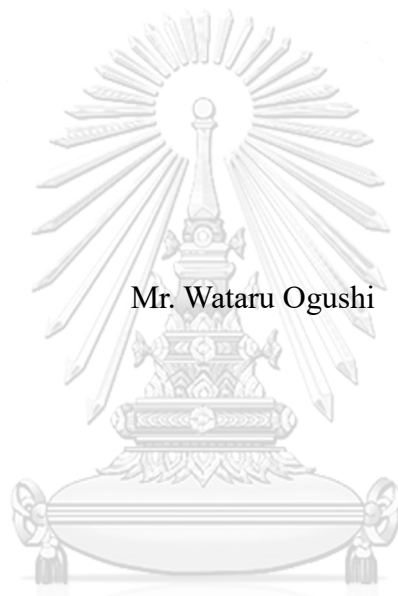


Expatriate Management, Absorptive Capacity of Knowledge, and Subsidiary  
Performance: the Case of Japan-Based Multinational Companies in Thailand and  
Singapore



Mr. Wataru Ogushi

จุฬาลงกรณ์มหาวิทยาลัย

บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)  
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ความสัมพันธ์ระหว่างการจัดการโดยชาวต่างชาติ ความสามารถในการดูดซับองค์ความรู้ และประสิทธิภาพของบริษัทย่อย  
กรณีศึกษาบริษัทย่อยจากบริษัทข้ามชาติญี่ปุ่นในประเทศไทยและสิงคโปร์



นายวาทู โอกุชิ

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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต  
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บทบาทและผลกระทบของกลยุทธ์ต่างชาติที่มีต่อกระบวนการส่งผ่านความรู้จากบริษัทแม่ไปยังบริษัทลูกในต่างประเทศ  
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นอกจากนี้รายงานชิ้นนี้ยังได้วิเคราะห์ถึงผลกระทบของประสิทธิภาพในการรับความรู้และการประยุกต์ใช้ความรู้ของบริษัทลูก  
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รายงานชิ้นนี้ได้รวบรวมตัวอย่างในการศึกษาวิเคราะห์ทั้งหมด 33 ตัวอย่าง โดยรวบรวมจากบริษัทลูกของบริษัทแม่จากประเทศญี่ปุ่น  
ซึ่งดำเนินงานในประเทศไทยและสิงคโปร์ในระยะเวลาทั้งสิ้น 16 ปี จากผลการวิเคราะห์ สามารถสรุปได้ว่า ผลกระทบของกลยุทธ์ต่างชาติที่มีต่อบริษัทลูกนั้น ก่อให้เกิด 1 :  
ส่งเสริมประสิทธิภาพการรับความรู้และการประยุกต์ใช้ความรู้อันสืบเนื่องมาจากกระบวนการส่งผ่านความรู้ด้านเทคโนโลยีในบริษัทลูก แต่ 2 :  
ขัดขวางประสิทธิภาพการรับความรู้และการประยุกต์ใช้ความรู้อันสืบเนื่องมาจากกระบวนการส่งผ่านความรู้ด้านการตลาดในบริษัทลูก อย่างไรก็ตาม  
การรับความรู้และการประยุกต์ใช้ความรู้ของหลักการความรู้ทั้งสองประเภะนั้น 3 : ไม่สามารถสร้างประสิทธิภาพในการดำเนินงานของบริษัทลูก  
หากความรู้ทั้งสองประเภททำงานแยกจากกัน แต่ 4 : ประสิทธิภาพในการดำเนินงานของบริษัทลูกจะเกิดขึ้นได้ต่อเมื่อความรู้ทั้งสองประเภททำงานร่วมกัน นอกจากนี้  
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สาขาวิชา เศรษฐศาสตร์แรงงานและการจัดการทรัพยากร ลายมือชื่อนิติกร .....

มนุษย์ .....ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

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## 5785649429 : MAJOR LABOUR ECONOMICS AND HUMAN RESOURCE MANAGEMENT

KEYWORDS: INTERNATIONAL HUMAN RESOURCE MANAGEMENT / MULTINATIONAL COMPANIES / KNOWLEDGE TRANSFER / EXPATRIATE

WATARU OGUSHI: Expatriate Management, Absorptive Capacity of Knowledge, and Subsidiary Performance: the Case of Japan-Based Multinational Companies in Thailand and Singapore. ADVISOR: ASST. PROF. DR. DANUPON ARIYASAJJAKORN, Ph.D., pp.

The impact of expatriates on knowledge transfer in foreign subsidiaries has been a focus of research on knowledge management in multinational companies (MNCs). This study combines knowledge-based view, the concept of absorptive capacity, and studies on expatriates literature's approach to examine the effect from expatriates on transfer of two kinds of MNC's knowledge (i.e. technological knowledge and marketing knowledge). This paper also analyzes the impact of knowledge absorptive capacity on subsidiary performance to examine how expatriates affect subsidiary performance by knowledge transfer. This study ran analysis of 33 subsidiaries of Japan-based firms in Thailand and Singapore over a 16-year period. Results of analysis indicate that the composition of expatriates in subsidiary workforce 1: promotes absorptive capacity on technological knowledge of subsidiary, but 2: hinders absorptive capacity on marketing knowledge of subsidiary. In addition, absorptive capacity of two kinds of knowledge in subsidiary 3: does not gain subsidiary performance by working separately, but 4: gain subsidiary performance by working together. The implications for expatriate management study and knowledge transfer literature are discussed.

Field of Study: Labour Economics and Human      Student's Signature .....

Resource Management                                      Advisor's Signature .....

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In conclusion, I would like to devote this paper to my father, Ken. He always gave a supportive push on my challenge at Chula. He is now sick in bed in my home country. I would like to hand on my thesis and degree to him soon after I go back to Japan.



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## CHAPTER1: INTRODUCTION

This study examines how expatriate strategy works in multinational companies (MNCs) and affects foreign subsidiaries by analyzing panel data from subsidiaries of Japan-based MNCs. “Do expatriates really work effectively in subsidiaries in comparison with the investment?”-this research started from this question. There are several reasons that MNCs send expatriates to subsidiaries and knowledge transfer is one of main purposes to send expatriates (Bonache and Brewster 2001, JILPT 2003, McNulty et al 2009).

From the knowledge-based view of international human resource management (IHRM), MNCs can be referred as networks of dispersed knowledge across borders (Kogut). Studies on MNCs knowledge management have focused on the impact of knowledge transfer from parent company on subsidiary performance (Delios, 2001 Chang et al 2012), and these studies have focused on transfer of strategically important knowledge, such as technological and marketing knowledge. The role of expatriates here is a knowledge carrier who helps improvement of subsidiary performance by dispersing individual experience and knowledge which are lacking in foreign subsidiaries (Minbaeva, 2004). In addition, they also facilitate decision making of

subsidiaries through applying experience and knowledge in parent companies (Shih et al 2005).

These two roles of expatriates; transfer and facilitation, imply that expatriates affect knowledge transfer from parent firms and subsidiary performance. However, empirical verification on this relationship is somewhat less than enough, yet. This study suggests two possible explanations for the lack of empirical evidence. First, most studies are cross-sectional and have less attention to the effect from lapse of time. As showed in Fang et al (2007), some organizational knowledge takes longer to benefit than others do. Second, earlier studies have not paid enough attention to the process that knowledge transfer benefit to subsidiaries. Several recent previous studies on the relationship of knowledge transfer and subsidiary performance have focused direct linkage of parent firm knowledge and subsidiary performance (Fang et al 2010, Riaz et al 2014). Although these studies conducted panel data analysis, but there was a lack of viewpoint from absorption in subsidiaries. Knowledge in parent companies does not benefit directly, but it practically works after transferred and absorbed in subsidiaries (Chang et al 2012). Absorptive capacity of knowledge is widely used in studies on knowledge management in MNCs (e.g. Cohen and Levinthal 1990, Minbaeva et al 2003), and also applied to studies on knowledge transfer from expatriates to subsidiary

employees (Tsai 2001, Minbaeva et al 2003, Vance and Paik 2005). However, these previous studies also have paid little attention to the effects that takes longer time to benefit. Recent studies also show that the importance of expatriates varies with respect to the growth stages of a subsidiary (Gaur et al 2007, Riaz et al 2014).

This paper examines the linkage of expatriate management, knowledge transfer, and subsidiary performance by using panel data analysis. This research focuses two types of organizational knowledge; technological knowledge and marketing knowledge, because both of these two types of knowledge are strategically important for IHRM, and suitable for fixed-effect analysis, which is the fitted approach to find an effect in long term.

The aim of this research is to define how much the composition of expatriates affects knowledge transfer from a parent company to a foreign subsidiary. This paper suggests that the influence of expatriate managers on the relationship between knowledge absorptive capacity in parent firms and knowledge absorption capability in subsidiaries depends on the type of knowledge. Specifically, this study anticipates that the use of expatriates moderates absorptive capacity for technological knowledge, while the use of expatriates does not moderate absorptive capacity for marketing knowledge. These hypotheses are based ones in Fang et al (2010) and this research aims to reinforce

its idea empirically and theoretically by bringing the absorptive capacity of knowledge to the model. This research uses panel data of over 500 observations from 33 subsidiaries of Japan-based MNCs in Thailand and Singapore over 16 years.

This research anticipates: 1: positive effect of expatriate employment on subsidiary's absorptive capacity, 2: positive effect of subsidiary absorptive capacity on subsidiary performance. In addition, this study also predicts: 3: transferred knowledge (i.e. technological knowledge and marketing knowledge) do not affect subsidiary alone, but 4: they affect subsidiary performance positively when they work together. The result of this study suggests several recommendations on HRM strategy of MNCs on sending expatriates.

### **Research Question**

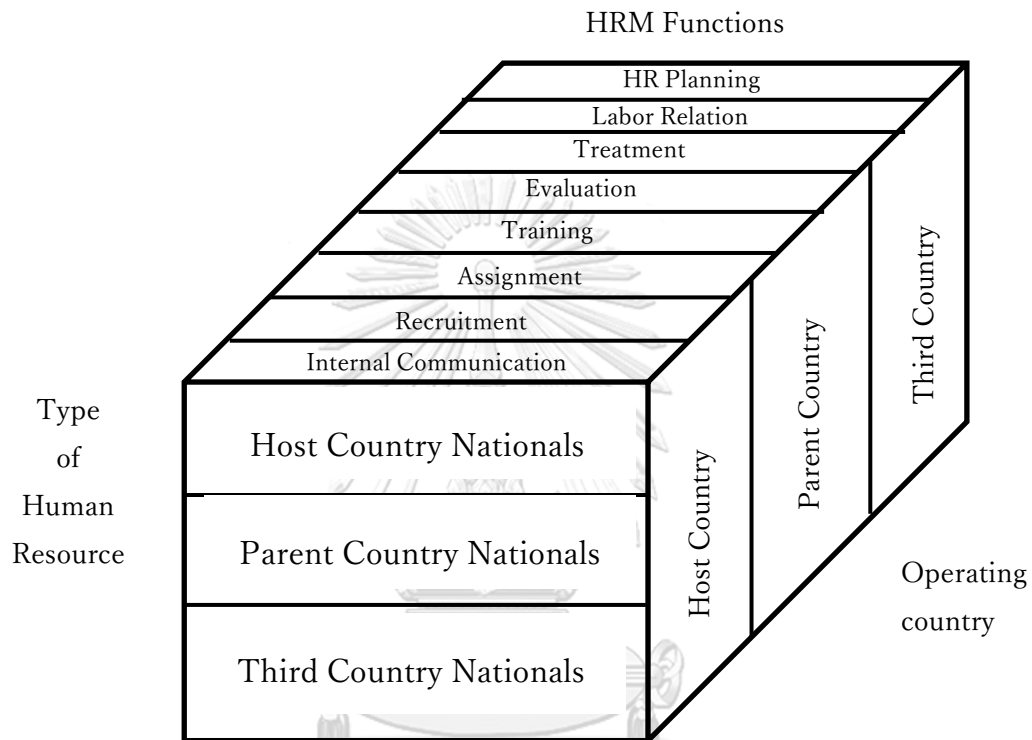
*—How does the change in the composition of the expatriate in workforce work with technical and marketing knowledge transfer in foreign subsidiaries?*

## CHAPTER2: LITERATURE REVIEW

### **The Concept of International Human Resource Management (IHRM)**

International Human Resource Management (IHRM) is defined as a human resource management in multinational companies (MNCs) that have subsidiaries in various companies with various socio-cultural backgrounds. According with Taylor et al (1996), this definition is restated more precisely that “the set of distinct activities, functions, and processes that are directed at attracting, developing and maintaining an MNC’s human resources”. MNC’s human resources stated here can be divided into host country nationals (HCNs), parent country nationals (PCNs), and third country nationals (TCNs). It can be said that the main difficulty of international HRM is this diversity of human resources. It adds an additional layer (or a dimension) on the field of HRM and this complexity of international HRM makes the difference between HRM and international HRM. The factors of international HRM can be shown like Figure 1.

Figure 1: Model of International HRM



Source: Shiraki (2006)

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According to Prahalad and Doz (1987), the main feature of international HRM is represented by “Integration” and “Differentiation”. “Integration” here means an internal governance of a company to coordinate a company’s resources for the strategy, and “Differentiation” here means localization of management required to adapt to the local business environment. Achieving balance of these two contradictory forces is the one of the important factors of international HRM and this balance is affected by

industries, products, regions, and cultural characteristics.

