

Subsidiaries Will Diffuse Knowledge within MNEs, or Not?

Mei H.C. Ho

Eindhoven centre for innovation studies (Ecis), Technische Universiteit Eindhoven (TU/e)

(Email: m.ho@tue.nl)

Abstract This study aims to discuss whether subsidiaries are willing to share what they learn from local actors with internal actors within MNE. We focus on examining both internal (e.g. HQ's strategies and subsidiary's internal characteristics) and external impacts on subsidiary's knowledge diffusing behaviours. The online survey for R&D managers in 15 European countries was carried out for analyzing these research topics. We apply regression models and a full structural equation model (SEM) by LISREL for empirical analysis. The results show that subsidiary's internal position of R&D importance encourages them to diffuse more knowledge for the whole MNEs. The external factors in local advantages helps subsidiaries to shape their role in the knowledge sharing procedure in different ways. However, the internal HQ's initial assignments make less influence on knowledge diffusion.

Key words subsidiary, knowledge diffusion, locational factors, R&D

1 Introduction

For MNEs, a subsidiary is always established to access new resources in host country for the whole MNEs. The headquarter (HQ) believes that subsidiary, playing a brokerage role between host and home country, can absorb local knowledge and experience for internal units within the MNE whole network (e.g. Bartlett & Ghoshal, 1991; Gupta & Govindarajan, 1994). In particular, the investment in R&D activities aiming to accumulating technological capabilities is expected to bring more knowledge into the MNE network. Although R&D investment may involve a relative higher risk and the performance of R&D always takes longer time to be shown, HQ still hope that subsidiaries can contribute what they have accumulated and diffused the knowledge for the whole MNE during the innovative. This study stands on this point to explore how subsidiaries are willing to share knowledge.

The internationalization of R&D activities has been discussed in the past two decades with R&D locational drivers most commonly used to explain MNE's foreign R&D investment (e.g. Dunning & Narula, 1995; Kuemmerle, 1999; Le Bas & Sierra, 2002). When HQ moves R&D to a specific location, it might be the necessity to access local customers, which could then adapt existent technologies to local tastes. The reason could also be the non-transferable locational-specific technological resources that make them move to different geographical areas (Dunning & Narula, 1995; Verspagen & Schoenmakers, 2004). HQ assigns different subsidiaries to finish specific R&D goals. In other words, subsidies might behave differently to search their target resources and play different positions for the MNE. In addition, as Bartlett & Ghoshal (1991) proposed, a whole MNE is like a network that all subsidiaries in different locations can absorb different resources for the growth of the whole MNE. When subsidiaries face different environmental challenges and advantages, they may adjust their behaviours to share accumulated knowledge for other units within MNE or to keep the experiences for local development. Subsidiaries' reliance on these different locational factors may influence whether they can contribute for the innovative activities of the MNE. The external forces from locational factors also have to be considered when we discuss subsidiary's knowledge diffusion.

In order to observe the knowledge diffusion deeply, we consider the role of different factors, including the responsibility assigned by HQ, the external locational factors in host country, as well the subsidiary itself position (i.e. the strategic importance within the whole MNE) in this research. These factors may make subsidiaries to have different behaviours, as well as shape subsidiary to play different role within the whole MNEs. For example, when subsidiaries are assigned to absorb specific resources from HQ, the assignment may encourage them to establish specific R&D position in the company (Birkinshaw & Hood, 1996). This also means whether "R&D" position could play another mediating role in this research model should be examined. We are interested to know whether these internal and external factors can strengthen subsidiary's internal R&D importance and knowledge diffusion, as well as whether the accumulated position motivate them to diffuse more knowledge.

