

CHAPTER 7 – CONCLUSIONS AND IMPLICATIONS

7.1 Introduction

This chapter presents all the conclusions and implications of the study. Firstly, the conclusions for the research questions are presented and compared with the extant literature. The research questions and hypotheses allow the study to draw conclusions on the following topics of interest: 1) the strength of interactions in backward linkages between MNC subsidiaries and local suppliers in the petrochemical industry in Malaysia; 2) the effect of the technological capability level of local suppliers on the strength of interactions in backward linkages; and 3) the enabler of the upgrading of technological capability in inter-organizational linkages between local suppliers and MNC subsidiaries/local producers. Secondly, the implications of the study in terms of theory and policy are discussed. Finally, the study's limitations are presented, together with suggestions for future research.

7.2 Discussion of the Findings

This section presents conclusions from the findings of the research questions, based on the results from the quantitative and qualitative approach to the study that were presented in Chapter 5 and Chapter 6.

7.2.1 Findings on the MNC Subsidiaries

This study aims to highlight whether the ownership structure of MNCs is significant in terms of influencing the acquired strength of interactions in backward linkages between MNC subsidiaries and local subsidiaries in the petrochemical industry. A review of the literature on the strategies of MNCs reveals at least two manifestations of global

integration and local responsiveness strategies (Johnson, 1995; Johansson and Yip, 1994; Roth and Morrison, 1990; and Hansen et al., 2009): 1) FDI motives (Dunning, 1993), and 2) intra corporate coordination between MNC and subsidiary (Birkinshaw and Hood, 1998; Gupta and Govindarajan, 2000). Even though other dimensions of global integration and local responsiveness framework strategy are available (including value chain configuration (Porter, 1986), or managerial orientations), FDI motives and intra corporate coordination are a conceivable proxy to look at the strength of backward linkages in this study of inter-organizational linkages.

The results of the study show that the data support the view that MNC subsidiaries given a higher level of autonomy by the parent are significantly more inclined to have strong backward linkages with local suppliers (Hypothesis 2). This confirms the view on the subsidiary's role vis-à-vis the parent that the subsidiary as defined by the parent firm can be more or less independent of the corporate strategy (Birkinshaw and Hood, 1998; Gupta and Govindarajan, 2000; Tavares and Young, 2006). One interpretation of this phenomenon is that the parent firm will give its subsidiary higher autonomy in order for the subsidiary to control local linkage partners; by allowing the subsidiary to control its local linkage partner, the parent company replicates its culture of centralization, monitoring and control in the host country. Yet, even if this interpretation is correct, the subsidiary still becomes more attuned to the requirements of its local supplier partners.

Owing to their high operational risks, petrochemical firms cannot compromise on the safety and quality of their input materials. Therefore, even as they give subsidiary firms high autonomy in decision-making, quality-oriented MNCs will extend their standards, as well as monitoring and controlling practices among local linkage partners. The results of this study show that local-owned firms provide stronger backward

linkages compared to joint-venture firms, which in turn show stronger backward linkages compared to foreign-owned firms. This observation could be explained by the fact that knowledge is firm-specific. Local-owned firms are seen as the provider of technology to local firms, whereas foreign firms have to make sure that their competitive advantage is not compromised, and so are more inclined to import their supplies from the home country.

In regard to the investment motives of MNC subsidiaries and their decisions as to whether to source locally or become locally embedded, the study's data support the notion that firms with a high motivation for local sourcing have strong backward linkages. Therefore a policy of high local sourcing will develop more linkages with local suppliers. Thus we can accept the hypothesis that local market-seeking MNC subsidiaries have higher interactions of backward linkages with local supplier firms than do export-oriented MNC subsidiaries (Hypothesis 1). This again confirms that linkage effects have a high correlation with the motives for investment (Dicken, 2003; and UNCTAD, 2000a). The study shows that the very existence of local-owned firms in the home country encourages them to source locally; this tendency is reinforced by the national interest in the case of the Petronas-owned subsidiary (a government-linked company), and by the suppliers' close proximity to customers. In contrast, foreign-owned firms are more prone to get their supplies from other channels, often their own home-based firms or other global suppliers.

7.2.2 Findings on the Local Suppliers

FDI is one form of knowledge transfer by which developing countries can acquire modern technologies, as well as new management and organizational practices, from the superior knowledge of MNC subsidiaries. It is also important for the host country that MNCs upgrade their subsidiaries once they are established, because this means that

their technology will also be upgraded. One way of encouraging such upgrading is for the host country to improve its own technological capability (Bell and Pavitt, 1993). Local suppliers therefore need to upgrade their technological capabilities to develop linkages with MNC subsidiaries. One way to do this is to join forces with a foreign partner, as seen in the case studies.