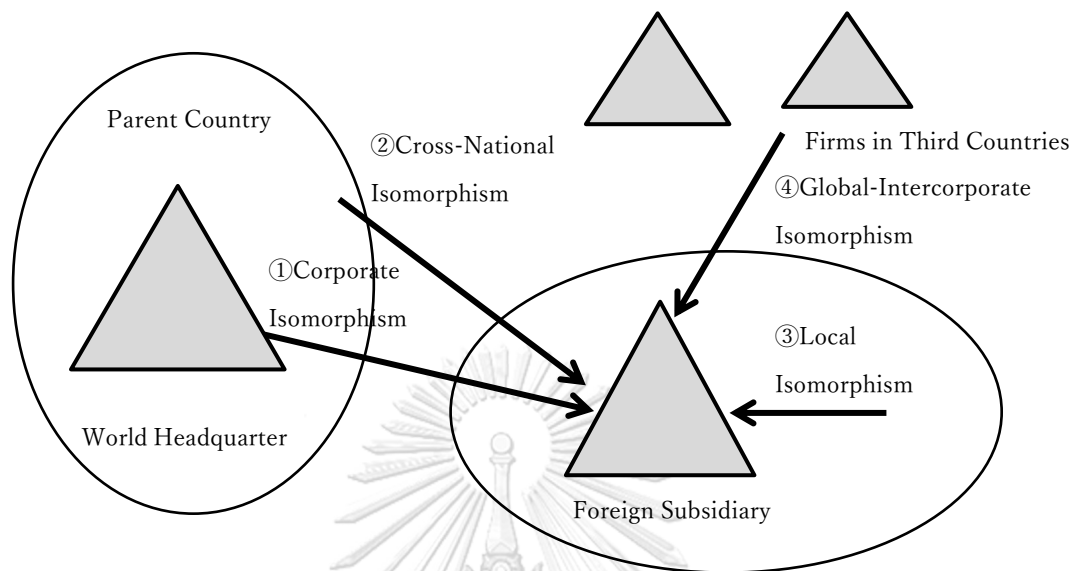
### **International HRM Practices and Characteristics affected by Parents Countries**

Evans (1991) developed this concept of “Integration” and “Differentiation” by dividing each force into two layers; “Product-Market Logic” and “Socio-Cultural Logic”. The “Integration” force in “Product-Market Logic” works to consolidate local marketing strategy into the head quarter’s strategy and “Differentiation” force here works to develop independent strategy from the head quarter. Likewise, “Integration” force in “Socio-Cultural Logic” works to foster a mono-cultural corporate culture and “Differentiation” force here works to foster a localized culture in local subsidiaries. Of course, these factors also get influences by industries, products, regions, and cultural characteristics as well as the framework by Prahad and Doz (1987).

Ferner and Quintanilla (2003) argued the framework with broader environment among foreign subsidiaries from the study on subsidiaries in Germany and Spain of US-owned firms. This theory contains four forces working toward building an international HRM system of foreign subsidiaries (Figure 2).



Figure 2: The four isomorphism forces toward foreign subsidiaries



Source: Ferner and Quintanilla (2003) and Shiraki (2006)

The force working here is called isomorphic pressure. This force works to make a homogeneous HRM system and corporate culture in foreign subsidiaries. The first isomorphic pressure is corporate isomorphism, which is from the parent company. World headquarters have distinctive systems on HRM and they transfer the systems to foreign subsidiaries. The second pressure is the one from the country of origin, which is called cross-national isomorphism. This force actually works indirectly converging with the corporate isomorphism pressure. Thus, this force can be treated as a part of the corporate isomorphism pressure. The third pressure is from the country where company is located, and this force is called local isomorphism. Wherever the country of origin is, every company cannot avoid influence from the local country. The fourth force is from

other companies located in third countries. This force is called global-intercorporate isomorphism. Influences from other companies in third countries have grown due to development of information-communication technologies and best practices in other countries are transferred to other firms easier than before. Every foreign subsidiary's HRM system gets influenced by these four isomorphism forces above. Or the number of forces can be treated as three when cross-national isomorphism is treated as the part of corporate isomorphism. The way these forces work builds HRM system in a foreign subsidiary.

There were some arguments against the discussion above, which argue that international HRM system in MNCs converge into each "Best-practice" HRM system (Jain et al (1998), and Myloni et al, (2004)). Tempel et al (2006) rebutted these arguments by empirical research of US-based MNC located in Germany, Britain. This study concluded that foreign subsidiaries are affected by national business systems in local countries and HRM systems there cannot be isolated from these types of influence.

### **Knowledge-based View and Knowledge Transfer in MNC**

Knowledge based-view is the theory that sees a company as a social community whose productive knowledge defines a comparative advantage. Kogut and Zander (1993) argued that knowledge that provides a comparative advantage here is

specialized, firm-specific and tacit knowledge. In the landmark of this study, they wrote; *“By our results, tacitness will increase the cost of transfer and decrease the speed by which knowledge is transferred within the firm or between partners. What firms do is to specialize in the creation and transfer of specialized knowledge. ...Competition among firms is based upon their differential capabilities and their abilities to expand by the creation and replication of new knowledge faster than the initiative and innovative efforts of competitors”*.

Once the knowledge is transferred, it enables multinational firms and their subsidiaries to achieve superior performance (Delios and Beamish 2001, Fang et al 2007, 2010, Krishnan et al 2009, Chang et al 2012). However, as citation above mentioned, strategically important tacit knowledge, such as technological knowledge or marketing knowledge, are likely to resist to be transferred. Thus, the main scope of studies on knowledge transfer has been the factors affect knowledge transfer. Fang et al (2007) found that marketing knowledge in parent company does not affect foreign subsidiary performance positively in short term, but do in long term, in contrast with fungible knowledge, such as internationalization experience and host country experience positively influence performance in short term, but not in long term. Kostova and Roth (2002) found institutional compatibility between institutional profile

of host country and relational context of the MNC affect degree of implementation of organizational practice.

### **Absorptive Capability of MNC Subsidiary**

The factor that has been studied the most on this topic is absorptive capability of subsidiaries. Cohen and Levinthal (1990) argued that absorptive capacity of a firm is the ability to recognize the value of new, external information. They measured company level absorptive capacity by R&D intensity, which is calculated by R&D expenditure divided by sales amount, since as they wrote *“There is a key insight that permits empirical tests of the implications of absorptive capacity for innovative activity. Since technical change within an industry – typically incremental in character – is often related to a firm’s ongoing R&D activity, a firm’s ability to exploit external knowledge is often generated as a byproduct of its R&D. We may therefore consider a firm’s R&D as satisfying two functions: we assume that R&D not only generates new knowledge but also contributes to the firm’s absorptive capacity.”* The concept of absorptive capacity was accepted and widely employed (e.g. Lane and Lubatkin 1998, Lyles and Salk 1996).

The same logic of theory was applied to marketing knowledge, (Day 1994, Dierickx and Cool 1989), and marketing intensity has been used for measuring company’s capacity to adopt markets of goods and services. Since characteristics of

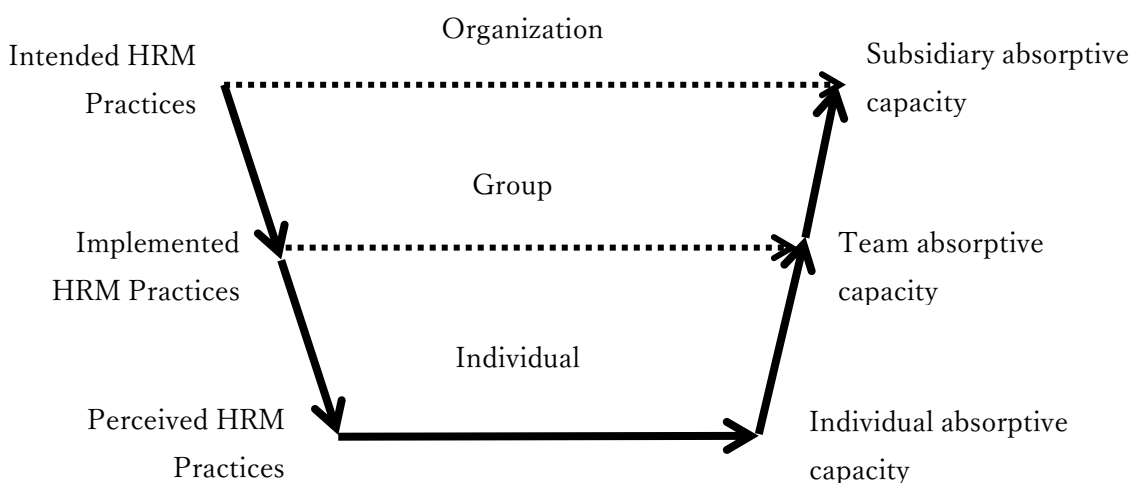
markets vary according to market environment and goods or services to sell, marketing knowledge is location-specific and difficult to transfer (Hulland 1999). Thus, marketing intensity reflects the firm's absorptive capacity to respond consumer and suppliers' trend. This set of two knowledge absorptive capacities was employed by various empirical studies (e.g. Delios and Beamish 2001, Fang et al 2010).

A number of empirical studies have focused on the relationship between knowledge transfer and the absorptive capacity (e.g. Tsai 2001, Minbaeva et al 2003, Vance and Paik 2005, Chang et al 2012). Since knowledge is transferred from specific individuals to specific individuals practically (Grant 1996), previous studies on knowledge transfer have worked into macro to micro, to explore this topic more in detail. Tsai (2001) focused absorptive capacity of business unit, and Minbaeva et al (2003), Minbaeva (2004) and Vance and Paik (2005) focused absorptive capacity of employee level. Especially, the method of approach by Minbaeva et al (2003), which measured employees' absorptive capacity by their ability and motivation, was widely accepted and applied in other studies (e.g. Minbaeva 2004, Bjorkman et al 2007, Williams 2009). As the scope of studies become micro-oriented, less attention has been paid for firm-level absorptive capacity. Behind this trend, there were criticisms on the method by Cohen and Levinthal (1990) (Zahra and George 2002, Lane and Lubaktin

1998). Zahra and George (2002) criticized application of firm-level measurements of absorptive capacity (like R&D intensity or number of employees working in R&D section) and argued that such measurements have been rudimentary and do not fully reflect the richness of the construct. Thus, previous studies have explored questionnaire-based, individual-level static models, such as the model uses Likert-scale transfer of knowledge as a target variable by Minbaeva et al (2003).

However, of course, there are some flaws on previous studies. First, studies on individual-level absorptive capacity have overlooked the influence from the parent companies' strategy. Yet the absorptive capacity ultimately belongs to the mind of individuals (Grant 1996), synergies are aligned with an entire organizational strategy. Minbaeva et al (2014) pointed out this problem and argue the need for multi-level research logic. (Figure 3)

Figure 3: The theory bridging micro and macro



Source: Minbaeva et al 2014

As the trend of previous studies shows, the flow of knowledge-transfer HRM practices from organizational level to individual level (or macro to micro), and individual-level knowledge transfer (the bridge over the left side of Figure 3 to the right side) have been main scopes of previous researches. However, yet the interest on multi-level research on IHRM studies have been growing in recent years, theoretical development is not enough. This line of researches calls for a better theoretical understanding of the interplay of knowledge between the different levels.

Second, the method of previous studies was not appropriate to capture the effect in the long term. As Minbaeva et al (2014) pointed; papers published on the topic of absorptive capacity during the last decade are dominated by cross-sectional, individual analyses. They argued that development of theory on dynamic models of knowledge transfer is needed and wrote; *“In this regard, access to proper data is again lagging the theoretical development, as solid studies of the dynamics will require longitudinal data, which are hard to obtain for the individual level”*. Is there any room for further study on knowledge transfer and absorptive capability from empirical side, which uses the method with theoretical backup?

I suggest the possibility of subsidiary-level panel analysis on the relationship between expatriate management and absorptive capacity of subsidiaries.

### **Expatriate Management on Knowledge Transfer and Absorptive Capacity Studies**

Knowledge transfer in MNC subsidiary is implemented mainly by an expatriate, who is the carrier of firm-specific and tacit knowledge (Minbaeva 2003). Hence, the role of expatriate on knowledge transfer and absorptive capacity in foreign subsidiary has been studied by various angles. Bonache and Brewstar (2001) is one of the earlier studies on the theory of relationship between use of expatriates and knowledge transfer. They argue that knowledge transferred by expatriates should be tacit knowledge and use of expatriates to transfer explicit knowledge should be avoided for the cost: they wrote “expatriates are a basic mechanism to transfer tacit knowledge”. Vance and Paik (2005) focused the learning of HCN from expatriate management by positions and found the difference among their role due to their positions. (Table1)

Table 1 HCN employee level HCN learning

<b>Operative level</b>	<ul style="list-style-type: none"> <li>• New employee orientation</li> <li>• Entry job skills</li> <li>• Parent company predominant language</li> <li>• Expatriate and MNC home country cross-cultural awareness</li> </ul>
<b>Supervisory and middle management</b>	<ul style="list-style-type: none"> <li>• Supervision and technical operations management</li> <li>• MNC home country cross-cultural awareness supporting expatriate interaction</li> <li>• Expatriate coaching</li> <li>• Liaison role between parent company expatriates and lower level HCNs</li> </ul>
<b>Upper management</b>	<ul style="list-style-type: none"> <li>• Advanced technical system operations</li> <li>• Subsidiary business level strategy</li> <li>• Parent company (MNC) strategy</li> <li>• Parent company (MNC) culture</li> </ul>

Source: Vance and Paik 2005

This result implies more than the difference among HCNs learning due to their position. As the authors pointed, expatriates transfer external knowledge from parent



companies such like parent company predominant language or cross-cultural awareness from operative level HCN employees. They wrote; “These categories relate to forms of HCN learning that would directly contribute to and facilitate immediate and longer-term absorptive capacity within the MNC by increasing HCN receptivity to external knowledge in the host country environment, as well as building attribute similarity to the expatriate, thus leading to increased inter-unit similarity and successful flow of information between HCNs and expatriates”. Minbaeva et al (2003) focused HCN employees’ ability, motivation and knowledge transfer from parent companies. Since transferred tacit knowledge here is from expatriates, expatriates’ share in the firm is included in the model here. However, this study found no significance effect from the share of expatriates. Chang et al (2012) succeeded to find significant relationship of expatriate management, knowledge transfer and company performance by focusing the ability and motivation of expatriates. They argued that competent expatriates promote effective knowledge transfer and transferred knowledge works positive on company performance.