2 Theoretical Background

Subsidiaries are part of the multinational enterprise which has established different affiliations in different locations to search the critical resources for innovations. The main typology of R&D investment by MNEs can be HBE (Home-based Exploitation) and HBA (Home-based Augmentation), or R&D resource seeking and resource augmenting (e.g. Dunning & Narula, 1995; Kuemmerle, 1999; Le Bas & Sierra, 2002). Subsidiaries have the responsibility to execute the tasks that HQ assigned. Subsidiaries are expected to either bring specific advanced tech-related knowledge for improving MNEs' R&D capabilities or apply current technologies to adapt the demand of local markets. The subsidiaries have to establish various and different interactions with local actors so that they can access the targeted resources. The accumulations of different local resources within specific subsidiaries may be diffused for sharing within the whole MNEs. When contributing more resources for the whole MNE, subsidiaries can gain a higher position among all internal units and play a relative strategic important role in innovative activities (Birkinshaw, 1996; Ghoshal and Bartlett, 1990). In order to explain subsidiary's contribution in innovations, three main categories can be summarized to show the influences on subsidiaries' importance and knowledge sharing behaviours. The three factors are HQ's strategy, subsidiary's role, and subsidiary's local condition (Roth and Morrison, 1992; Birkinshaw, 1996; Andersson and Forsgren, 1996; Strandell, 2008). These factors may make subsidiary to play different role for the whole MNEs. Therefore, as a member within the MNE network, subsidiary's internal strategic importance might be different so that they may behave differently when sharing knowledge.

2.1 The Internal Initial R&D Assignments by HQ

The first factor is about the initial task that HQ has assigned. Birkinshaw (1996) applied the concept of "mandate" and explained how the role of a subsidiary can rise and fall overtime within a MNE. If aiming at keep high position within the whole MNE, subsidiaries have to finish the assigned task of HQ, e.g. getting specific local market-related or technological-related resources (e.g. Kuemmerle, 1999). In order to fulfil HQ's assignment, subsidiaries have to create different local networks to absorb the local resources. Subsidiaries' different behaviours in host countries may make them become relative stronger or weaker among all internal units (Birkinshaw, 2002). In other words, they play different roles for innovative activities within the whole MNE. We have to examine whether the strength of HQ's initial assignments encourages subsidiaries to shape their internal R&D position, and whether they thus behave differently in knowledge sharing.

The initial R&D tasks, e.g. tech-driven R&D, aiming at learning local technologies seem to encourage subsidiaries to share as much as possible for the MNEs. However, different local resources might not be standardized for global world but just only for local adaptation (e.g. Kustin, 2004; Mohan and Hewett, 2004). How different impacts made by the initial assignments for subsidiary's behaviours should be examined.

Hypothesis 1: The R&D assignments by HQ influence subsidiary's internal position of R&D importance within the whole MNE.

Hypothesis 2: The R&D assignments by HQ influence subsidiary's knowledge diffusion behaviours within the whole MNE.

2.2 The Embeddedness of Locational Resources in Host Country

As Bartlett and Ghoshal (1991) discussed, subsidiary plays its role in the MNE's network. On RBV (resource-based view), we cannot ignore the external resources in subsidiary's location since these resources are the most important sources to provide new knowledge for MNEs (e.g. Markides & Williamson, 1996). The global integration-local responsiveness (I-R) paradigm (Doz & Prahalad, 1991; Roth and Morrison, 1992; Taggart, 1997a) explains that subsidiary's consider local endowments and demand opportunities to be integrated or be responsive for attaining a higher economic efficiency for MNE (Dunning, 1981; Porter, 1990). As several past studies pointed out, the knowledge transfer from subsidiaries become more and more important for MNEs to accumulate competence (Ambosa, et al., 2006; Criscuolo, 2004). When subsidiary's innovative activities rely more on specific local resources, the local resource advantages may become the treasure for subsidiary. Subsidiaries thus can strengthen their internal strategic importance since they can facilitate the knowledge transfer from subsidiary site to other units within the MNE. The strategic position within MNE seems to become a mediating factor to encourage their knowledge sharing.

Therefore, we have to examine whether the local reliance on specific in market-, tech-, and industrial- related advantages, which subsidiaries can access, improve subsidiary's internal position and subsidiary's knowledge sharing behaviours.

Hypothesis 3: Subsidiaries, with higher reliance on local resources, can help to gain higher position of R&D importance within MNEs.

Hypothesis 4: Subsidiary's reliance on local resources influences the knowledge diffusion within the MNE.