This study presented two hypotheses regarding the influence of backward linkages on the technological capability level of local suppliers. Hypothesis 3 suggested that the technological capability level of local suppliers is affected by the breadth of backward linkages, while Hypothesis 4 suggested that the technological capability of local suppliers is not affected by the internal factors of suppliers. In the results, only backward linkages show a high correlation (Hypothesis 3), while local suppliers' internal factors show no correlation (Hypothesis 4). These hypotheses are therefore confirmed. It should be noted that Hypothesis 4 is in contrast to studies of the E&E industry by Iguchi (2007), who found that local suppliers' technological capability is indeed affected by the internal factors of suppliers. The discrepancy can be explained by the differing nature of the petrochemical industry, with its emphasis on engineering that is knowledge-intensive.

Studies by Ivarsson and Alvstam (2009) show that MNCs and local suppliers interact regularly in order to manufacture finished products based on non-standardized, customized intermediate products with high-quality requirements. In such cases, technological assistance from MNCs to local suppliers is an integral part of their business relations. Level 1 local suppliers or basic suppliers, being involved only with standardized products, have fewer interactions with the customers; but Level 2 local suppliers or advanced suppliers, being much more involved with non-standardized and customized products, have more interactions with customers. As with the difference in

the findings with Iguchi (2007), the local suppliers in the petrochemical industry are much more diversified. Some firms are small but are involved in non-standardized and customized products that are very knowledge-intensive, while others are small but are involved in standardized products, and vice versa. This could be a factor in the difference between the present study's findings and those of Iguchi (2007).

Two important empirical findings can be generated from the study of local suppliers. Firstly, there seems to be significant potential for local suppliers to upgrade their technological competence by becoming suppliers of engineering parts and components in the petrochemical industry. MNCs need to interact regularly with such suppliers in order to manufacture non-standardized and customized intermediate products with high-quality requirements. Technological assistance forms part of their business relations in these interactions. Secondly, the empirical study shows that the amount of technological assistance that advanced local suppliers under VDP receive from MNCs is influenced by whether the local suppliers are focused only on the domestic market or on both the domestic and the foreign markets. If an advanced local supplier under VDP targets both the domestic and the foreign markets, the quantum of assistance is greater than for suppliers that focus only on the domestic market. This is consistent with studies by Ivarsson and Alvstam (2009:384), which found that local suppliers receive more technological support if they form part of an MNC's global sourcing strategy through their export of intermediate products.

Hence, being part of a global value chain has an additional positive effect on supplier upgrading. This is probably because MNCs find that it is to their advantage to outsource their parts and components to additional global suppliers. However, the study is inconclusive as to the findings in regard to local suppliers that are not under VDP and to basic suppliers, as it does not have enough data to draw conclusions.

This local supplier study also contributes to the theoretical understanding of supplier upgrading in the global value chain. The upgrading of suppliers' technological capability in non-standardized engineering products seems to be based to a certain degree on local business linkages with MNCs having production in the host country. This finding supports an evolutionary perspective on international technology transfer (Kim and Nelson, 2000; Lall, 1996a). Through these linkages, local suppliers can interact regularly with MNCs in order to facilitate the transfer of product and process technology. The most important element in this transfer of technology is the tacit element of the knowledge.

7.2.3 Influences of Backward Linkages on Local Suppliers' Technological Capability Levels

The result from Hypothesis 3 shows that backward linkages factors affect the technological capability level of local suppliers. Our data support Hypothesis 3 in the sense that a higher strength of backward linkages in process and management is correlated with a higher level of technological capability. In other words, suppliers' technological capability levels are significantly affected by these two forms of backward linkages – or, to put it another way, local firms' technological capability has been built up through these two categories of backward linkages. These results confirm the fact that local suppliers gain knowledge from the superior knowledge of MNC subsidiaries: suppliers gain knowledge through learning by interacting with subsidiaries (Lundvall, 1988). For the petrochemical industry in Malaysia at this point in time, process linkages and management linkages are found to be crucial in upgrading technological capability. From the results of the study, there is also some significant strength in training linkages.