#### **Application of panel data analysis on knowledge transfer context**

Previous studies above have a problem in common: these studies did not handle the lapse of time. Indeed, cross-sectional and questionnaire-based studies have enabled researchers to examine factors that are difficult to detect only by financial data.

However, as mentioned before, this method of research does not fit to capture the effect that takes long to benefit.

In recent years, the panel data analysis has become used on this topic (Fang et al 2007, 2010, 2013, Riaz et al 2014). However, I found the lack of measurement of subsidiary absorptive capacity from the models in any studies.

Fang et al (2010) focused effect from parent companies' technological knowledge, marketing knowledge and expatriate ratio on subsidiary performance. The main scope of this study is the use of expatriate as a transfer mediator of parent company's technological and marketing knowledge: the former is represented by parent company's R&D intensity and the latter is represented by marketing intensity, respectively. They divided the role of expatriates into two: as knowledge carrier individuals, and as knowledge transfer mediators. The former role is the same role as mentioned already, and they mentioned the latter role by using the word "homophily", the word which means the degree to which two or more individuals who interact are similar in certain attributes such as beliefs, education, and social status (Rogers 1995);

*"Expatriates can increase the level of homophily between the parent and subsidiary in terms of common language, meanings, norms, and values. This then results in a stronger absorptive capacity for the subsidiary, which in turn allows for more effective*

*knowledge transfer*". This study found diminishing effect of interaction variable of technological knowledge and expatriate on subsidiary performance. This result implies that the return from technological knowledge from expatriate diminishes according to subsidiary growth.

Although they employed subsidiary absorptive capacity as source of influence from parent company's knowledge on company performance, there is no variable measuring subsidiary absorptive capacity inside the model, at first sight. Indeed, there is no theoretical support for the relationship between parent firm's knowledge and subsidiary absorptive capacity. However, is it possible to consider R&D and marketing knowledge, the variable represented parent company's knowledge, as the absorptive capacity of parent firm? I found that the model of Fang et al (2010) can be more convincing and theoretically and empirically supported when treated as the model of "absorptive capacity transfer", since the relationship between parent firm's absorptive capacity and subsidiary's absorptive capacity from the approach by Cohen and Levinthal (1990) is theoretically and empirically supported (Hennart et al 1999, Belderbos 2002, Kotabe et al 2002). This study explores more about this idea and entire model in the methodology section of this paper.

Riaz et al (2014) focused the relationship between expatriate deployment and

subsidiary growth from knowledge based view. They revealed that: 1; the firm which employs more expatriates at founding achieves higher growth over time, 2; the firm which reduces the proportion of expatriates slower achieves higher growth over time. They also argued the logic behind this: *“Expatriates can be considered to serve a role comparable to organizational founders through their administrative capabilities...A higher proportion of expatriates deployed at subsidiary founding is thus congruent with higher level of administrative capabilities available for knowledge transfer, control and coordination”* “When expatriate levels change gradually, a subsidiary is able to maintain a better fit between subsidiary staffing and the requirements for subsidiary growth”. These two arguments imply that expatriates affect absorptive capacity of subsidiaries the most at founding and they play the role on knowledge transfer over time. However, this study also does not have function to measure subsidiary absorptive capacity, although they used parent R&D intensity as a measurement of knowledge to be transferred.

Though this is not a panel data analysis on expatriate management, but as a previous study on knowledge transfer over time, I would like to give one more empirical study example from Delios and Beamish (2001). This study examined the relationship between knowledge in parent company and subsidiary’s survival over time. They

argued that technological knowledge and marketing knowledge of parent company contributes the survival of subsidiaries over time. They mentioned parent knowledge as the source of competitiveness of subsidiaries, but they did not measure knowledge transfer or absorptive capacity of subsidiaries.

I suggest two reasons of this absence of the absorptive capacity concept in previous studies on subsidiary absorptive capacity. First, the main scope of previous studies on absorptive capability has been individual-oriented, as argued already. Minbaeva et al (2014) mentioned the trend of last decade like this: *“In fact, it could be argued that an organization cannot have any absorptive capacity independent of its employees”*. However, actually, as they quoted Cohen and Levinthal (1990), *“a firm’s absorptive capacity is not ... simply the sum of the absorptive capabilities of its employees, and it is therefore useful to consider what aspects of absorptive capacity are distinctly organizational”*. Yet there are criticisms on the use of R&D as a measurement of subsidiary absorptive capacity (Zahra and George 2002, Lane and Lubatkin 1998), there is no other theoretically and empirically target variable of “distinctly organizational” absorptive capacity, which can be applied to the methodology with time-frame. Second, foreign subsidiaries’ historical financial data is difficult to collect. Since the method by Cohen and Levinthal (1990) is well-known

and classic, it might seem to be unnatural that there is no previous study handling subsidiary absorptive capacity with longitudinal data. However, the access to historical financial data of foreign subsidiaries is limited. Although there are over 28,000 subsidiaries of Japanese firms all over the world, the data source of financial historical data of foreign subsidiaries is quite difficult to obtain and normally not available for individual researchers. Cross-sectional and questionnaire-based survey can address financial data of foreign subsidiaries and there are a number of studies examining knowledge transfer by using subsidiaries' financial data, including subsidiary R&D intensity (Tsai 2001, Belderbos 2003, Zhang et al 2007, Krishnan et al 2009). However, it is difficult to collect the data over years by individual level and clearly this is the bottleneck of the study.

Latest paper pointed out the need of new theoretical framework of analysis with longitudinal data. Minbaeva et al (2014) suggested the possibility of dynamic model on this topic, but theoretical construction is not enough. Therefore, this study suggests the panel-data analysis by financial data of subsidiaries which are listed in stock markets.

### **Japanese MNCs' expatriate strategy**

This study focuses on subsidiaries of Japan-based MNCs. I choose Japan-

based MNCs for several reasons. First, when compared with European firms, Japanese MNCs send more expatriates, especially to senior management (Rosenzweig 1994). Second, Japan is one of the largest investors in Thailand and Singapore, which are the geographical scope of samples in this study. Third, Japanese companies expect relatively long time for recovery of investment than other countries (Shih et al 2004), and this tendency works positively for the method of this study; panel data analysis. Here I review context of Japan-based MNCs briefly.

Rosenzweig (1994) analyzed management system of 249 foreign-owned enterprises in the U.S. and found characteristics of each parent country. This study focuses four points of management; marketing, HRM, manufacturing, and financial management. The remarkable discovery of this study for this study is the rate of expatriates in executives, CFO and CHO of each parent country. (Table 2-5)

(Unit: %, No. of companies)

Table 2 Ratio of expatriates in foreign-owned companies located in the U.S.

	0%	1%	2~5%	6~10%	11% or above	Sum (Sample size)
Canada	64	18	14	4	0	100(22)
France	33	33	25	0	9	100(12)
Germany	34	24	22	5	15	100(41)
Japan	16	8	24	32	21	100(38)
Netherland	56	22	11	0	11	100(9)
Sweden	50	29	14	7	0	100(14)
Switzerland	47	13	26	0	13	100(15)
U.K.	54	23	15	2	6	100(48)
Sum	42	20	19	9	10	100(199)
Sum (except Japan)	48	23	18	3	8	100(161)

Table 3 Ratio of CFO's Nationalities

	U.S.	Parent Country	Third Countries	Sum(Sample size)
Canada	78(18)	22(5)	0	100(23)
France	69(9)	23(3)	8(1)	100(13)
Germany	76(31)	17(7)	7(3)	100(41)
Japan	33(15)	67(30)	0	100(45)
Netherland	89(8)	0	11(1)	100(9)
Sweden	86(12)	14(2)	0	100(14)
Switzerland	100(15)	0	0	100(15)
U.K.	90(45)	6(3)	4(2)	100(50)
Sum	73(153)	24(50)	3(7)	100(210)
Sum (except Japan)	84(138)	12(20)	4(7)	100(165)

Table 4 Ratio of executives' nationality

	U.S.	Parent country	Third countries	Sum (Sample size)
Canada	75(18)	21(5)	4(1)	100(24)
France	85(11)	15(2)	0	100(13)
Germany	56(25)	33(15)	13(6)	100(45)
Japan	29(14)	71(35)	0	100(49)
Netherland	78(7)	11(1)	11(1)	100(9)
Sweden	80(12)	13(2)	7(1)	100(15)
Switzerland	50(8)	25(4)	25(4)	100(16)
U.K.	75(39)	17(9)	8(4)	100(52)
Sum	60(113)	33(73)	8(17)	100(223)
Sum (except Japan)	68(119)	22(38)	10(17)	100(174)

Table 5 Ratio of executives' nationality

	U.S.	Parent country	Third countries	Sum (Sample size)
Canada	75(18)	21(5)	4(1)	100(24)
France	85(11)	15(2)	0	100(13)
Germany	56(25)	33(15)	13(6)	100(45)
Japan	29(14)	71(35)	0	100(49)
Netherland	78(7)	11(1)	11(1)	100(9)
Sweden	80(12)	13(2)	7(1)	100(15)
Switzerland	50(8)	25(4)	25(4)	100(16)
U.K.	75(39)	17(9)	8(4)	100(52)
Sum	60(113)	33(73)	8(17)	100(223)
Sum (except Japan)	68(119)	22(38)	10(17)	100(174)

Source: Rosenzweig (1994)

The finding of this research is the uniqueness of Japanese companies' expatriate strategy. Its characteristics are 1; high ratio of expatriates in every section, and 2; low ratio of third nationals in executive positions. The possible reason of this characteristic is ethnocentric culture of management in Japanese companies. The



important implication and question here is adequacy of this culture of the international HRM system by Japanese companies.

According to JILPT report (2003), major reasons that Japanese companies send expatriates are 1; to transfer skills, know-how, and corporate culture 2; for liaison job between subsidiary and parent company 3; because of the short of human resource in management position. This survey also contains information about relationship among industries, the ratio of expatriates and region of companies located. (Table 6-8)

Table 6 Relationship between ratio of expatriate and industries

	Ratio of expatriates	No.of Companies	Std. Dev.
Manufacturing	7.3	292	12.6
Non-Manufacturing	13.0	217	12.6
Sum	9.7	509	12.9

Source JILPT(2003)

Table 7 Region of subsidiaries located and ratio of expatriates

	Ratio of expatriates	No. of companies	Std. Dev.
Asia	6.2	222	9.2
Middle-East	9.7	14	8.9
Europe	12.6	109	16.1
North America	13.2	65	14.7
Latin America	10.3	71	9.6
Africa	6.7	11	5.9
Oceania	16.2	34	19.5
Sum	9.7	526	12.9

Source JILPT(2003)

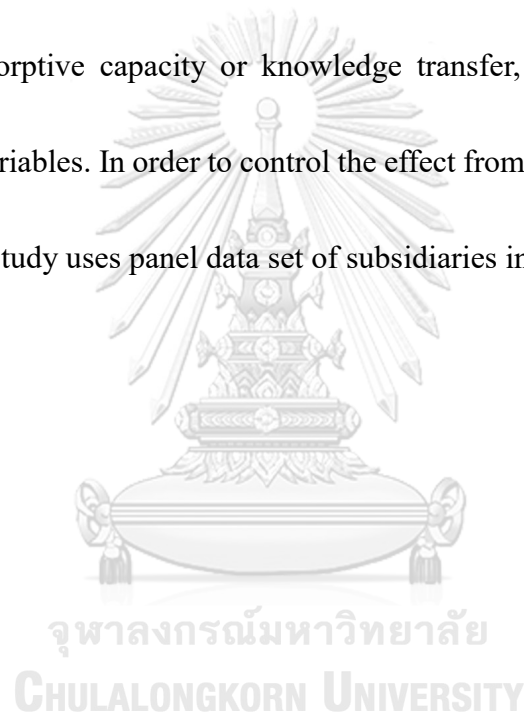
Table 8 Industry of companies

	Manufacturing	Non-Manufacturing	Sum
Asia	122	95	217
%	56.2	43.8	100.0
Middle-East	7	7	14
%	50	50	100.0
Europe	74	30	104
%	71.2	28.8	100.0
North America	36	25	61
%	59.0	41.0	100.0
Latin America	33	37	70
%	47.1	52.9	100.0
Africa	5	5	10
%	50.0	50.0	100.0
Oceania	15	18	33
%	45.5	54.5	100.0
Sum	292	217	509
%	57.4	42.6	100.0

Source JILPT(2003)

The important finding from this table is the relationship among region, industries and ration of expatriate. In Table 6, it is showed that companies in non-manufacturing industry have more expatriates than in manufacturing industry. However, the result showed in Table 7 and 8 is partly against the prediction from the result in Table 6. In Table 7, ratio of expatriates in North America is higher than in Asia. At first sight, it can be related with the prediction of “the more companies in manufacturing sector, the less expatriates in the country”, so the ratio of manufacturing sector in North America should be less than in Asia. However, the ratio in North America is more than in Asia. This result shows that we cannot measure the impact of expatriates only with control of industry, operation years or host country, but also with the control of other factors. A number of studies have examined factors determining expatriate employment

strategy, such as years of operation (Riaz et al 2014, Beamish and Inkpen 1998, Kobrin 1988), cultural distance between the parent company and host country (Gong 2003, Chang et al 2012), industry relatedness between the parent company and the subsidiary (Fang et al 2013, Riaz et al 2014), in-house human capital accumulation in the subsidiary (Shiraki 2006) etc. Hence, the effect from expatriate management, such as promotion of absorptive capacity or knowledge transfer, has to be measured with control of these variables. In order to control the effect from cultural distance and years of operation, this study uses panel data set of subsidiaries in Thailand and Singapore.