2.3 Subsidiary's Strategic Importance and Real Contribution

The R&D importance implies that specific subsidiaries play relative important role in R&D activities for the whole MNE. For these subsidiaries, they may have more bargaining power to ask HQ to give more autonomy for local R&D activities in decision procedure. On the view of HQ, compare to those who are less important in R&D activities, these crucial subsidiaries are supposed to contribute more what they already possessed for the R&D activities (Birkinshaw & Fry, 1998; Taggart, 1997b). However, there exists a dilemma for subsidiary to decide which goals, i.e. HQ goal or subsidiary itself goal, are more important. When subsidiaries accumulate specific capabilities and knowledge, these subsidiaries may become the critical sources to enrich the knowledge base of MNEs. The subsidiaries may gain a higher bargaining power in knowledge interactive processes within MNEs (Mudambi & Navarra, 2004) because of their unique capabilities. On one hand, when subsidiaries perceived their internal importance, they may try their best to diffuse their unique knowledge in order to earn more internal trust and keep internal position. They aim to play an influential role within MNEs or gain more support from central HQ or other units within MNEs. Therefore, a positive impacts o knowledge sharing behaviours could be observed if subsidiaries have played a critical role for innovations within MNEs.

On the other hand, some specific subsidiaries may try to keep unique resources exclusively, so as to keep their independence and autonomy. They may think their local autonomic R&D decisions are more important than the R&D strategies in the whole MNE. They may also consider if they contribute what they already absorbed for other internal units, they face to lose the relative advantages and become to be a competitor with other internal units. In other word, when the whole MNE rely more on specific subsidiary's technological capabilities, in order to keep relative competence, the subsidiary may be reluctant to share what they have accumulated with other units ((Birkinshaw, et al. 2002; Foss and Pedersen 2002; Rabbiosi, 2008). However, most of international R&D investments are still HQ-oriented and relies more financial support from HQ although subsidiaries hope to establish their unique autonomy decision procedure in new location (Taggart, 1997b). In our hypothesis, we set to examine that subsidiaries' knowledge diffusion is positive related to the crucial role they are playing for the whole MNE. In other word, subsidiaries will diffuse more knowledge for the rest of units in a MNE when they perceived they are in a higher position among all units.

Hypothesis 5: The higher R&D strategic importance the subsidiary plays, the more knowledge the subsidiary shares for the whole MNE.

3 Data and Methodology

We draw on the online survey to invite R&D managers in 15 European countries to answer the questionnaire, from which we collect 150 valid subsidiary samples¹ in European regions. EFA (Exploratory factor analysis) and CFA (Confirmatory factor analysis) are used to construct the research concepts in research models. Not only the regression models, but also a full SEM (Structural Equation model) is applied to test the hypotheses. The full SEM, including the measurement model and the relationship model, can help to examine the complete relationships in a research model. The reason that we choose to test the research issues by different models is to look for a more precise relationship between variables. The OLS regression models first provide us the general influences of HQ's factors and locational factors on subsidiary's position and the knowledge diffusing behaviours. However, the models could not test the indirect impacts (moderator effect) in the same time. In the structural equation model, we can test both direct and indirect impacts of different factors in the relationship model, and meanwhile, it also establishes a measurement model to examine if it is valid and reliable to include all these research concepts that are based on CFA.

3.1 Variables Definition

The main dependent variable in our study is the role of subsidiaries in knowledge sharing behaviour within MNEs. In order to measure the concept of knowledge diffusion, we include different questions for managers regarding the behaviour of subsidiaries in knowledge diffusion within the MNE.

¹ The empirical analysis is based on the 150 firms, but they may have some missing values which make the valid numbers in regression models are less than 150. After checking the sample correlation between what we target to measure and what we have, the one used in our models has high representiveness for original one.

We define the concept of “knowledge” to include tangible documents or reports, as well as intangible resources “embodied” in people, particularly the information for R&D and innovative activities. A subsidiary is like a node within an MNE’s internal network (Birkinshaw, 2002) to absorb or diffuse knowledge between internal units. We measure knowledge diffusion from the view of subsidiaries as well as the whole MNE so the knowledge sharing behaviour (including inflows and outflows) can be expressed more completely (Gould & Fernandez, 1989). The relevant questions about knowledge diffusion within the MNE construct the factor, KN_DIF (Knowledge Diffusion). Five point Likert-Scale is applied for all the different questions.

We also have another dependent variable, RD importance (RD_IMP), which used to represent subsidiary’s innovative characteristics for the whole MNEs. We consider the role of subsidiary in participating in a new innovative and RD project. We also include the relative scale of subsidiary’s R&D activities. This variable plays not only as a dependent variable, but also an independent variable since we design a mediating effect to test the relationships between internal HQ’s assignment/external local factors and knowledge diffusion (KN_DIF).