These results too contrast with those of Iguchi (2007), who found that process and training linkages in the E&E industry have the most persistent influence in the upgrading the technological capabilities of local suppliers. In the petrochemical industry, process linkages and management linkages have some influence in the upgrading of technological capability of local suppliers. However, training linkages are not significant, as it is believed in the industry that firms can get access to training and skills from various institutions that are available in the market, and that most firms have sufficient resources to ensure their workers are well trained.

The confirmation of Hypothesis 4 means that internal factors of local suppliers do not affect their technological capability level. This is somewhat surprising, given the strong indications in the literature that size, sales and age are indicators of the technological capability level of local firms in developing countries (Blomstrom and Kokko, 1997, Giroud, 2000). Yet the results indicate that these independent variables show no significance for the petrochemical industry in Malaysia. In relation to volume of sales, for example, the items sold in the petrochemical industry are highly variable, with some small items costing more than big ones. As for the number of employees, there is no correspondence in the petrochemical industry between staff numbers and the number of linkages that a firm might form: since the industry is knowledge-intensive, it needs only a small number of employees to run a plant. Nor is the age of a firm a reliable guide. Most of firms in the study are still relatively new, and some are able to form more linkages than others, depending on the type of product or services that the firm supplies to MNC subsidiaries (Ivarsson and Alvstam, 2009). It is true that some engineering products produced by local suppliers do require active interactions with the customer, as they are designed according to the customer's specifications. In other cases, suppliers have to interact regularly with customers face-to-face because they produce non-standardized and customized products. But overall, internal factors cannot

be used as a proxy for indicators of the technological capability of engineering firms, as the petrochemical industry is too complex. We can assume that besides backward linkages factors, the technological development of local suppliers in the petrochemical industry may be affected other factors, such as environmental factors, rather than by size, sales and age.

7.2.4 Findings on Backward Linkages

The findings in Section 7.2.1 and 7.2.2 show that there is strong correlation between i) backward linkages and the ownership structure of the MNC subsidiary; and ii) backward linkages and different levels of supplier technological capability. These observations show that MNCs invest in countries where a certain level of technological capability already exists. In the case of the Malaysian petrochemical industry, the CEO from a joint-venture firm noted that his parent company chose Malaysia due to its infrastructure and its skill levels. In the case of local suppliers in the petrochemical industry, all except three of the interviewed suppliers indicated that they started their businesses by supplying to upstream activities in the oil and gas industry. In developing countries it is difficult to set up totally new suppliers, because the competitive industrial base is not available. Thus the suppliers in the oil and gas industry integrated and became suppliers to the petrochemical industry. These supplier firms had already obtained a certain amount of knowledge or technological capability either through their linkages with their previous customers (local or global), or from the previous experience gained by their owners or employees in the oil and gas industry.

The development of technology suppliers in the petrochemical industry is important for Malaysia. So far, suppliers from the oil and gas industry have supplied the petrochemical industry, as the technology is somewhat compatible. However, for the Malaysian petrochemical industry to expand further, new supplier firms need to

emerge. Without this, the industry will be supplied either by imports or by suppliers from other sectors if their technology is compatible.

The empirical evidence in chapters 5 and 6 shows that MNC subsidiaries (100% local-owned, joint ventures and 100% foreign-owned) provide suppliers with many kinds of backward linkages. As a result, suppliers have upgraded their technological capabilities. They have also accumulated technological capabilities through many other channels: spillovers, government programs, and interactions with customers from exporting countries. The strength of the 'Others' linkage category shows that government programs do have a certain effect on building the technological capability of local firms. The study did not include environmental factors that could influence the strength of backward linkages. But the case study did show that the government-linked Petronas has acted as an enabler for bringing oil and gas and petrochemical technology into the country through the Malaysian government-initiated strategy under the VDP.

7.2.5 The Role of Petronas as Enabler

From the empirical evidence, the linkage between technology suppliers and the producers of petrochemicals is rather weak, although qualitative analysis of the upgrading of local suppliers shows that LOP has managed to play a role in upgrading local suppliers. Lauridsen (2004) argues that support from the government, from industry associations or from international organizations can contribute to improving local suppliers' bargaining power. The Malaysian government has followed this principle by combining SME promotion with the creation and enhancement of inter-firm linkages. Institutions may also contribute to coordinating the allocation of resources and enhancing the links of local technology suppliers to global industries, so generating formal or informal large networks that allow a rapid information flow