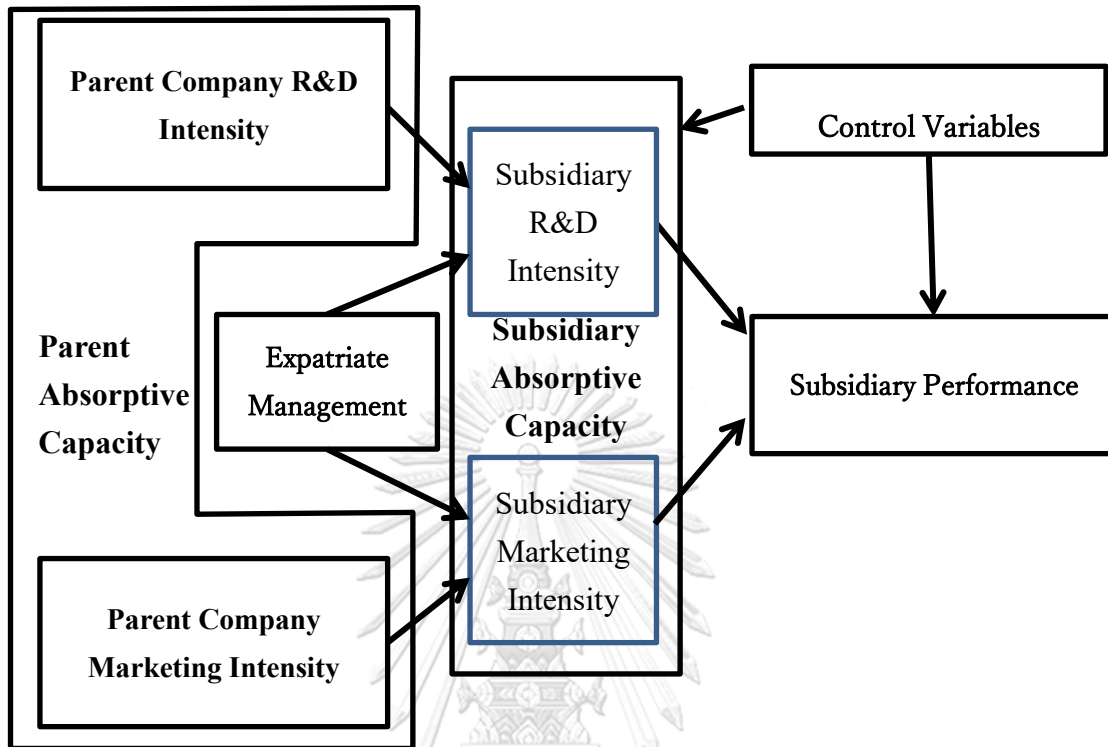
## CHAPTER3: METHODOLOGY

### Conceptual Framework

The entire conceptual framework of this study is represented diagrammatically in Figure 4. The model can be divided into 2 stages; Stage1: the model of how parent company's absorptive capacity and expatriate management affect absorptive capacity of subsidiaries, Stage 2: the model of how absorptive capacity affects subsidiary performance. The entire conceptual framework is designed to resolve the framework of Fang et al (2010) into two stages as above. They examine the direct relationship between parent firm's knowledge, expatriate employment and subsidiary performance but their model would be more convincing and significant with this dissolution. This improvement has two benefits: 1; it enables analysis of the effect from parent absorptive capacity and expatriate management separately, 2; it explains the relationship between expatriate management and subsidiary performance more logically.

**Figure 4: Framework of this study:**

**Expatriate management, Knowledge Absorptive Capacity, and Subsidiary performance**



Conceptual framework: extracted from Fang et al (2010)

**Stage 1: The model of how parent absorptive capacity and expatriate management affect subsidiary absorptive capacity**

This part focuses the process of how subsidiary's knowledge absorptive capacity is affected by parent company's absorptive capacity and expatriate management. The aim of this part is to breakdown the model of Fang et al (2010) and to examine the effect from parent firms on absorptive capacity of subsidiaries by the new model with more theoretical support. The relationship between absorptive capacity of parent firm and the one of subsidiary is examined by studies in R&D or marketing

localization context (Hennart 1999, Kotabe et al 2002, Belderbos 2003). The main focus of this stage is how expatriate employment affects subsidiary absorptive capacity. The influence from expatriate on subsidiary's absorptive capacity is widely studied already (e.g. Minbaeva et al 2003, Xu et al 2004). Expatriates promote the subsidiary's absorptive capacity by their knowledge and experience (Riaz et al 2014). The aim here is to examine influence from expatriate employment on subsidiary absorptive capacity overtime.

### **Stage 2: The model of how absorptive capacity affects subsidiary performance**

This part focuses the influence of knowledge absorptive capacity on subsidiary performance. A number of studies have examined this relationship and have found that absorptive capacity of subsidiary affects subsidiary performance positively (Krishnan et al 2009, Chang et al 2012). As Cohen and Levinthal (1990) argued, the development of absorptive capacity of subsidiary promotes knowledge transfer, enables subsidiary to allocate resource for innovative activity, and contributes subsidiary performance over time. The aim here is to examine how subsidiary absorptive capacity works on subsidiary performance over time. This paper anticipates that this longitudinal analysis on absorptive capacity will capture its effect in long term.

### **Data collection**

This study developed dataset of subsidiaries of Japan-based MNCs in Thailand

and Singapore from 2000 to 2015. Japan-based MNCs are chosen for several reasons. First, when compared with European firms, Japanese MNCs send more expatriates (Rosenzweig 1994). Second, Japan is one of the largest investors in Thailand and Singapore, which is the geographical scope of samples in this study. Third, Japanese companies expect relatively long time for recovery of investment than other countries (Shih et al 2004). These tendency works positively for the method of this study, panel data analysis. To avoid the effect from host country (Gong 2003, Chang 2012), this study focuses on subsidiaries in Thailand and Singapore. These two countries are selected for: 1; Japan is one of the largest investors there 2; the number of listed Japan-based companies there is larger than in other countries. This study collected subsidiary-level data from *Kaigai Shinshutsu Kigyō Soukan, Kuni-betsu (Japanese Overseas Investment, by-country edition) Ver.2000-2015* by Toyo-Keizai Publishing, SETSMART database provided by Stock Exchange of Thailand, and SGX Net database by Singapore Exchange. Parent-level data is collected from eol<sup>TM</sup> database by Pronexus Inc. Other macroeconomic data are extracted mainly from World Bank database.

In addition, in case that there were collisions between sources of data, this study employed subsidiary-level data. For instance, some subsidiaries reported the number of expatriates in SETSMART data and the data there were different to the one

provided by *Kaigai Shinshutsu Kigyō Souran*. In cases like this, this study applied subsidiary-level data because the data from SETSMART is reported from subsidiary itself but the one from *Kaigai Shinshutsu Kigyō Souran* is the database collected from phone interview in parent companies. Therefore, the data from SETSMART can reflect real fluctuation of subsidiary business activity and this study applied them. This study used 16-year long data set because it can take over 10 years for Japan-based MNCs to realize a recovery of investment on subsidiaries (Tachiki 1999). The number of subsidiaries used in the sample is 29 Thai subsidiaries + 4 Singaporean subsidiaries = 33 subsidiaries. Data size is 33 subsidiaries  $\times$  16 years = 528 samples. Actual sample size used in each model is less than 528 because of unbalance structure of dataset from the lack of data. Due to the restriction from required length of time and geographic scope of samples, sample size is inevitably limited.

### **Models**

Panel data analysis has three approaches of regression modeling: pooling OLS, Random effect model and fixed-effects model. This study applies fixed-effects model to each model. This method is adequate for this study in terms that: 1: this method enables analysis of factors varying according to the lapse of time, 2: this method can control effects from unobserved factors (Wooldredge 2013). This study uses least square dummy variable model (LSDV model) for coefficient estimation. Since this



method needs several assumptions before the use, the adequacy and validity of the application of fixed-effects models is discussed in Appendix I. All models are run by statistics analyzing package software Gretl Ver.2016a.

**Model 1&2: The model for subsidiary intensity**

$$\begin{aligned} \text{Equation 1: } (SubR\&D_{it} - \overline{SubR\&D}_i) &= \\ &\beta_1(X1_{it} - \overline{X1}_i) + \beta_2(X2_{it} - \overline{X2}_i) + \dots + (\mu_{it} - \overline{\mu}_i) \\ \text{Equation 2: } (SubMKT_{it} - \overline{SubMKT}_i) &= \\ &\beta_1(X1_{it} - \overline{X1}_i) + \beta_2(X2_{it} - \overline{X2}_i) + \dots + (\mu_{it} - \overline{\mu}_i) \end{aligned}$$

Where *SubR&D*=Subsidiary R&D intensity  
*SubMKT*=Subsidiary marketing intensity  
*X1*=Subsidiary age (year)  
*X2*=Subsidiary size  
*X3*=Capital contribution from parent firm (percentage)  
*X4*= Composition of expatriates in workforce  
*X5*=Composition of expatriates in executive board members  
*X6*=Parent firm R&D intensity (Model 1 only)  
*X7*=Parent firm marketing intensity (Model 2 only)

**Model 3&4: The model for subsidiary performance**

$$\begin{aligned} \text{Equation: } (SubPerf_{it} - \overline{SubPerf}_i) &= \\ &\beta_1(X1_{it} - \overline{X1}_i) + \beta_2(X2_{it} - \overline{X2}_i) + \dots + (\mu_{it} - \overline{\mu}_i) \end{aligned}$$

Where *SubPerf*=Subsidiary Performance(ROS)  
*X1*=lag of subsidiary performance  
*X2*=Subsidiary age (year)  
*X3*=Subsidiary size  
*X4*= Subsidiary R&D intensity (Model 3 only)  
*X5*=Subsidiary marketing intensity (Model 3 only)  
  
*X6*=Interaction term: Subsidiary R&D intensity  $\times$  Subsidiary marketing intensity  
 (Model 4 only)

*X7=Parent firm performance (parent firm ROS)*

*X8=Host country political stability*

*X9=GDP per capita of host country (in US\$)*

## Measurement of Variables

### Stage 1

#### Dependent Variables

**Subsidiary R&D Intensity.** This variable stands for the part of a subsidiary's absorptive capacity. R&D intensity is calculated from *R&D expenditure divided by sales amount*. This study uses *Investment on intangible asset* in cash flow report of subsidiary as R&D expenditure. R&D intensity represents the company's effort to acquire technological knowledge and its accumulation becomes technological strength of the company (Chang 1995, Delios and Beamish 2001, Fang et al 2010). This investment flow measures development of technological intangible asset and absorptive capacity in subsidiary firms (Belderbos 2003). Therefore, this study used R&D intensity as a measurement of subsidiary's absorptive capacity of R&D. This variable was extracted from database of SETSMART and SGX.

**Subsidiary Marketing Intensity.** This variable stands for the part of a subsidiary's absorptive capacity. Marketing intensity is calculated from *marketing expenditure divided by sales amount*. This study uses *Investment on selling, general and administrative (SG&A)* in cash flow report of subsidiary as marketing expenditure

(Krishnan 2009). SG&A includes salary and costs of sales personnel, shipping cost of products, sales commission, etc. Some previous studies use narrower term by definition, investment on advertising as the measurement (Delios and Beamish 2001, Fang et al 2007, 2010, 2013), but I use SG&A for several reasons. First, SG&A is reported by every company listed, whereas investment on advertising is not reported by some companies. Second, industries that do not require advertisement for mass consumer (e.g. IT vendor or electric parts supplier) employ direct selling, and SG&A can reach these part of activities (Krishnan 2009, Wuyts et al 2004). Essentially, companies need these activities and SG&A can reflect marketing of such companies. Third, “marketing” contains broader meaning than just a marketing. Activities such like facilitation of sales channel is a part of marketing, and by that mean SG&A is more appropriate measurement for marketing intensity (Lin et al 2006). Even companies without advertising channel should have sales personnel or sales commission, and these expenditures can be regarded as investments for marketing, in broader interpretation. This investment flow measures subsidiaries’ intangible asset on marketing and absorptive capacity for local market. This variable was extracted from database of SETSMART and SGX.

## **Independent Variables**

**Parent R&D Intensity (Model 1) and Parent Marketing Intensity (Model 2).** These variables stand for parent firm's absorptive capacity. Each of variables are calculated from *R&D expenditure divided by sales amount*. Belderbos (2003) argued about the relationship between parent firm's R&D intensity and subsidiary's R&D intensity: "*The R&D intensity of the investing parent firm is likely to impact on the R&D intensity of foreign affiliates. If a parent firm produces technologically complex products and relies on R&D to gain a competitive advantage, this will also be reflected in the R&D intensity of affiliate operations*". Fang et al (2010) argued that parent firm's marketing intensity contributes to parent firm's marketing capacity and it leads to company performance in the long term: "*despite its limited value in the short term, parent marketing knowledge have a positive impact on subsidiary performance in the long run.*" Each of these variables was extracted from eol<sup>TM</sup> database.

**Ratio of expatriates in workforce.** This study focuses expatriates' knowledge transfer role. Fang et al (2010) analyzed influences from expatriates on knowledge transfer and subsidiary performance in quantitative way. Fundamentally, this study built research methodology from this study. Ration of expatriates in workforce is calculated from *the number of expatriates divided by the number of whole workplace*. This variable was

extracted from database of SETSMART and SGX essentially, but in cases of data absence, data was extracted from *Kaigai Shinshutsu Kigyō Souran*.

## Stage 2

### Dependent Variable

**Subsidiary Performance.** This study applies return on sales (ROS) as the measurement of subsidiary performance (Delios and Beamish 2001, Krishnan et al 2009). Since the investment of subsidiaries can take long to benefit (Shih et al 2004), the measurement which can observe over time is needed for this study. ROS is calculated from *profit divided by sales amount* and it can be extracted from subsidiaries' annual financial report. This variable was extracted from SETSMART.

### Independent Variables

**Subsidiary R&D Intensity and Subsidiary Marketing Intensity (Model 3).** These variables stand for subsidiary's absorptive capacity (Cohen and Levinthal 1990, Day 1994). Absorptive capacity gains the firm's competitiveness and it leads to company performance in a long term (Morbey 1990, Kotabe et al 2002). Each of variables was extracted from SETSMART.

**Interaction Term: Subsidiary Absorptive Capacity (Model 4).** This variable stands for the subsidiary absorptive capacity for overall knowledge. Krishnan et al (2009)

argued that the effect of absorptive capacity is better observed by multiplying because the investment on R&D and marketing works in a mutually complementary manner. This study derived subsidiary's absorptive capacity by multiplying subsidiary's R&D intensity and marketing intensity.