Table 1 Dependent Variables

<p>KN_DIF (Dependent Variable)</p> <p><i>Please rate how much you agree or disagree with the following statements about the <u>role of R&D activities in your unit</u> for the company (group) as a whole (1=completely disagree, 5 = completely agree)</i></p> <ul style="list-style-type: none"> • Our unit has an important role in transferring new knowledge from outside the company to other units within the firm • We often act as a coordinator for joint R&D projects between different units within our company. • Sharing knowledge within the company (group) is an important goal for our R&D employees. • A larger amount of knowledge flows from our unit into other units within the whole company (group) • We play a leading role in R&D activities for other R&D units or business divisions in the company
<p>RD_IMP</p> <p><i>Please rate how much you agree or disagree with the following statements about <u>R&D employees and organization culture</u> in your unit (1=completely disagree, 5 = completely agree)</i></p> <ul style="list-style-type: none"> • When the company launches a new innovation project, our unit will always be involved. • The scale of R&D activities of our department is relatively large as compared to other R&D units within our company

The first part of independent variable is the initial R&D assignment by HQ. Choosing a specific location to start R&D activities implies that the place has advantages or attractive conditions that motivate firms to fulfil their R&D goals. We asked respondents to evaluate the importance of different local factors for “motivating” the R&D activities in the new location. The possible answers were classified into three categories: (1) tech and local general resources (Tech_AS), (2) market (MAR_AS) and industrial factors (IND_AS). Each part includes few items from which we can extract the related items and observe how important these different locational factors are for MNEs’ decision of R&D location (Granstrand, 1999; Håkanson & Nobel, 2001; Lindelof & Lofsten, 2001; Niosi, 2004).

With regard to another part of independent variable, i.e. locational reliance, we asked managers to rate the importance of locational factors on their current R&D activities. We finally get three factors, including local R&D human resource (HR_LR), local industrial network (IND_LR), and market issue (MAR_LR).

We also include two control variables. One is about the sector (DOM_SB). We classify sample into whether they belong to science-based (SB) sectors or not (Marsili and Verspagen, 2002). The dummy variable is used that “1” is for those belonging to SB sectors and “0” is for the others. The second control variable is the age. We enter the year that the firm was established into the model. If the negative coefficient is shown, it means the older firms share more knowledge or play a higher position in a MNE.

Table 2 Independent Variables

<p>1.Initial Assignment (AS)*:</p> <p>Tech-related AS (Tech_AS)</p> <ul style="list-style-type: none"> • Availability of qualified employees • Availability of advanced technological knowledge <p>Industrial-related AS (IND_AS)</p> <ul style="list-style-type: none"> • Access to suppliers • Competitors invest here <p>Market-related AS(MAR_AS)</p> <ul style="list-style-type: none"> • Large markets • Lead markets (where new fashions show first) • Access to customers
<p>2.Local Reliance (LR)**:</p> <p>Local R&D industrial Network (IND_LR)</p> <ul style="list-style-type: none"> • The presence of R&D units of competitors • The presence of firms and organizations that are technological leaders • The presence of suppliers or customers who provide inputs into our R&D activities <p>Local technical and R&D human resource (HR-LR)</p> <ul style="list-style-type: none"> • The availability of R&D workers in a specific field of expertise relevant to your research fields • The availability of highly qualified R&D workers, independent of their specific expertise <p>Local market resource (MAR_LR)</p> <ul style="list-style-type: none"> • Local consumers (buyers) have special needs and preferences • Local consumers (buyers) provide ideas for our innovations • Local markets for our products or services are large • Comparing to other locations, local customers (buyers) are more innovative • Potential market can be developed in this location

*: How important of the followings when investing R&D?

** : How important of the followings for your R&D?

3.2 Research Framework and Methodology

This model examines whether the initial assignments (AS) influence the importance of the subsidiary make in innovative activities (RD_IMP) and the knowledge diffusion behaviours (KN_DIF). We also test whether the local embeddedness in terms of different locational dimensions improve the importance of R&D(RD_IMP) and encourage the knowledge diffusion(KN_DIF) for the whole MNE. Furthermore, the mediating role of R&D importance on knowledge diffusion is also examined.