(Rasiah, 2010, Rodrik, 2004). In this regard, the Malaysian government has made efforts to improve developmental linkages between foreign and local firms – for example, MIDA’s launch of the VDP in 1993. In this program, technologically advanced firms – usually foreign MNCs – were given incentives to mentor upgrading processes in local vendors. This was facilitated by guaranteed contracts, a free interchange of engineers and product specifications, loans with preferential terms from local banks, and ongoing technical assistance from public research institutes. Petronas is one of the many MNCs and large Malaysian corporations that established the VDP. The results of the study show that the Petronas subsidiaries LOP have given more backward linkages to local supplier firms than any other MNC subsidiary. Thus Petronas, the anchor company for the government petrochemical VDP program, has become a tool for the country to transfer engineering technology. Petronas has managed to bring technology into the country and has become an enabler to upgrade the technological capabilities of local suppliers in the petrochemical industry. Thus in upgrading the industry, Petronas has acted as an intermediary in the bargaining by the local suppliers, a role it could fulfill because it is also the regulator of the Malaysian oil and gas and petrochemical industry.

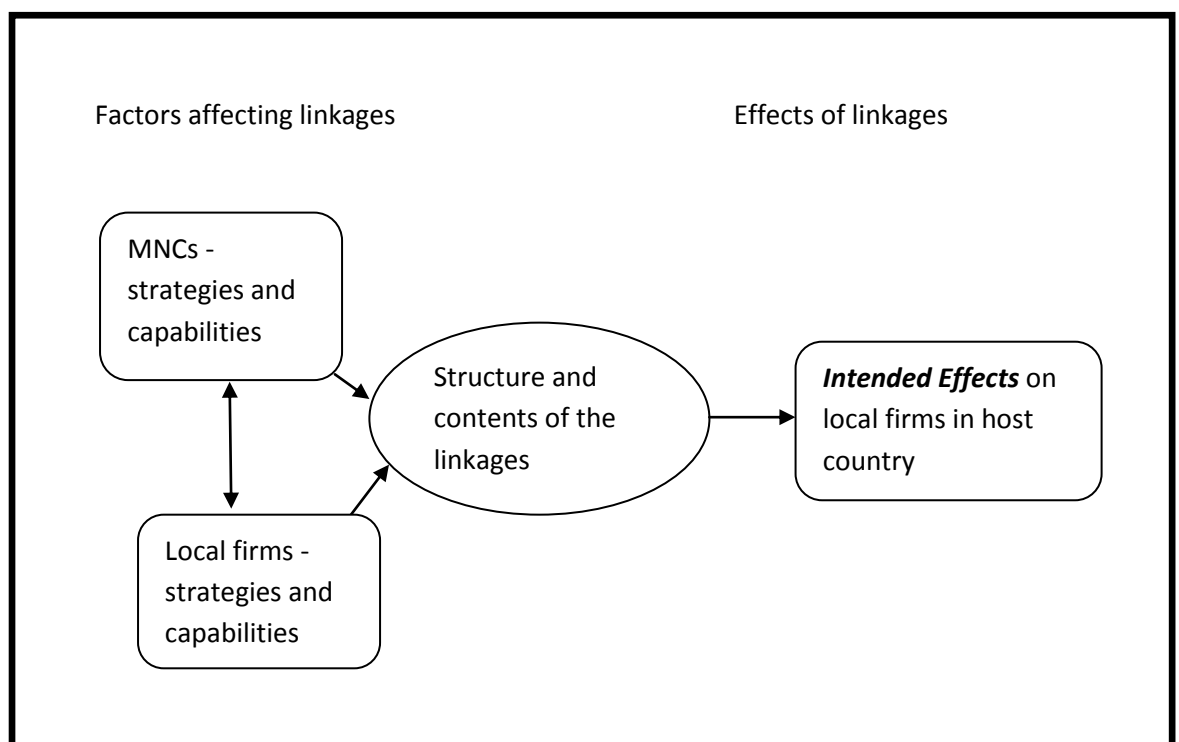
7.3 Contribution to the Literature

The study demonstrates the importance of MNC-SME linkages. Firstly, it shows that MNCs can be a powerful source of demand for the output of local suppliers and subcontractors. Secondly, MNCs can raise the capabilities and quality of local suppliers to the international level more effectively than links among domestic firms. Thirdly, through business linkages MNCs can transmit technical and market information, skills, finance and other forms of assistance. Lastly but most importantly,

MNCs are increasingly tending to perceive the building up of supplier networks (via supplier development programs) as a long-term investment.