### **Control Variables**

**Ratio of expatriates in executive board.** This study included this variable to isolate the impact from expatriates in executive board from all expatriates. The role of expatriates differs according to the position and the target in this study, the role as a knowledge transfer agent, is not played by expatriates in board mainly (Vance and Paik 2005). This variable was extracted from database of SETSMART and SGX. **Subsidiary size and Subsidiary age.** Subsidiary size is *the number of employees in subsidiaries* and subsidiary age is *the year of operation of subsidiary*. Both variables are widely used for control variables for the management and performance of subsidiaries (e.g. Delios and Beamish 2001, Fang et al 2007, 2010, Krishnan et al 2009). This variable was extracted from database of SETSMART and SGX. **Capital contribution ratio from parent firm.** Capital contribution ratio from parent firm is extracted from subsidiaries' annual financial report. In case that the subsidiary is a joint venture of a few Japan-based MNCs, the sum of the contribution from these Japanese MNCs is applied

(Belderbos 2003), because the contribution from Japanese firms means the intervention from Japan. Capital contribution from parent firm reflects the ownership of parent and it affects subsidiary management (Delios and Beamish 2004). This variable is extracted from database of SETSMART and SGX. **Parent firm ROS.** Parent firm's financial performance is linked to the subsidiary performance because of relatedness of goods, services and strategy (Fang et al 2007, 2010, 2013, Riaz et al 2014). This variable is extracted from eol<sup>TM</sup> database. **Lag of subsidiary ROS.** Former subsidiary performance is linked to current subsidiary performance (Krishnan et al 2009), and this variable reduces heteroscedasticity problem in the model. **Host country GDP per capita.** Subsidiary performance is affected by macroeconomic climate in host country (Riaz et al 2014). The data was collected from World Bank database. **Country political stability.** This variable stands for the political risk in the host country, which affects subsidiary management and performance as an exogenous factor (Riaz et al 2014). This variable is extracted from The Worldwide Governance Indicators (WGI) dataset by World Bank.

## **Hypotheses**

### **Stage1**

Technological knowledge of foreign subsidiaries relies on the one developed

in the home country of their parent firms (Caves 1996), and knowledge which builds competitive advantage of subsidiaries is often tacit and difficult to transfer (Cohen and Levinthal 1990). Such knowledge has been transferred mainly from expatriates (Bonache and Brewster 2001, McNulty et al 2009). In addition, some forms of technological knowledge can be codified and transferred easily. Thus technological knowledge tends to be less dependent on location (Kogut and Zander 1992). Therefore, this study anticipates positive relationship between expatriate employment and subsidiary R&D intensity:

**H1: A foreign subsidiary's R&D intensity is positively associated with the parent firm's R&D intensity.**

**H2: A foreign subsidiary's R&D intensity is positively associated with the composition of expatriates in workforce.**

Marketing knowledge and capacity of marketing is a critical factor for company performance, because a marketing knowledge is built on a series of cumulative investments in marketing development over time (Percy and Rossiter 1997). A central part of marketing's contribution is brand building and it is often difficult to imitate; thus, it gives sustainable competitive advantage to the firm (Capron and Hulland 1999). Indeed, a brand's value is transferable to new products or product



categories, but its transfer to a foreign subsidiary may present challenges due to the high location specificity of marketing knowledge (Fang et al 2010). The difference from the local environment often requires the adapting of products, services, and sales channels to the local context (Day 1994). However, a parent marketing knowledge can contribute to the subsidiaries' absorptive capacity in the long term, as a result of knowledge adaption (Delios and Beamish 2001). Localization of a brand is achieved by contentious marketing effort (Pascale 1984) and involvement of local personnel to the development of marketing absorptive capacity (Cohen and Levinthal 1990). Thus, this study proposes:

**H3: A foreign subsidiary's marketing intensity is positively associated with a parent firm's marketing knowledge.**

Although parent knowledge itself benefits to the subsidiary, do expatriates contribute to marketing knowledge transfer? This study presumes not. Because of the location specificity of marketing knowledge, expatriate management is not appropriate solution to gain absorptive capacity on marketing (Fang et al 2007, 2010). In contrast, local managers can perform better on application of marketing knowledge (Gong 2003). Thus this study posits:

**H4: The composition of expatriates in a foreign subsidiary is negatively associated**

**with subsidiary marketing intensity.**

## **Stage 2**

Absorptive capacity of a subsidiary contributes to the subsidiary performance by gaining the subsidiary's competitive advantage (Delios and Beamish 2001, Chang et al 2012). Technological knowledge transferred from the parent firm enables a subsidiary to create advanced goods and services (Kogut and Zander) and transferred marketing knowledge facilitates adaption to the local environment and help subsidiary to build appropriate advertising and sales channeling. Thus, this paper anticipates:

**H5: A foreign subsidiary's performance is associated with the subsidiary's R&D intensity.**

**H6: A foreign subsidiary's performance is associated with the subsidiary's marketing intensity.**

**H7: A foreign subsidiary's performance is associated with the subsidiary's R&D intensity × marketing intensity.**

## CHAPTER4: RESULTS

### Sample structure

Table 9 presents sample structure by industry according to Standard Industrial Classification (SIC) code and host country. Samples can be classified by the first 3 digits of SIC code as follows: 1500-1799: construction, 2000-3999: manufacturing, 5200-2999: retail trade, 6000-6799: finance, insurance and real estate. Table 10 presents the structure by entry mode. This study defines each entry mode by the criteria used in Belderbos (2003). Majority-owned joint venture is a joint venture company founded from >50% equity stake by parent company and subsidiaries of parent company with local partners. Minority-owned joint venture is a joint venture founded from =<50% equity stake by parent company and subsidiaries of parent company with local partners. Minority-owned acquisition is a company which originally was a local listed company without interventions from other companies from foreign country and acquired by foreign companies (=<50% of equity stake) and receives management interventions. This sample did not have majority-owned acquisition company, which originally was a local listed company without interventions from other companies from foreign country and acquired by foreign companies (>50% of equity stake) and receives management interventions.

Table 9 Entry mode of samples

	Thailand	%	Singapore	%	Total	%
Majority-owned Joint Venture	9	9	2	50	11	33.3
Minority-owned Joint Venture	14	48.3	0	0	14	42.4
Minority-owned Acquisition	6	20.7	2	50	8	24.2
Total	29	100	4	12.1	33	100

Table 10 Industry classification of samples by SIC code

	Thailand	%	Singapore	%	Total	%
Construction	1	3.03	0	0	1	3.03
Manufacturing	22	66.7	2	6.06	24	72.7
Transportation, Communications, Electric, Gas and Sanitary service	2	6.06	0	0	2	6.06
Retail Trade	0	0	1	3.03	1	3.03
Finance, Insurance and Real Estate	4	12.1	1	3.03	5	15.2
Total	29	87.9	4	12.1	33	100

As Belderbos (2003) argued, entry mode can affect management and knowledge transfer of subsidiaries because equity stake reflects the power balance between parent company from foreign country and host country partners. However, over 75% of samples are joint ventures and funded by two or more Japanese NMCs including trading companies called *Sougou-Shosha*<sup>1</sup>, which helps Japanese NMCs' overseas expansion and local marketing with hands-on style. This characteristic of sample is caused by regulations of stock markets for capital contribution. Therefore, Impact of entry mode on subsidiary management and knowledge was expected to be limited and omitted from analysis.

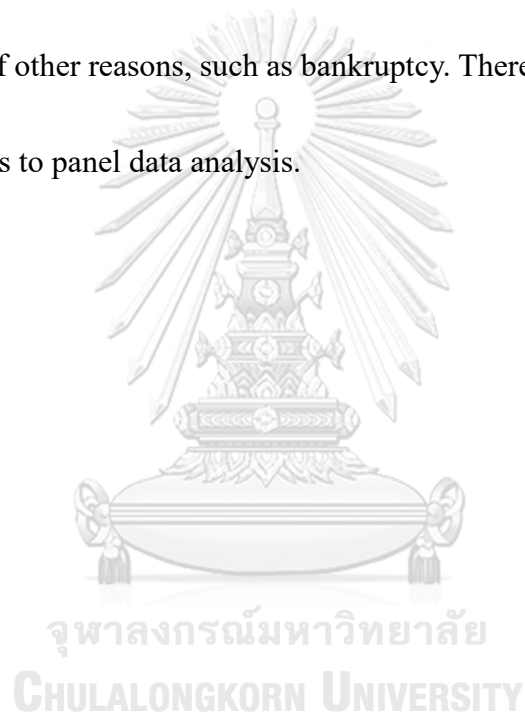
Although this study collected samples from the data set of 33 subsidiaries for 16 years, sample size of each regression model is less than the number of multiplication

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<sup>1</sup> Abut *Sougou-Shosha*, refer Shiraki (2006)

$33 \times 16 = 528$ , due to the unbalance structure of the data set. The sample size of each regression model is as follows: Model 1: 285, Model 2: 325, Model 3: 291, Model 4: 291. Deficiencies of observation were occurred from several causes. First, subsidiary did not report data. Second, interventions from Japanese firms on subsidiaries started, or ended during the period of data collection and observations before or after the intervention were cut off. Third, a subsidiary was delisted during the period of data collection. When the data set has unbalanced structure, causes of deficiencies and possible biases from those causes should be concerned. If the cause of deficiencies is random event, such as non-respondent without specific reasons, panel data analysis is feasible. However, when deficiencies are caused by events according with specific characteristics or systematic reasons, adequacy of panel data analysis should be discussed. This study considered that reasons of deficiencies are non-systematic, or even though there is a systematic characteristic in deficiencies, the bias is limited. First, since this study extracted data from financial report of listed company, non-submission of data to stock exchange markets for systematic reason is unlikely to be occurred. Second, attrition of samples due to the start or the end of intervention from parent company may be a systematic deficiency, but since the scope of this study is the relationship between parent and subsidiaries, this paper considered that data during the

intervention can be applied. Third, the attrition from delisting was hardly occurred, and the reason of delisting indicated limited bias from delisting. The data set has only 1 attrition case from delisting and the reason of delisting was management buy-out (MBO) by Japanese parent company. The bias of attrition because of MBO on models of this study is difficult to be estimated, but it is likely to be less than the one caused by attrition because of other reasons, such as bankruptcy. Therefore, this study considered that the data set fits to panel data analysis.



## Descriptive statistics

Table 1: Correlation matrix for stage 1

Variables	Mean	S.D.	1	2	3	4	5	6	7
1: Subsidiary age (year)	29.839	13.898	1						
2: Subsidiary size	1472.5	1348.2	-0.04	1					
3: Parent capital contribution ratio	0.4095	0.1919	0.1616	0.0101	1				
4: Ratio of expatriates in workforce	0.0092	0.0062	-0.28	-0.378	0.1843	1			
5: Ratio of expatriates in executive board	0.3388	0.1889	-0.033	0.1708	0.563	0.2943	1		
6: Parent R&D intensity	0.0365	0.0676	-0.045	0.0543	-0.141	-0.198	-0.057	1	
7: Parent marketing intensity	0.2151	0.2296	-0.171	-0.003	-0.188	-0.241	-0.221	0.3705	1

Table 12: Correlation matrix for stage 2

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9
1: Lag of Subsidiary ROS	0.1201	0.1025	1								
2: Subsidiary age(year)	29.839	13.898	-0.354	1							
3: Subsidiary size	1472.5	1348.2	-0.158	-0.04	1						
4: Subsidiary R&D intensity	0.0173	0.0345	0.3908	-0.344	-0.133	1					
5: Subsidiary marketing intensity	0.1165	0.1045	0.3199	-0.132	-0.1	0.5959	1				
6: Subsidiary R&D intensity x Marketing intensity	0.0042	0.012	0.3565	-0.27	-0.072	0.939	0.7141	1			
7: Parent firm ROS	0.0582	0.0676	0.3793	-0.084	-0.002	0.2898	0.6827	0.3896	1		
8: GDP per capita (USD)	3906.7	1519.6	-0.019	0.3088	0.0984	-0.016	0.0031	0.0323	0.0248	1	
9: Political Stability	-0.695	0.6624	-0.024	-0.25	-0.074	-0.013	-0.007	-0.08	-0.037	-0.75875	1

Table 11 presents the descriptive statistics and the correlation matrix of stage 1 and Table 12 presents the one of stage 2. Low to moderate correlation values across most independent variables in each model suggest that models have no severe multicollinearity problem that affects results of the regressions. For the first step of data analysis, Residual Variance F test and Hausman H test were run to confirm adequacy of the use of fixed-effects model, and results showed that all models are appropriate for fixed-effects model (Regression 1: F=26.51\*\*\*, H=30.52\*\*\*, Regression 2: F=126.19\*\*\*, H=21.275\*\*\* Regression 3: F=4.28\*\*\*, H=143.50\*\*\* Regression 4: F=4.41\*\*\*, H=147.23\*\*\*). To control distortion of result from heteroscedasticity problem, heteroscedasticity-robust standard errors by Arellano (1987) are applied to each model.