We use both regression model and the SEM (Structural Equation Model) full model in this research. The regression model helps to observe the linear relationships between variables and the SEM can provide a completed analysis for considering both indicator constructing and relationship establishing. First, in the part of factor analysis, in order to get a higher reliability for all the construct/factor, we try to apply not only exploratory factor analysis (EFA) but also confirmatory factor analysis (CFA) for showing the reliability and validity of all the behavioural variables (Table 1 & Table 2 shows the results that we selected for constructing indicators). Secondly, applying both regression models and SEM is complementary for explaining the relationships. We first test the results from regression models which can guide us to choose the critical relationships to test in structural equation models. The results of SEM can show both direct and indirect impacts between independent variables and dependent variables.

The reason to use SEM full model to test research issue is that we include two different dependent variables. And the one of the dependent variables (i.e. R&D importance of subsidiary) could be taken as

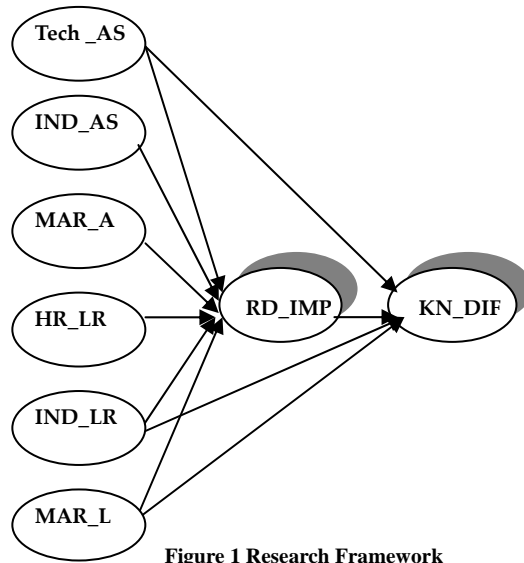


Figure 1 Research Framework

the mediating role to test whether it facilitates subsidiary's knowledge diffusion behaviours. Therefore, applying both SEM full model and regression models is the better way to find some more detailed explanations. In addition, differing from regression model, SEM model can include measurement model and relationship model in a test. In other words, many of the lost/sacrificed variance in EFA will not occur in SEM full model

4 Results and Discussion

4.1 Empirical Results

In the regression model, we first found if the initial assignment was aim to get industrial resource from new location, subsidiaries have less intention to strengthen their internal R&D importance (Model I-1) or to share knowledge from host country to internal units (Model II-1). Only the subsidiaries which were asked to look for local industrial resources have negative impacts on both dependent variables (H1). This seems to imply that the industrial-oriented R&Ds have to deeply involve in local area but not focus on absorb local knowledge to the rest of units in MNEs. Secondly, the reliance of local resources, i.e. market resource and human resource, seem both encourage subsidiary to share knowledge and can help to strengthen their internal strategic importance (H2). However, the reliance on local industrial network discourages subsidiary diffusing behaviours.

In the control variable part, the negative coefficient shown in AGE(model I-2) means that the older firms(established earlier) play more important position in R&D. In addition, in Model II-2 also shows the firms in SB sectors are willing to share knowledge for the whole MNEs.

Table 3 Regression Model

	(RD_IMP)		(DV-KN_DIF)		
	Model I-1	Model I-2	Model II-1	Model II-2	Model II-3
R&D Assignment					
MAR_AS	-.046	-0.050	0.033	0.029	0.039
Tech_AS	-.042	0.049	0.029	0.006	0.021
IND_AS	-.182**	-0.169**	-.135*	-0.122*	-0.077
Local Reliance					
MAR_LR	.275***	0.272***	0.132*	0.150*	0.050
HR_LR	.114*	0.133*	0.358***	0.370***	0.342***
IND_LR	-.294***	-0.284***	-0.020	-0.028	0.064
RD_IMP					0.307***
Control: AGE		-0.164**		-0.167	-0.112
<i>DOM_SB</i>		0.007		0.115*	0.107
constant	-0.135	6.865**	-0.067	7.487**	4.995
N	138	138	140	140	137
Model F	376***	3.373***	4.465***	4.268***	5.772***
R2	0.147	0.173	0.173	0.207	0.290

*, P<0.1; **,P<0.05; ***,P<0.01;