The study has developed an analytical framework for the development of a resource-based industry in Malaysia. The framework is as follows:

Figure 7.1: A Conceptual Framework for Research on Resource-based Industry



7.4 Theory Implications

Evolutionary Model: the study has shown that the state can take the role of a coordinating agent, building up institutions and domestic technological capabilities which allow the economy to join the international marketplace under their own terms and conditions (Rasiah, 2010; Rodrik, 2004). The case study also illustrates the role played by institutional elements, with Petronas, a state-owned enterprise, acting as an enabler for technology transfer in the petrochemical industry in Malaysia. The findings

from this study show how “ownership” of MNCs (locals or foreigners) as technology supporters matters for industry development. This corresponds to the argument by Amsden (1989) that industry which experienced progress and spillover knowledge to the local economy was domestic-owned productive organizations, where the government had systematically intervened in the industries’ production and market. These findings correspond to Chandler’s (1977) hierarchical structural economic theory which argues that productive organizations and institutional arrangement would create conducive environment for innovation.

7.5 Policy Implications

The type of FDI that enters a developing country will depend on the development stage the host country has reached (Dunning and Narula, 1996), as well as the industrial development strategy of the host government (Altenburg, 2000). In Malaysia’s case, oil and gas were found in the country long before the government developed the petrochemical industry. The progression to the development of petrochemicals was due to the demand for petrochemical products in the Asia-Pacific, which itself stemmed from the region’s economic development. Studies have ascertained that not many linkages can be produced if it is only government that wants to develop the industry (Battat et al., 1996).

With the Malaysian government still pursuing its petrochemicals project even though the industry is capital intensive, the policy implications of the study’s findings go to what kind of foreign investors the government should bring into the country with respect to the petrochemical industry. The motivations MNC parent companies have for making foreign investments are always changing, even as developing countries compete for a share of the capital investment. Policy makers thus need to scrutinize the value to their countries of this investment, and it is important, as Auty (1987) warned, for

developing countries to study the possible effects of petrochemical development. Capital-intensive investment can lead countries to divert their resources into sectors that give less value to the country's development – the 'Dutch Disease' phenomenon.

In regard to policy implications for developing countries, this study firstly supports the shift in focus from merely attracting FDI to promoting linkages with local firms (Altenburg, 2000; UNCTAD, 2001; Tavares and Young, 2006). Linkage policies increasingly require sophisticated and differentiated approaches, whereby FDI is assessed on the basis of its contribution to local industry development. Government policies to promote FDI should include infrastructure development in order to spur the agglomeration of supporting industries and the tackling of problems related to supplier capacity and competitiveness (Altenburg, 2000; UNCTAD, 2001). The study supports the view that it makes sense for policy makers to differentiate between MNC subsidiaries, based on: i) the degree to which their local activities are integrated in global operations; and ii) their inclination to be involved in the local market (Hansen and Schaumburg-Muller, 2006). Firms that are involved in global operations produce fewer linkages with local suppliers, and their integrated activities can produce fewer effects, but these effects can be deep. In contrast, firms that concentrate on the local market can have strong linkages, but the type of technology may not be of the kind that will benefit the country very much in terms of technology transfer. In addition, the extent of the linkages formed between MNC subsidiaries and local suppliers will depend on the autonomy given to the subsidiaries by their parent companies. This decision is based in turn on the parent company's strategy in entering the foreign market, and that will depend on what kind of technology the subsidiary has and what firm-specific advantage the parent needs to protect; in short, on its mode of entry to the host country.

Secondly, the growing demand on the part of MNCs for deeper linkages, better-developed infrastructure and greater capabilities among local suppliers may actually be to the disadvantage of local suppliers, since it may make them too dependent on foreign MNCs. In the long run, too, the change in MNC strategies will likely widen the gap between developed and developing countries. While the spirit of competitiveness is important for developing countries to catch up, this gap will continue to grow. Developing countries will continue to be the backyard of developed countries. This is where the role of government-linked companies can be important. Petronas shows how such companies can be enablers or intermediaries for technology transfer to local suppliers.

Thirdly, this study has shown that successful technological development requires a vision for the country. There were many doubters as to whether a developing country could succeed in developing a petrochemical industry – doubters who pointed to the trap of ‘Dutch Disease.’ However, as the product life cycle theory suggests, firms move to a location where they can make greater profits. The petrochemical industry was brought into developing countries as a result of the oil embargoes in the 1980s, which, by increasing the price of oil, drove up the cost of all related products. Following the product cycle theory, the big oil MNCs had to bring the prices of petrochemical products down. One way to do this was to invest in foreign countries. For Malaysia, the timing was perfect. When the oil prospectors came with their deep-sea oil excavation techniques, the country found it was sitting on vast oil and gas wealth.