### Stage 1: Models for subsidiary absorptive capacity

**Table 13: Fixed-effects regression result for stage 1**

Dependent variable	Model 1: Subsidiary R&D intensity			Model 2: Subsidiary MKT intensity		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.0272	0.0123	**	0.1766	0.0192	***
1: Subsidiary age(year)	-0.0001	0.0004		-0.001	0.0006	
2: Subsidiary size	5.05E-06	4.06E-06		4.10E-06	3.86E-06	
3: Parent capital contribution ratio	-0.0591	0.0493		-0.074	0.0321	**
H2&4 4: Ratio of expatriates in workforce	0.8453	0.3539	**	-1.0323	0.5942	*
5: Ratio of expatriates in executive	0.01559	0.0125		0.0317	0.0196	
H1 6: Parent R&D intensity	-0.0565	0.0337	*			
H3 7: Parent marketing intensity				0.047	0.0184	**
LSDV R-squared		0.84			0.97	
Within R-squared		0.094			0.1	
F statistic		2.241	**		3.04	***
Welch F		114	***		97	***
Sample size		285			325	

Note: \*\*\* p<0.01; \*\* p<0.05, \* p<0.1 (two-tailed)



The result of regressions for Stage 1 is presented in Table 13. Model 1 presents the regression for subsidiary technological knowledge absorptive capacity and Model 2 presents subsidiary marketing knowledge absorptive capacity. Hypotheses 1 and 3 stated that subsidiary R&D intensity and marketing intensity are positively associated with parent R&D intensity and marketing intensity. In result, hypothesis 1 was not supported ( $\beta=-0.0565$ ,  $p<0.1$ ). Each regression shows negative relationship between parent R&D intensity and subsidiary R&D intensity, while marketing intensity shows positive relationship. Although Hypothesis 1 failed the test, Hypothesis 3 passed ( $\beta=0.0470$ ,  $p<0.05$ ). Hypothesis 2 and Hypothesis 4 are supported by the result. Ratio of expatriates affects subsidiary technological knowledge positively ( $\beta=0.8453$ ,  $p<0.05$ ) and affects marketing knowledge negatively ( $\beta=-1.0323$ ,  $p<0.1$ ). Outside independent variables, capital contribution ratio of parent firms significantly shows negative effect on subsidiary marketing knowledge absorptive capacity. Overall explanatory power of Model 1 and Model 2 are significant (Model 1: Welch  $F=114$ ,  $p<0.01$  Model 2: Welch  $F=97$ ,  $p<0.01$ ).

## Stage 2: Models for subsidiary performance

**Table 14: Fixed-effects regression result for stage 2**

Dependent variable: Subsidiary ROS	Model 1: Independent variables only			Model 2: Interaction term		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.1203	0.0581	**	0.1117	0.0544	**
1: Subsidiary age(year)	-0.002	0.0004		-0.0022	0.0033	
2: Subsidiary size	3.53E-06	4.06E-06		2.99E-06	5.38E-06	
H5 3: Subsidiary R&D intensity	0.413	0.2817				
H6 4: Subsidiary marketing intensity	-0.1814	0.2481				
H7 5: Subsidiary R&D intensity × Marketing intensity				1.2514	0.7263	*
6: Parent firm ROS	0.1756	0.58	***	0.1657	0.0473	***
7: Host country GDP per capita (USD)	1.47E-05	1.13E-05		5.37E-06	8.78E-06	
8: Host country political stability	-0.0028	0.0063		-0.0019	0.006	
9: Lag of Subsidiary ROS	0.2011	0.068	***	0.195	0.064	***
LSDV R-squared		0.81			0.81	
Within R-squared		0.082			0.083	
F statistic		5.84***			5.97***	
Welch F		1.78**			1.91**	
Sample size		291			291	

Note: \*\*\* p<0.01; \*\* p<0.05, \* p<0.1(two-tailed)

Table 14 presents the result of regression models in stage 2. Model 3 addresses each kind of knowledge absorptive capacity separately and Model 4 applies interaction variable of 2 kinds of knowledge by Krishnan et al (2009). Hypothesis 5 and Hypothesis 6 are not supported (H5:  $\beta=0.4130$ ,  $p>0.1$ , H6:  $\beta=-0.1814$ ,  $p>0.1$ ). Hypothesis 7 is supported ( $\beta=1.2514$ ,  $p<0.1$ ). Outside independent variables, ROS of parent firm and lag of subsidiary ROS indicates significantly positive effect on subsidiary ROS. Overall explanatory power of Model 3 and Model 4 are significant (Model 3: Welch F=1.78,  $p<0.05$  Model 4: Welch F=1.91,  $p<0.05$ ). This result shows that application of interaction term improves overall significance of the model.

## CHAPTER5: DISCUSSION

### Findings of the research

The results reveal several findings on the relationship of parent firm's knowledge, subsidiary knowledge, and subsidiary performance.

First, Hypothesis 1 and 2 were as below;

**H1: a foreign subsidiary's R&D intensity is positively associated with the parent firm's R&D intensity,**

**H2: a foreign subsidiary's R&D intensity is positively associated with the composition of expatriates in workforce.**

The finding from the result is; **parent technological knowledge has negative relationship with subsidiary technological knowledge and parent marketing knowledge has positive relationship with subsidiary marketing knowledge.**

Hypothesis 1 on technological knowledge is not supported, but Hypothesis 2 on marketing knowledge is supported. Regression analysis indicated that; 1, 1% increase of parent company's R&D intensity contributes 0.05% decrease in subsidiary's R&D intensity, 2, 1% increase of parent company's marketing intensity contributes 0.04% increase of subsidiary's marketing intensity. Two possible reasons can be suggested for the failure of test in Hypothesis 1. First, technological knowledge has less location

specificity than marketing knowledge. Technical knowledge in parent firms can be applied to foreign subsidiaries relatively easily (Kogut and Zander 1992), thus more accumulation of technological knowledge can cause less absorptive capacity on technological knowledge in foreign subsidiaries. Second, the dataset contains joint ventures and it affects the result. Although this is specific reason in the case of joint venture, some parent companies can form joint ventures due to host country partners' superior absorptive capacity. 42.4% of sample in regressions is joint ventures by Japanese NMCs and host-country-based companies. In case that a Japanese MNC does not have absorptive capacity for technological knowledge, the combination of a parent firm with low absorptive capacity and a subsidiary with high absorptive capacity is possible. This logic on technological knowledge in joint venture is in accordance with the findings of Belderbos (2003). The result on marketing knowledge supports hypothesis and the prediction: the difference between location specificity of technological knowledge and marketing knowledge. Technological knowledge is less location specific, thus the combination of a parent firm with high technological knowledge and a subsidiary with low technological knowledge is possible, and vice versa. In contrast, marketing knowledge is more location specific, thus marketing knowledge in foreign subsidiary has to be developed autonomously with a knowledge

spillover from a parent.

Second, Hypothesis 3 and 4 were as below;

**H3: a foreign subsidiary's marketing intensity is positively associated with a parent firm's marketing knowledge,**

**H4: the composition of expatriates in a foreign subsidiary is negatively associated with subsidiary marketing intensity.**

The finding from result is; **ratio of expatriates affects subsidiary technological knowledge absorptive capacity positively, but it affects marketing knowledge absorptive capacity negatively.** Regression analysis indicated that; 1, 1% increase in the ratio of expatriates in the subsidiary contributes 0.8% increase of subsidiary R&D intensity, 2, 1% increase in the ratio of expatriates contributes 1.03% decrease in subsidiary marketing intensity. This result can be explained by location specificity of each kind of knowledge. Expatriates can transfer technological knowledge from parent firms effectively because of less specificity of the knowledge, but they cannot transfer marketing knowledge effectively due to the lack of the knowledge about characteristics of the market in host countries. Moreover, markets of some products or services can differ to the host countries, and it can lead to the difference of goods or services to sell. In this case, expatriates cannot utilize their marketing knowledge in parent countries,

again. This result corresponds with Fang et al (2010).

Third, Hypothesis 5-7 were as below;

**H5: A foreign subsidiary's performance is associated with the subsidiary's R&D intensity,**

**H6: A foreign subsidiary's performance is associated with the subsidiary's marketing intensity,**

**H7: A foreign subsidiary's performance is associated with the subsidiary's R&D intensity × marketing intensity.**

The finding from result is; **subsidiary R&D intensity and marketing intensity do not affect subsidiary performance separately, but they affect subsidiary performance positively when they work together.** Since the model here used interaction term, regression analysis result cannot be quantitatively interpreted. As Krishnan et al (2009) argued, R&D knowledge and marketing knowledge are beneficial for subsidiaries when they work together. Regardless of the characteristic of the industry, technological knowledge is important to cultivate sustainable competitiveness overtime (Blumentritt and Danis 2006). However, investment in R&D alone does not have a positive impact on performance and investment on both technological knowledge and marketing knowledge is necessary for superior performance.

The method and results of this study contain particular issues, which need to be discussed, yet they are digress from main point or not valid enough. This paper discusses such issues in appendix sections. First, fixed-effects model requires several assumptions and the validity or efficacy of the application need to be discussed. Appendix 1 discusses this issue by using econometric techniques and comparison with other possible models (i.e. pooling OLS and random effects model). Second, several control variables that have been reported significant effect on dependent variables did not indicate significant effect in results of this study. Possible reason of this phenomenon is an influence of the use of fixed-effects model. This matter is also discussed in Appendix 1 by comparing results from pooling OLS regression model analysis. Third, the comparison of Thailand and Singapore needs to be discussed in main topic, but models focusing only in Singapore are not valid due to the short of sample size. This topic is discussed in Appendix 2 and this section also provides implications for future study.

### **Practical implications for MNC management**

Multinational firms face problem of balancing the control from parent firm by expatriates and subsidiary autonomy (Kostova and Roth 2002). Implementation of effective knowledge transfer from expatriates is a great challenge for MNCs and

qualified expatriate manager pool is a scarce resource. In addition, human resource development of foreign subsidiary is clearly a bottleneck for MNC management toward internationalization and sustainable superior performance (JILPT 2003). This study suggests several recommendations for MNC human resource management. First, to maximize the effectiveness of expatriate management for knowledge transfer, it might be better to assign expatriates to departments that do not address location-specific knowledge, such as marketing knowledge. Expatriates transfer their technological knowledge effectively, but for positions that require knowledge with local specificity, professionals in host countries should be employed. Second, investments on technological knowledge or marketing knowledge do not lead to superior performance alone. Investments on these two kinds of knowledge have to be implemented altogether. As Porter (1985) argued and repeated empirically by Krishnan et al (2009), two vital functions of MNC's value chain, R&D and marketing, should be simultaneously addressed for sustainable success.

### **Contribution of this study to the context**

This study has two possible contributions to the context of knowledge transfer and expatriate studies. First, this study deconstructed the model of relationship between parent firm knowledge and subsidiary performance into 2 stages: Stage 1 for subsidiary



absorptive capacity and Stage 2 for subsidiary performance. This deconstruction enabled analysis of entire flow of process from knowledge transfer to subsidiary performance. The approach of this study, which applied absorptive capacity as a driver of superior performance, described the effect of expatriate management on knowledge transfer well, even though the use of R&D intensity or SG&A is still controversial. Second, this study indicates the possibility of the application of panel data analysis and fixed-effects model to knowledge transfer and expatriate study context. The data set with panel structure responded the call of longitudinal data set and fixed-effects model succeeded to examine the effect of factors varying overtime and control unobserved factors' effect, both of which were common bottlenecks for the application of financial data. Results of this study suggested effectiveness of this method and possibility of future development of panel data analysis approach to this research context.

### **Limitations and future study**

This study has several limitations. First, this research does not focus other type of knowledge, such as human resource practices and financial controls. The effect from those activities is considerable and most subsidiaries of Japan-based MNCs employs expatriate CFO (Rosenzweig 1994) to control financial policy of subsidiaries. Second, this study does not focus other function of expatriate employment, such as approval

purposes, customer service purposes and expatriates as an experience for individual career of executive candidates. According to McNulty (2009), expatriates also have many functions that cannot be measured by financial data, such as approval function, talent management and their own career buildup as global managers. Thus, the impact measured by this study will be limited. These functions also would be studied by questionnaire or interview-based studies (e.g. Bjorkman and Lervik 2007). Third, this study focuses only on quantitative factors in subsidiaries that are available from annual report or publishing and does not take qualitative factors of HRM in subsidiaries (i.e. factors in minds of knowledge careers and receivers). As series of studies on knowledge transfer in the last decade argued, effectiveness of knowledge transfer and subsidiary absorptive capacity also differs according to knowledge senders' mind and perception of a subsidiary. Motivation, moral, ability, or knowledge belonging to HCNs in subsidiaries and expatriates are considerable factor affecting knowledge transfer (e.g. Minbaeva et al 2003, Wang et al 2004). Application of these factors into panel data analysis models is one of the challenges for the development of this context. Theory construction and analysis model development are needed to combine analysis method by longitudinal data set and the use of these soft factors, which are difficult to obtain from annual reports or publishing. Or application of questionnaire-based data collection

method may address this problem easier. Fourth, results suggest another story of knowledge transfer: knowledge transfer from a subsidiary with more knowledge to a parent firm with less knowledge. The result of Model 1 presented negative relationship between parent R&D intensity and subsidiary R&D intensity. This study posits that MNCs can establish joint ventures with companies in host country for the sake of introduction of local partners' knowledge. This implication indicates that old perspective of knowledge transfer studies, which assumes that MNC is a knowledge sender and a subsidiary is a knowledge receiver, is not always true. MNCs and subsidiaries can be knowledge senders and receivers at the same time. Although this new perspective of knowledge transfer was argued by several previous papers already (e.g. Belderbos 2003, Minbaeva et al 2014), theory development and model construction are not enough to examine this new perspective. Dynamic model will also address this relationship and simultaneousness of knowledge transfer.

This study also faced methodological problems, and they provide several implications for future study. First, the structure and collection of dataset restricted freedom of model construction. Indeed, panel data and application of fixed-effects model enabled the analysis of effects over time and controlled heteroscedasticity in models. Specifically, since I used financial data of subsidiaries, adjustment of

regression by fixed-effects model was helpful<sup>2</sup>. However, application of fixed-effects model restricted the use of factors that do not vary in long term (e.g. cultural distance, entry mode of subsidiary, industry). To control the effect from cultural distance, this paper limited the geographic focus of sample. However, the result of Hypothesis 1 suggests the need of more restriction on entry mode (i.e. distinction of wholly-owned subsidiary, joint venture, and acquisition). The control of such factors clearly restricts the size of sample. For instance, if the scope of sample is “listed Japan-based MNC’s joint venture in manufacturing industry located in Thailand”, sample size is grossly limited and not large enough to conduct regression model with many independent variables. The balance of the sample size and the control of factors may be the challenge for future study. Possible solution of this problem is the application of dynamic panel model with GMM estimators, but theoretical framework is not enough built on this issue. Second, the use of R&D intensity and marketing intensity as measurements of absorptive capacity is still controversial, even they are commonly used. As pointed by Lane and Lubatkin (1998), explanatory power of R&D intensity as a measurement of knowledge absorptive capacity is less than variables obtained from questionnaire-based research. The use of variables obtained from financial data, including R&D intensity

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<sup>2</sup> See Appendix 1

and marketing intensity, should be further tested. Since the availability of dataset and model construction is connected, the choice of dataset: panel data with controversial financial data or questionnaire-based data with difficulty with availability of longitudinal data, remains to be solved as a problem of knowledge transfer and expatriate literatures.