To explain the existence of multiple relationships, we apply structural equation model(SEM) to identify the mediating role of strategic importance that subsidiary is playing. The significance shows that research model in indicator measurement and relationship establishment are acceptable (e.g. CFI>0.9; GFI>0.9) according to the criteria in Hair, et al., (1998). The measurement model shows that all indicators (constructs) used in this model are reliable and validity. H1 and H2 are partly supported that HQ's initial Tech_AS and MAR_AS could not make any significant impacts on subsidiaries' behaviours. In addition, HR_LR and MAR_LR are positively related to subsidiary's strategic importance in R&D activities. H3 and H4 are both partly supported. In SEM model by LISREL, we have confirmed again the R&D importance on subsidiary's knowledge diffusion (H5). The mediating role of subsidiary's R&D importance is existent that some local reliant resources can strengthen knowledge sharing behaviours when subsidiary holds a relative important role in a MNE. Considering both direct impacts on knowledge diffusion and indirect impacts via RD_IMP, the three local forces that subsidiary relies on influence subsidiary's knowledge contribution behaviours in different ways.

Table 4 Structural Equation Model (SEM) by LISREL^a

IV \ DV	Model for Gamma						Model for Beta	
	Initial Assignment(AS)			Local Reliance (LR)			RD_I MP	KN_DI F
	Tech_AS	IND_AS	MAR_AS	HR_LR	IND_LR	MAR_LR		
RD_IMP	-0,09 (0.09)	-1.18* (0.82)	0,19 (0.19)	0.22** (0.13)	-0.40 (0.35)	0.42*** (0.20)	x	x
KN_DIF	x	0.64* (0.57)	x	x	0.51** (0.29)	-0.41** (0.25)	1.35* ** (0.31)	x

***:P<0.01; **:P<0.05; *:P< 0.1; DV: Dependent Variable; IV: Independent Variable;

^a: "X" means that relationships are not examined in the research model; some of them shows insignificant relationships that the model suggests to deleted; and some of them are the relationships we did not aim to test by theoretical and empirical concerns.

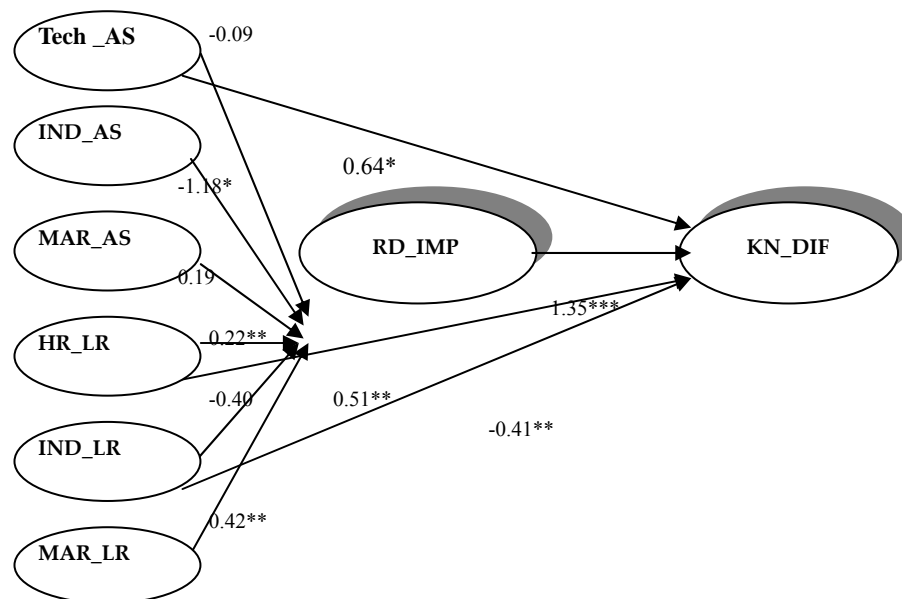


Figure 2 Results of Structural Equation Model

4.2 Discussion

4.2.1 R&D strategic position facilitates knowledge diffusion

As the model shows, R&D importance (RD_IMP) of specific subsidiary makes significant influence on the knowledge sharing behaviours. Since some external local advantages help subsidiaries to improve internal R&D importance, the RD_IMP also plays as a mediating role between some local advantages and the knowledge diffusion. Subsidiaries relying on HQ's support always hope to establish their unique position within the MNEs. If HQ can help subsidiaries to recognize their specific role for the whole MNEs, they become more willing to share what they have. However, if the subsidiaries always cannot get supports from HQ or they cannot involve in any new innovation plans, their

knowledge sharing become less. For HQ, they should take different views on all different subsidiaries (e.g. Bartlett & Ghoshal, 1991; Birkinshaw, 2002) and coordinate the internal global network so the specific resources within subsidiaries won't be lost.