After first developing the oil and gas industry, the Malaysian government embarked on developing the petrochemical industry. Next in line was the development of the downstream activities from the products of the petrochemical industry, namely the plastic fabrication industry. The linkages considered in this study could be used to

study possible linkages in the downstream activities of the plastics industry. The progression from oil and gas to petrochemicals and then to downstream activities in plastics fabrication illustrates the development path of strategic industries in Malaysia.

Lastly, this study has shown how Malaysia's national oil company acted as the vehicle for developing the petrochemical industry. Petronas is seen as the enabler in bringing in petrochemical technology from global MNCs. It was highly professional in developing the industry by requiring it adhere to market forces, for example by inviting competitive suppliers into its outsourcing process. Petronas acted as the anchor company for bringing in technological capabilities through the VDP, the supplier development program. As an anchor, it influenced local firms to obey its rulings. Further study is needed to see whether this process can be emulated in other manufacturing industries.

The role of Petronas in the oil and gas industry has transformed the industry to include the petrochemical industry. Petronas is now transforming the upstream and downstream activities of the oil and gas industry into further downstream activities in the formation of the plastics industry. The record of local suppliers in the oil and gas and petrochemical industries shows that supplier development programs are gaining in importance for cost reductions in firms (Sako, 1994). In Malaysia, under Petronas's VDP, the supplier development program has upgraded the technological capabilities of local suppliers.

7.6 Limitations of the Study

This study focuses only on the intended upgrading effects of linkages between MNC subsidiaries and local suppliers. It does not look at unintended upgrading effects,

which are the spillover effects examined in many studies. Furthermore, the number of MNC subsidiaries that participated in the study was not sufficient for robust inferential statistics to be compiled. Thus, in order to make up for the low sample bias, a case-study approach was used to reach a better understanding of the issues surrounding the types of entry mode an MNC uses when it decides to enter a foreign country. The number of linkages that it produces could clearly have an effect on the development of local suppliers in the petrochemical industry, but with a small number of samples such inferences could not be established using parametric and non-parametric statistics.

Due to constraints on time and resources, only backward linkage factors were found to be significant in terms of transferring technological capabilities from MNC subsidiaries to local suppliers. There are other aspects that could be analyzed. A review of the literature on technological capabilities reveals that linkage effects can be attributed to a number of factors. For example, a number of studies on linkages have emphasized, among other things, environmental factors or the National Innovation System (Iguchi, 2008); the development level of the host country (Dunning and Narulla, 1996); and the absorptive capacity of local firms (Altenburg, 2000; Tavares and Young, 2005; and UNCTAD, 2000b). Some studies even relate linkage practices and their effects to the capabilities and characteristics of the investing firms. For example, Giroud (2000) relates linkages to the size of MNCs, Hansen and Schaumburg-Muller (2006) relate the entry mode of Danish MNCs to linkages formed and the upgrading of local suppliers in developing countries, and Iguchi (2007, 2008) looks at the effects of the MNC on the development path of local suppliers.

Lastly, linkage capability is only one of the three technological capabilities mentioned in the taxonomy of Lall (1990), the others being investment capability and production

capability. Thus, further study is required to understand the petrochemical industry fully.

7.7 Further Research

This study has described one method for developing the technological capabilities of local firms, especially in the petrochemical industry. The mode of entry of MNCs matters in building technological capabilities. Different ownership structures will provide different strengths of linkages. The strength of these linkages is a proxy of what technological knowledge might be expected from these MNCs. The strength of these linkages can also show the spillover effects of building linkages with MNCs. Accordingly, further study is necessary on the factors that affect the strength of linkages, as described in the limitations of the study, above.

Research on the effects of linkages as a result of FDI in developing countries is still minimal. Researchers are more inclined to study spillover effects, as they provide more proxies to examine when looking from the economic perspective. The study of linkages is challenging, as it may not be easy to get precise information regarding the time when linkages were first established between the parties. As Malaysia is increasingly trying to entice FDI, the country should remain conducive to FDI and competitive in attracting it. But it should also put the focus on the quality of the FDI. FDI policies are indeed shifting more and more from a focus on merely attracting FDI to a focus on promoting linkages with local firms. Therefore, study of linkage effects should also focus on environmental factors or the National Innovation System. In the case of the petrochemical industry, in order to study this aspect of inter-organizational linkages, one needs to get a clearance from Petronas headquarters, as the national oil company is the gatekeeper of the Malaysia's petrochemical industry.