This study indicated not only the effectiveness and possibility of knowledge transfer model with the longitudinal data set, but also several limitations, difficulties, and invalid aspects of the approach applied in this study. However, application of panel data to knowledge transfer study context has begun in recent years and these limitations and challenges remain to be solved in future studies.

## CHAPTER6: CONCLUSION

This research examined the impact of expatriates on subsidiary knowledge absorptive capacity and the effect of the absorptive capacity on subsidiary performance. Findings of the result are; 1: expatriates affect subsidiary technological knowledge positively, but 2: affect subsidiary marketing knowledge negatively, and 3: subsidiary knowledge absorptive capacity on technological knowledge and marketing knowledge do not affect subsidiary performance alone, but 4: they affect subsidiary performance positively when they work together. The result suggests 2 points for the implications for MNC management; 1: expatriates are better to be assigned to positions with the call of less location-specific knowledge (i.e. marketing knowledge) for the purpose of knowledge transfer, 2: investments on technological knowledge and marketing knowledge should be implemented together simultaneously for the sustainable superior performance of subsidiaries.

This study attempted to examine the effect from expatriate deployment on absorptive capacity and the one from the absorptive capacity on subsidiary performance by the application of panel data and fixed-effects model. The result shows the both of effectiveness of models and limitations of method. However, this paper presented the possibility of analysis combining financial data and panel data analysis method. This

contribution of this paper may respond the need of the context nowadays: application of longitudinal data set and dynamic analysis approach, to some extent. Further theoretical development and method construction of dynamic approach will solve limitations of this study and will advance knowledge transfer and expatriate study context.



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## **APPENDIX I**

### **Discussion on model selection and fixed-effects model application**

#### **Introduction**

This section discusses about two issues; 1: model selection and validity of the use of fixed-effects model, 2: further discussion about analysis result by comparing results indicated by other regression models. The aim of this section is to examine the validity of the method used in this study in detail and discuss appropriate application of financial panel data to knowledge transfer and expatriate studies.

#### **1: Discussion on model selection and validity of the use of fixed-effects model**

Although panel data has begun used for this field (Fang et al 2007, 2010, 2013, Riaz et al 2014), effectiveness, validity, and limitations of data set with panel structure on knowledge transfer context have not been discussed enough. Especially, fixed-effects model has several assumptions for the use and discussion on application of this model in main topic was not enough. Therefore, this section examines adequacy of the application of panel data and fixed-effects model again in detail.

#### **Discussion on model selection of panel data analysis model**

This study examines three models of panel data analysis method as options: pooling OLS, random effects model, and fixed-effects model. This study applied fixed-effects for several reasons<sup>3</sup>. First, unobserved effect models (i.e. fixed-effects model and random effects model) can omit effect from an unobserved time-constant variable. Unobserved effect model like fixed-effects model can omit the effect from such variables by econometrics technique discussed later. Pooling OLS cannot omit unobserved effect and thus this study did not apply this model. Second, fixed-effects model can control unobserved effects that are correlated with explanatory variables. Although both of fixed-effects model and random effect model can omit unobserved effect, only fixed-effects model can control the effect from unobserved variables that are correlated with other explanatory variables. When a regression model has an unobserved variable and it is correlated with other variables, the model will be biased by the unobserved variable and coefficients of other variables will be inconsistent. Fixed-effects model can avoid this bias and this point is a considerable strength for the application. This study employed financial data and unobserved effect bias was expected according to limited data availability and individuality of data set. Thus, this study selected fixed-effects model.

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<sup>3</sup> Discussion here is mainly argued in detail in Wooldridge (2010) Chap. 10-11.

### Brief note: derivation of fixed-effects model

This section reviews how fixed-effects model omits unobserved effects. There are two ways to derive the model, but this section focuses simpler way of derivation for the ease of understand. Thus, later discussion may seem to be complex if just read this section. In case of the need for other ways of derivation, please refer Wooldridge (2010), Greene (2002), or other advanced undergraduate and post-graduate level econometric texts concerning with panel data analysis.

First, assume simple panel regression model with unobserved effects

$$y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 z_{it} + \mu_{it} \quad (1)$$

Where  $i=1,2,\dots, N$ ,  $t=1,2,\dots,T$ , and  $Z$  is unobserved time-constant variable and correlated with  $X$ , which varies according to time. When this model is assumed by OLS, coefficient  $\beta_1$  have inconsistency problem due to the bias from unobserved variable  $z$ . However, fixed-effects model can assume coefficient  $\beta_1$  without observing variable  $z$ .

If assume  $\alpha_i = \beta_0 + \beta_2 z_{it}$ , equation (1) can be rewritten

$$y_{it} = \beta_1 x_{it} + \alpha_i + \mu_{it} \quad (2)$$

This model can omit the effect from  $\alpha_i$  by transformation. Given  $\bar{y}_i = \sum_{t=1}^T y_{it}/T$ ,  $\bar{x}_i = \sum_{t=1}^T x_{it}/T$ , and  $\bar{\mu}_i = \sum_{t=1}^T \mu_{it}/T$ , equation (2) is

$$\bar{y}_i = \beta_1 \bar{x}_i + \alpha_i + \bar{\mu}_i \quad (3)$$

This equation indicates average of each individual. To omit effect from  $\alpha_i$ , deduct (3) from (2)

$$y_{it} - \bar{y}_i = \beta_1(x_{it} - \bar{x}_i) + (\mu_{it} - \bar{\mu}_i) \quad (4)$$

By this transformation, panel data can omit unobserved effects and OLS estimation using (4) is called fixed-effects estimation. Since the other way of presentation and estimation describe unobserved effects by dummy variables, the model is also called least square dummy variable model (LSDV model), and the way of estimation is called LSDV estimation<sup>4</sup>.

#### **Assumption for the application of fixed-effects model**

As mentioned in introduction, fixed-effects model calls for several assumptions. First, this model requires strict exogeneity of explanatory variables, which means exogeneity of  $\{x_{it}: t = 1, 2, \dots, T\}$  conditional on the unobserved effect  $\alpha_i$

$$\text{Assumption 1: } E(\mu_{it}|x_i, \alpha_i) = 0, t = 1, 2, \dots, T. \quad (5)$$

where  $x_i \equiv (x_{i1}, x_{i2}, \dots, x_{iT})$ . This function means that residual term in any time cannot be correlated with independent variable on unobserved effects in any time. This assumption is an extended version of classical assumption of OLS:  $E(u_i) = 0$ . This function can be interpreted another way: for fixed effects analysis,  $E(\alpha_i|x_i)$  is allowed

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<sup>4</sup> See Wooldridge (2010) in detail



to be any function of  $x_i$ , and this is the key difference between random effect model and fixed-effects model. Random effect model assumes that unobserved variable  $z$  is not correlated with other explanatory variables, but fixed-effects model assumes that  $z$  and other variables are correlated. This assumption enables fixed-effects model to examine individual level time-constant unobserved effects, which is called individual effects. Since fixed-effects model sets dummy variables to observe these individual effects<sup>5</sup>, degree of freedom in this model is limited. This way of estimation of individual effects adds one more assumption on fixed-effects model. Since dummy variables which display characteristics of individuals do not vary over time, effects from these variables are embedded into individual unobserved effects. This phenomenon can be imagined easily, since  $x_{it} - \bar{x}_i$  of constant variable overtime is zero. Thus, such variables constant over time cannot be added in fixed-effects model. This assumption can be presented in statistic description

$$\text{Assumption 2: } \text{rank}\{\sum_{t=1}^T E(\dot{x}_{it}' \dot{x}_{it})\} = K \quad (6)$$

where  $\dot{x}_{it} \equiv x_{it} - \bar{x}_i$ ,  $\dot{y}_{it} \equiv y_{it} - \bar{y}_i$ , and  $\dot{\mu}_{it} = \mu_{it} - \bar{\mu}_i$ , given  $K$  equals to the number of independent variables in each individual. If  $x_{it}$  contains a variable that does

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<sup>5</sup> Derivation of individual effects is discussed in Wooldridge (2010) in detail with derivation of LSDV model

not vary over time, then corresponding individual has a  $\alpha_i$ , which is identically zero for all  $t$ .

In addition, this study contains the models with the lag of dependent variables.

These models are inconsistent with Assumption 1, since  $\mu_{it}$  and  $x_{i,t+1}$  must be correlated, since  $x_{i,t+1} = y_{it}$ . Chamberlain (1992) introduced alternative assumption on unobserved effect models, which is called sequential moment restriction

$$E(\mu_{it} | x_{it}, x_{i,t-1}, \dots, x_{i,1}, \alpha_i) = 0 \quad (7)$$

This assumption is different from strict exogeneity (5), in terms that this assumption allows  $\mu_{it}$  to be correlated with future values of the explanatory variables ( $x_{i,t+1}, x_{i,t+2}, \dots, x_{iT}$ ). This expansion allows the model including lagged dependent variables.

Assumption 2 can be confirmed easily by avoiding including time-constant variables in models, but Assumption 1 and sequential moment restrictions are difficult to be tested and these assumptions affect the model selection grossly. Next section discusses model selection and validity of selection by combining assumptions and econometric testing techniques.

### **Tests for the application of fixed-effects model**

This section examines the validity of application of fixed-effects model by two

kinds of test: F test and Hausman test.

First, this section examines the validity of application of fixed-effects model comparing with pooling OLS model. F test is used for the test of validity of fixed-effects model against pooling OLS model. This F test uses the assumption that; 1: constant variables of each individual in pooling OLS model are equal for all individuals, 2: the ones in fixed-effects model differs according to individuals. Hence the test builds F statistic

$$F(\text{pool vs fixed}) = \frac{(RSS_{\text{pool}} - RSS_{\text{fixed}})/(N-1)}{RSS_{\text{fixed}}/(NT - (N+1))} \quad (8)$$

where  $RSS$ =residual sum squared,  $(N-1)$ =first degree of freedom, and  $(NT - (N+1))$ =second degree of freedom. Likewise, the test sets hypothesis

$$H_0: F = 0 \quad (9)$$

$$H_1: F \neq 0 \quad (10)$$

where null hypothesis means constant intercept for all individuals and alternative hypothesis means independent intercept for individuals. As discussed in the main topic, all models were passed for this test, which means fixed-effects is appropriate for all regressions (Regression 1:  $F=26.51^{***}$ , Regression 2:  $F=126.19^{***}$ , Regression 3:  $F=4.28^{***}$ , Regression 4:  $F=4.41^{***}$ ).

Second, this section handles selection between random effects model and

fixed-effects model. To examine this issue, Hausman test is often applied. This test is related with strict exogeneity (or endogeneity) (5) or sequential moment restriction (7) of independent variables. However, we have to be noticed about assumption of this test: Hausman test can only test the validity of random effect model or fixed-effects model based on hypothesis on strict exogeneity or sequential moment restriction but cannot test strict exogeneity or sequential moment restriction themselves. This test sets hypothesis on strict exogeneity

$$H0: E(\mu_{it}|x_i, \alpha_i) = 0 \quad (11)$$

$$H1: E(\mu_{it}|x_i, \alpha_i) \neq 0 \quad (12)$$

and on sequential moment restriction

$$H0: E(\mu_{it}|x_{it}, x_{i,t-1}, \dots, x_{i,1}, \alpha_i) = 0 \quad (13)$$

$$H1: E(\mu_{it}|x_{it}, x_{i,t-1}, \dots, x_{i,1}, \alpha_i) \neq 0 \quad (14)$$

These hypotheses are combined with Hausman test, which tests adequacy of random effects and fixed-effects

$$H0: \text{Unobserved effect estimator is uncorrelated with independent variables} \quad (15)$$

$$H1: \text{Unobserved effect estimator is correlated with independent variables} \quad (16)$$

where null hypothesis means adequacy on random effect model and alternative hypothesis means adequacy on fixed-effects model. Hausman H is computed by

following procedure: assume

$$\hat{q} = \hat{\beta}_{fixed} - \hat{\beta}_{random} \quad (17)$$

$$\text{var}(\hat{q}) = \text{var}(\hat{\beta}_{fixed}) - \text{var}(\hat{\beta}_{random}) \quad (18)$$

where  $\hat{\beta}_{fixed}$  is a fixed-effects estimator and  $\hat{\beta}_{random}$  is a random effect estimator, given: 1:  $\hat{\beta}_{fixed}$  is a consistent estimator under (11)-(14), but inefficient under (11) and (13), 2:  $\hat{\beta}_{random}$  is a consistent efficient estimator under (11) and (13), but inconsistent under (12) and (14). When assume that  $\hat{V}_{(\hat{q})}$  is a consistent estimator of  $\text{var}(\hat{q})$ , Hausman H statistic is defined

$$\text{Hausman H} = \frac{\hat{q}^2}{\hat{V}_{(\hat{q})}} \sim \chi^2 \quad (19)$$

Hausman H sets hypothesis (15) and (16) by testing whether H statistic follows chi-square distribution. The combination of hypotheses on random estimator, fixed-effects estimator and Hausman test is presented in Table A-1.