4.2.2 Industrial local resources are location-specific

The negative impact of initial industrial-related assignment on subsidiary's R&D importance seems to show that industrial network in specific locations are always embedded in the area. Initial IND_AS brings negative impacts on knowledge diffusion when we consider both direct (0.64) and indirect (-1.18*1.35) impacts in Table 4. This seems to imply that the initial industrial drivers lead subsidiaries to become localised. Although HQ assigns subsidiaries to learn from local actors and hopes to get the accumulated knowledge from subsidiaries, the industrial experience and knowledge embedded in local area might be more suitable for local firms to adapt local preferences.

However, when we observe the influence of industrial reliance, there is only the positive direct influence on knowledge diffusion. The indirect influence looks negative but the negative impacts on shaping internal position is not significant existent. For those IND_LR subsidiaries, they may not be able to utilize the local industrial resources to strengthen the internal R&D importance, but their knowledge sharing behaviours still can contribute to the whole MNEs. Industrial experience could not improve subsidiary's internal position might be its local-embedded characteristics (Lou, 2004). The local industrial resources are too location-embedded to transfer. Thus, although subsidiaries have accumulated much industrial knowledge, this could not be helpful in improving position. In addition, the local industrial knowledge and advantages may not be helpful or standardized for other internal units so that the resources cannot be used to strengthen the internal bargaining power.

4.2.3 The role of HQ's initial R&D assignment

The empirical results did not show that initial assignments can encourage subsidiary's knowledge sharing. Although market-driven and tech-driven R&Ds have different goals to access different locational resources for internal need, both of them do not encourage subsidiary to share more knowledge. However, in SEM model, the initial industrial-driven assignment encourages subsidiaries' knowledge sharing behaviours.

In SEM model, it also shows that the initial R&D drivers did not influence whether the subsidiaries can gain a higher position within MNEs. Both Tech_AS and MAR_AS could not help to improve the R&D importance. In addition, the industrial assignment lowers down the internal R&D_IMP position. H1 and H2 are both partly supported which the H1 shows the negative impact and H2 shows the positive impact. Considering both direct impact (positive) and indirect impact via RD_IMP (negative), the total impact of industrial assignment on knowledge diffusion is still negative.

For subsidiary, on one hand, they are willing to share local industrial experience since sharing these resources can show the contribution and achievement of HQ's initial assignment for the whole MNEs. On the other hand, when all sharing knowledge is only suitable for local development but not help MNEs in new R&D plans, the R&D strategic importance of this subsidiary become weaker. These subsidiaries might initially be taken as minor important in foreign R&D investment so their influence on R&D. The negative impact might also give an implication for HQ that only aiming at imitating industrial actors may weaken the internal R&D capability for the whole MNE. Although market-driven or tech-driven assignments did not show the positive influence for contributing in R&D, MNEs should think to pursue a diversified innovative resources, but not just copy from industrial actors.

4.2.4 The influence of local reliance on knowledge diffusion

The crucial force to promote subsidiary's internal position is the external locational resources. Managers in subsidiaries have to utilize these local advantages that can help them to shape the internal position. Meanwhile, HQ needs to be capable to identify the differences between subsidiaries so that they can advice different subsidiaries to exploit and explore different local resources for the whole MNE. The results show that the reliance on local tech human resource and market resources helps subsidiaries to shape their unique positions within MNEs and strengthen subsidiaries' strategic importance in innovative activities. However, the reliance on local R&D industrial network does not help much on strengthening R&D importance for subsidiaries. It seems to make more influence on subsidiaries' knowledge sharing behaviours. Subsidiaries have to spend more time to transfer the valid local industrial resources for internal units since this cross-locational resource may need time to digest for MNE's innovations. In contrast, the impacts of local market reliance show the negative impacts on subsidiary's knowledge diffusing. This might tell the HQ that the specific market experience may only useful for some markets but not suitable for diffuse for the whole MNE. Although subsidiaries' market resources are important for developing local markets, the accumulation of this type of resources may

hinder the willingness of knowledge sharing.

