third-world-MNCs and developed country MNCs (Ramamurti, 2004).

In this paper, we focus on the advanced stage of FDI from China which is a prominent emerging country, and therefore investigate Chinese R&D strategies in Europe and the U.S.. We not only compared Chinese R&D investments in different locations, but also enfold our findings with the current studies on R&D investments.

\[ \text{R&D intensity above 5\%}\]

\[ \text{R&D intensity between 2\% and 5\%}\]
from developed country MNCs. We start a discussion on a new model of R&D internationalization, which entails significant managerial and policy implications for both emerging/developing and developed countries.

7.1 Managerial implications

As we analyzed earlier, many Chinese overseas R&D units in the U.S. and Europe are acting as ambidextrous organizations with a dual motive driven by both technology exploitation and technology exploration. At the initial stage, seeking survival is quite urgent for the Chinese companies just step into develop country markets, and overseas R&D units have to adjust their strategy for the short-term goal and assist in technologies/products adaptation for local market. Meanwhile, they should keep in mind that their predominant task is to explore advanced technologies for a long-term development. It is necessary for Chinese managers to balance the two-sided motives strategically.

We identify several strategies used by Chinese companies when they face the managerial dilemma to reach an equilibrium state of R&D structure with both internal integration and external embeddedness. On the one hand, Chinese companies give overseas R&D units sufficient autonomy to participate in decision-making process since their full exposure to centers of excellence. On the other hand, Chinese companies centralize the power while making important decisions for the sake of optimum allocation of R&D resources in both R&D units and headquarters. Besides the participative-centralization-strategy, informal coordination and communication mechanisms are more effective than formal mechanisms to facilitate bi-directional learning and knowledge transfer.

Moreover, we find a distinctive hierarchical labor division in Chinese companies enabling R&D cost minimization and R&D efficiency maximization. Since emerging and developing countries usually have a large pool of inexpensive labor force, R&D units don’t have to grow to a complete and large scale R&D center, but keep a small number of elites as an upstream link in the R&D chain, where the downstream links are remained in home country.

Learning has become the main theme of Chinese overseas R&D units. However, how to efficiently learn from external knowledge networks is still need to be further investigated. In our cases, we see various learning and cooperation modes, which can be used as a reference by other MNCs from emerging and developing countries as well.

7.2 Policy implications

Europe and the U.S. are two world’s most developed regions that attract more and more investments, especially technology-related investments, from China as well as other emerging and developing countries. The economic concerns as well as national security impacts of Chinese investments have received increasing attention from policymakers in Europe and the U.S. (Burghart and Rossi, 2009; Globerman and Shapiro, 2009; Mathieu, 2006; Nicolas, 2010; Rabellotti and Sanfilippo, 2008).

Our findings demonstrate that many Chinese companies invest in R&D with similar business-related motives but not political or government-driven motives. We also find that Chinese companies deploy different learning modes in Europe and the U.S.. Some cases in Europe tend to insulate themselves from their original partners and increasingly rely on good indigenous labor after a period of collaboration and learning from their local partners. However, we don’t find evidence that Chinese companies in the U.S. are isolating themselves from local innovation system. On the contrary, the cases in the U.S. continuously deepen their local embeddedness by consolidating cooperation with local partners or establishing new partnership as well as recruiting local employees. This deserves special attention from both European and American policy makers. What does this mean for Europe and the U.S.? Why do Chinese R&D investments in Europe and the U.S. show different dynamics? Should policy makers encourage Chinese companies to maintain high level of engagement with local partners?

In addition to the shorter presence of Chinese R&D units in the U.S., we propose that (1) maintaining leadership in cutting-edge technologies, and (2) maintaining attractiveness for high-skilled immigrants are important reasons for Chinese companies to choose a more active and long-lasting learning mode in the U.S.. Moreover, policymakers should not ignore that behind these Chinese companies lies a even larger China’s domestic market. While Chinese companies are increasing involved in the learning and cooperation in Europe and the U.S., they also open a window toward China for their local collaborative partners.

Anyway, technology-related FDI from emerging and developing countries bring both opportunities (e.g., increasing employment opportunities and public revenue) and challenges (e.g., Protection of intellectual property and national security) to the developed countries that urge policy makers to give timely responses.

8. References


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