Table A-1: Combination Matrix of Hausman test and unobserved effect estimators

		Hausman test	
		H0	H1
Unobserved effect estimator	Random	Consistent Efficient	Inconsistent
	Fixed	Consistent Inefficient	Consistent

Source: Discussion of Kitamura (2005)

Thus, from discussion and Table A-1, we can see that rejection of null hypothesis on Hausman test indicates adequacy of the application of fixed-effects model and fail to the test indicates the adequacy of random effect model, generally. Results of this sort

of tests indicated adequacy of fixed-effects model in all models in this study (Regression 1:  $H=30.52^{***}$ , Regression 2:  $H=21.275^{***}$  Regression 3:  $H=143.50^{***}$  Regression 4:  $H=147.23^{***}$ ).

Therefore, from the sort of tests, the validity of fixed-effects model application is supported to some extent, at least it can be said that fixed-effects model is more adequate method to be applied in this study than other methods. However, as discussed already, we have to be noticed that this sort of tests suggests adequacy of model selection based on the nature of relationship between each model and exogeneity restrictions. Theory construction of test on strict exogeneity and sequential moment restriction is not enough, and validity of each model is to be tested further from the view point of assumptions on exogeneity restrictions.

## **2: Discussion: comparison of results between fixed-effects model and pooling OLS**

This section aims to examine how fixed-effects model indicates different result from other methods. From the restriction of space, this section makes comparison only with pooling OLS. Results by pooling OLS are presented in Table A-2 and A-3.

**Table A-2: Comparison of results: fixed-effects model and pooling OLS (1)**

Dependent variable: Subsidiary's R&D intensity	R&D intensity: fixed-effects model			R&D intensity: pooling OLS		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.0272	0.0123	**	0.0495	0.0166	***
1: Subsidiary age(year)	-0.0001	0.0004		-0.0009	0.0003	***
2: Subsidiary size	5.05E-06	4.06E-06		5.03E-06	2.57E-06	*
3: Parent capital contribution ratio	-0.0591	0.0493		0.0029	0.018	
H2 4: Ratio of expatriates in workforce	0.8453	0.3539	**	-0.4234	0.5643	
5: Ratio of expatriates in executive board	0.01559	0.0125		0.0072	0.0091	
H1 6: Parent R&D intensity	-0.0565	0.0337	*	0.1543	0.0754	**
LSDV R squared or Adjusted R squared		0.84			0.27	
F statistic		2.241**			4.601***	
Sample size		285			285	

Dependent variable: Subsidiary's MKT intensity	MKT intensity: fixed-effects model			MKT intensity: pooling OLS		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.1766	0.0192	***	0.0413	0.0404	
1: Subsidiary age(year)	-0.001	0.0006		-0.001	0.0009	
2: Subsidiary size	4.10E-06	3.86E-06		1.06E-05	7.33E-06	
3: Parent capital contribution ratio	-0.074	0.0321	**	0.1391	0.0716	*
H4 4: Ratio of expatriates in workforce	-1.0323	0.5942	*	-1.21	2.02	
5: Ratio of expatriates in executive board	0.0317	0.0196		0.0311	0.0477	
H3 7: Parent marketing intensity	0.047	0.0184	**	0.0301	0.0969	***
LSDV R squared or Adjusted R squared		0.97			0.53	
F statistic		3.04***			3.04***	
Sample size		325			325	

Note: \*\*\* p<0.01; \*\* p<0.05, \* p<0.1 (two-tailed)

**Table A-3: Comparison of results: fixed-effects model and pooling OLS (2)**

Dependent variable: Subsidiary ROS	Model without interaction: fixed-effects			Model without interaction term: pooling OLS		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.1203	0.0581	**	0.0354	0.0156	**
1: Subsidiary age(year)	-0.002	0.0004		-0.0002	0.0003	
2: Subsidiary size	3.53E-06	4.06E-06		-3.12E-06	2.34E-06	
H5 3: Subsidiary R&D intensity	0.413	0.2817		0.17	0.1089	
H6 4: Subsidiary marketing intensity	-0.1814	0.2481		-0.0692	0.0371	*
6: Parent firm ROS	0.1756	0.58	***	0.1888	0.0332	***
7: Host country GDP per capita	1.47E-05	1.13E-05		1.76E-07	2.48E-07	
8: Host country political stability	-0.0028	0.0063		-0.0004	0.0045	
9: Lag of Subsidiary ROS	0.2011	0.068	***	0.7718	0.0888	***
LSDV R-squared or Adjusted R squared		0.81			0.7	
F statistic		5.84***			160***	
Sample size		291			291	

Dependent variable: Subsidiary ROS	Model with interaction: fixed-effects			Model with interaction: pooling OLS		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.1117	0.0544	**	0.0349	0.0153	**
1: Subsidiary age(year)	-0.0022	0.0033		-0.0003	0.0003	
2: Subsidiary size	2.99E-06	5.38E-06		-3.09E-06	2.19E-06	
H7 5: Subsidiary R&D intensity × Marketing intensity	1.2514	0.7263	*	0.0497	0.3234	
6: Parent firm ROS	0.1657	0.0473	***	0.1414	0.0208	***
7: Host country GDP per capita(USD)	5.37E-06	8.78E-06		-2.82E-07	2.52E-07	
8: Host country political stability	-0.0019	0.006		0.0001	0.0045	
9: Lag of Subsidiary ROS	0.195	0.064	***	0.778	0.0884	***
LSDV R-squared or Adjusted R squared		0.81			0.69	
F statistic		5.97***			127***	
Sample size		291			291	

Note: \*\*\* p<0.01; \*\* p<0.05, \* p<0.1 (two-tailed)

Comparison between fixed-effects model and pooling OLS presented in Table A2-3 suggests effectiveness of application of fixed-effects model to some extent. Results indicate that several variables are estimated better in pooling OLS (e.g. subsidiary age and size in the model on R&D intensity), but other variables, especially variables on expatriate are better presented in fixed-effects model. I suggest two possible reasons for this contrasting result. First, control of unobserved effect adjusted individual characteristics of expatriate management. Reasons to send expatriates differs according to industry, corporate culture, and human resource pool of global managers (JILPT 2003). Fixed-effects model can control such difference belonging to each company and estimate general trend of the change of expatriates' composition in workforce. Second, estimators on the change of expatriates' composition fitted to describe the change in knowledge transfer. As discussed in the section of derivation of fixed-effects model, fixed-effect estimator is an estimator describing the effect from the change over time. The amount of knowledge transfer is likely to follow the change in composition of expatriates, rather than composition of expatriates itself. Since the knowledge to be transferred belongs to knowledge carriers (i.e. expatriates), estimation by the change in expatriates' composition in each subsidiary is likely to be better method to describe the change in subsidiaries' absorptive capacity.



However, as discussed in discussion section in the main topic, model selection has several issues to be discussed further. Especially, the need of discussion about the model selection; specification of sample by fixed-effects model or control of dummy variables by cross-sectional model, is emphasized by this comparison. This comparison suggested unobserved effect from firm-specific or industry-specific factors as the reason of better explanation by fixed-effects model. This suggestion implies the need of control on firm-specific, location-specific, or industry-specific factors, in order to obtain more statistical significant result<sup>6</sup>. Dynamic panel model with GMM can be a model example that can address this issue. This model addresses unobserved effect of individuals and can include dummy variables as well. At first sight, this model looks like an ideal model, but the data set of this study failed to apply this model due to the fail to Sargan test. Both of theoretical development and research design is needed to apply this model and the application of this model is to be discussed and developed by future studies.

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<sup>6</sup> See discussion section in the main topic also

## APPENDIX II

### Comparison of results: Thailand and Singapore

#### Introduction

This section compares results of two countries; Thailand and Singapore. This section was not included in the main topic due to the short of samples of subsidiaries in Singapore. This problem was occurred from several reasons; 1: some companies were delisted because of MBO, 2: several companies were subsidiaries of non-listed parent firms in Japan and financial data of parent firms were not available 3: data availability from data source was limited for individual researchers. From these reasons, this research could not collect enough samples of subsidiaries in Singapore in order to make valid comparison with the ones in Thailand. Hence, this study discusses about the comparison of these two countries as an appendix. This section aims to make hypotheses on difference (or similarity) according to host countries, and implications for future study are discussed.

#### Comparison of results in two countries

Results of each model in two host countries are presented in Table A-4 and Table A-5. Fixed-effects model is applied to all models.

**Table A-3: Comparison of results: Thailand and Singapore (1)**

Dependent variable: Subsidiary R&D intensity	R&D intensity: Thailand			R&D intensity: Singapore		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.0274	0.0123	**	-0.0611	0.0069	***
1: Subsidiary age(year)	-0.0001	0.0004		0.0007	0.0001	***
2: Subsidiary size	5.09E-06	4.10E-06		3.05E-05	1.58E-06	***
3: Parent capital contribution ratio	-0.0591	0.0498		-	-	
H2 4: Ratio of expatriates in workforce	0.8556	0.3549	**	2.1019	0.075	***
5: Ratio of expatriates in executive board	0.01559	0.0124		-0.0567	0.0051	***
H1 6: Parent R&D intensity	-0.0565	0.0337	*	0.2231	0.0053	**
LSDV R squared		0.84			0.98	
F statistic		2.393**			0.03	
Sample size		270			15	

Dependent variable: Subsidiary MKT intensity	MKT intensity: Thailand			MKT intensity: Singapore		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.1755	0.0192	***	0.3633	0.3483	
1: Subsidiary age(year)	-0.001	0.0006		-0.006	0.0066	
2: Subsidiary size	4.10E-06	3.85E-06		1.06E-05	3.58E-05	
3: Parent capital contribution ratio	-0.074	0.0323	**	-	-	
H4 4: Ratio of expatriates in workforce	-1.017	0.6	*	-4.15	4.81	
5: Ratio of expatriates in executive board	0.033	0.0195	*	-0.0845	0.0479	
H3 7: Parent marketing intensity	0.0411	0.0163	**	0.0318	0.0613	***
LSDV R squared		0.97			0.92	
F statistic		3.04***			0.14	
Sample size		310			15	

Note: \*\*\* p<0.01; \*\* p<0.05, \* p<0.1 (two-tailed)

capital contribution of subsidiaries in Singapore is omitted for exact collinearity

**Table A-4: Comparison of results: Thailand and Singapore (2)**

Dependent variable: Subsidiary ROS	Model without interaction: Thailand			Model without interaction: Singapore		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.2014	0.0813	**	0.6961	0.1254	**
1: Subsidiary age(year)	-0.0054	0.0041		-0.0131	0.0002	**
2: Subsidiary size	3.45E-06	4.11E-06		-1.00E-04	2.08E-05	**
H5 3: Subsidiary R&D intensity	0.416	0.2772		0.64	0.2337	*
H6 4: Subsidiary marketing intensity	-0.1814	0.2506		0.0116	0.1092	
6: Parent firm ROS	0.18	0.0599	***	-0.0713	0.005	***
7: Host country GDP per capita(USD)	1.47E-05	1.13E-05		3.03E-06	8.31E-07	**
8: Host country political stability	-0.0026	0.0063		-0.1828	0.0448	**
9: Lag of Subsidiary ROS	0.2001	0.0703	***	-	-	
LSDV R squared		0.81			0.98	
F statistic		7.81***			1.88	
Sample size		281			14	

Dependent variable: Subsidiary ROS	Model with interaction:Thailand			Model with interaction: Singapore		
	Coefficients	Std. errors	Sig.	Coefficients	Std. errors	Sig.
Intercept	0.1835	0.0747	**	0.6992	0.044	***
1: Subsidiary age(year)	-0.0053	0.0033		-0.013	0.0011	***
2: Subsidiary size	3.04E-06	5.48E-06		-1.00E-04	8.33E-06	***
H7 5: Subsidiary R&D intensity × Marketing intensity	1.2228	0.7142	*	4.1997	0.8164	***
6: Parent firm ROS	0.1657	0.0473	***	-0.0734	0.0023	***
7: Host country GDP per capita(USD)	1.42E-05	1.02E-05		-2.97E-06	4.17E-07	***
8: Host country political stability	-0.0018	0.006		-0.1836	0.0195	***
9: Lag of Subsidiary ROS	0.1934	0.0667	***	-	-	
LSDV R squared		0.81			0.98	
F statistic		6.95***			8.75**	
Sample size		281			14	

Note: \*\*\* p<0.01; \*\* p<0.05, \* p<0.1 (two-tailed)

Lag of subsidiary ROS of subsidiaries in Singapore is omitted from exact collinearity

Since this comparison does not have validity in statistical significance due to the short of sample size, this section focuses only on signs of coefficients which are related to hypotheses. This result implies similarity of result in subsidiaries in Thailand and Singapore. Only Hypothesis 1 and Hypothesis 6 indicate different signs on coefficients and the other coefficients on other hypotheses indicate same signs. Considering that the difference of sign on Hypothesis 1 may be solved by controlling entry mode<sup>7</sup> and Hypothesis 6 was insignificant in subsidiaries in Thailand too, this result implies the similarity of samples in Thailand and Singapore. This section suggests that effects from host country can be absorbed into unobserved effect of fixed-effects model. As gong (2003) and Gaur et al (2007) argued, cultural distance between parent country and host country affects knowledge transfer. However, comparison result implies the controllability of the cultural distance by the application of fixed-effects model. Even further test is needed, fixed-effects model can expand scope of samples when unobserved effect can absorb the effect from cultural distance. Furthermore, as discussed in the main topic, this result also suggests the possibility of control of firm-specific, industrial-specific, and host-country-specific time-constant effects by application of dummy variables into dynamic panel model. Even though the problem

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<sup>7</sup> See discussion section of the main topic also

on availability of subsidiary-level longitudinal data still remains, this study may suggest possibility of panel data analysis on this topic.

In conclusion, this study expects two ways of future development of this field of study; 1: theory development of dynamic aspect of study on knowledge transfer and expatriates, 2: further method construction of approach from secondary data source with panel structure, such as financial data, into this topic. From the trend of studies on this topic; exploration of dynamic approach, movement of data from questionnaire-based cross-sectional data to secondary data source is inevitable. The future challenge of this topic may be the exploration of method that reaches “soft” issues on knowledge transfer, such as motivation, from “hard” data source. This paper expects that this research can be a little catalyst of further researches toward such dynamic approaches.

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