All the three local factors can encourage subsidiaries to diffuse knowledge. As Birkinshaw (2002) discussed, different type of knowledge may influence how MNEs manage the global R&D network. The different new resources have been diffused within the MNEs in different ways that MNEs have to establish an efficient knowledge sharing system. As the evidence has shown, the local human resource makes an indirect impact on knowledge diffusion indirectly via the internal R&D_IMP. In contrast, the local industrial network only makes direct impact significantly on KN_DIF. The reliance on market resource seems to show a negative direct impact on KN_DIF, but a higher positive indirect impact. All the three external local resources reliance can help to facilitate subsidiaries knowledge diffusing in different ways so that the HQ can help subsidiaries to play different but unique role for the whole MNE.

Particularly, the reliance on local market encourages subsidiaries to strengthen their internal position since they might think the local market is critical for the whole MNE. Subsidiaries try to gain a higher internal R&D strategic importance when they can access a lead market. However, the local market experience may be not so useful for the whole MNE that the direct but negative relationship is shown. Because the encouragement from market resources on R&D important and the positive relationship between RD_IMP and KN_DIF create the indirect positive impacts on subsidiary's knowledge sharing. If HQ can help the market-reliance subsidiaries exploit their position in local market but not just ask for contribution, subsidiaries can play their influential role for both HQ and their local market.

5 Conclusions

To understand subsidiaries' knowledge diffusion behaviours, this research model helps us to figure out the role of initial assignments by HQ, the forces of external local factors, and the different roles (direct and mediating) of subsidiary's R&D importance. The initial HQ assignments, especially market- and tech-related goals, seem to make less influence on how subsidiary strengthen their internal position. Although specific subsidiaries are expected to bring unique tech or market resources for the whole MNE, whether subsidiaries become important and whether they are willing to share knowledge depend on the availability of external local resources. However, new subsidiaries focusing on local industrial resources (IND_AS) take much effort on local market development. Therefore, although the accumulated industrial resources make them to share knowledge within MNEs, the experience cannot help subsidiaries to establish higher position among all internal units.

Subsidiary's internal R&D position plays a positive role to influence knowledge sharing. Subsidiary's knowledge diffusion becomes stronger when the subsidiary can gain a higher R&D importance within the whole MNEs. In addition, RD_IMP also plays a mediating role when subsidiaries can take advantages of local external resources. The reliance on local technological human resources and market advantages both leads the subsidiary to create their strategic importance within the whole MNEs, which can be a mediator to facilitate knowledge sharing. This seems also to imply that advanced technological knowledge is not the only competence for subsidiaries to gain higher position. When subsidiaries absorb useful market experience from local customers, it also helps to shape unique R&D strategic importance within MNEs. However, the specific market resources may not be so standardised for all markets so that the direct contribution on knowledge sharing seems to mitigate the indirect contribution of the high market-reliance subsidiary. Finally, the high market-reliance subsidiary and high HR-reliance (human resource reliance) subsidiary both tend to share knowledge for all internal units more than those which are low local-reliance subsidiaries.

For further work, this research model should try to use another perspective to observe knowledge diffusion. Standing on the view of subsidiary, the managers might hope to know whether their contributing in knowledge sharing can lead them to be more important within MNEs. This is also related to one of the limitations of this study that we did not apply a non-recursive structural equation model (SEM). Some SEM full models check whether both directions (i.e. RD_IMP and KN_DIF play both dependent and independent variables). However, our model turns unacceptable in non-recursive way so we need to establish further model to examine this relationship.

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ⁱ In particular, a Global value chain for software: the ICT value chain in Nanjing China (Van Dijk, 2006). I am also using the work of two PhD students, in particular Preville (2002) on the banana chain and Andadari (2008) on wood furniture clusters in Central Java. Finally I am a supervisor at MSM of a number of MPhil theses for value chains in the Southern African region

ⁱⁱ The Financial Times (10-12-2007) mentions that sugar, like three other products, is excluded for duty free entry!

ⁱⁱⁱ Supply Chain Management (SCM) is also important to remain competitive. It means using techniques to improve competitiveness by improving efficiency at the level of the channel, rather than at the firm level.