

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Literature Review

This section provides the summary of previous studies related to the effects of FDI productivity spillover on the host country economy. According to the objectives of study, this study is aimed to evaluate the economic impacts of FDI productivity spillover on Thai economy as a result of FDI technology spillover effects on productivity level of the automotive industry. Hence, literature related to this topic can be considered into four groups of studies as follows. The first group of studies is accounted for the impacts of FDI on economic growth of the host country based on the framework of endogenous technological change. The second group of studies is concerned with the effects of FDI technology spillover on productiveness of domestic firms in the host country or FDI productivity spillover effects. The third group of studies is involved with the role of FDI technology spillovers in the Thai automotive industry. The last group of studies provides the analysis of FDI productivity spillovers by implementing the Computable General Equilibrium (CGE) model.

2.1.1 FDI and Economic Growth

Impacts of FDI on economic growth of the host country are manifold. Through capital accumulations in the host economy, FDI is expected to be a growth enhancing through encouraging the incorporation of new inputs and new technology used in the production process. In the case of new inputs, output growth in the host country is resulted from the uses of a wider range of intermediate goods in FDI-related manufacturing sectors. In the case of new technology, FDI is expected to be a potential source of productivity gains via the spillover effects to domestic firms in the host country. Even though there are empirical studies related to the impacts of FDI on economic growth, it is found that the impacts of FDI on economic growth remain more contentious in empirical than in theoretical studies.

Borensztein et al. (1998) have examined the impacts of FDI on economic growth based on the endogenous growth model in which technological progress takes place through the process of capital deepening in the form of the introduction of new varieties of capital goods. Econometric technique is applied and all regressions are based on a panel data for the two decades 1970-1989 using data of FDI flows from industrial countries to 69 developing countries. The study introduces two different types of effects of FDI on economic growth; the direct and indirect effects. The direct effect is shown by the relationship between FDI and economic growth measured by per capita real GDP growth rates. Nonetheless, FDI can also affect growth of the host country through pulling in other sources of investment. This is referred to as the indirect effect of FDI on economic growth and it is represented by the relationship between FDI and domestic investment measured by aggregate investment rates. The purpose of this study is to estimate the effects of FDI on economic growth both directly and indirectly and examine whether FDI interacted with the stock of human capital affects economic growth in which the proxy of human capital is the level of educational attainment focusing on secondary school attainment.

The estimation results show that FDI has positive effects on economic growth but the magnitude of these effects depends on the stock of human capital available in the host country. However, the nature of the interaction of FDI with human capital is that, for the country with very low level of human capital, the direct impacts of FDI on economic growth become negative. The indirect effects of FDI indicate that FDI exerts positive, though not strong, effects on the level of domestic investment and its efficiency. This study has found some evidences of the crowding-in effects in which FDI is complementary to domestic investment. The most robust finding is that the effects of FDI on economic growth are dependent on the level of human capital in which FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technology is available in the host country or when the host country has a minimum threshold stock of human capital.

Li and Liu (2005) have studied whether FDI affects economic growth of the host country based on a panel of data for 84 countries including 21 developed and 63 developing countries over the period of 1970 to 1999. Econometric approach is applied in both single and simultaneous equation estimations. For single equation

estimation, there are two equations to be estimated which are growth equation and FDI equation in which the former represents the impacts of FDI on economic growth which is measured by per capita GDP growth rates while the latter represents the impacts of GDP growth on FDI inflows. Both single equations with GDP growth and FDI growth as the dependent variables, respectively, are estimated over the whole sample period. In order to estimate the effects of FDI on economic growth, not only the interaction of FDI with human capital, but also the interactions with infrastructure per capita and technology gap are introduced in order to examine the role of absorptive capability of the host country. The proxy for human capital and infrastructure per capita are the level of educational attainment focusing on secondary school attainment and the number of telephone lines per capita, respectively.

The empirical results from single equation estimation show that FDI itself has strong positive effects on economic growth. Moreover, there are strong positive interaction effects of FDI with human capital and strong negative interaction effects of FDI with the technology gap on economic growth. By comparing developed and developing countries, the test results show that FDI has positive and statistically significant impacts on economic growth in both categories. The interaction of FDI with human capital has strong positive impacts on economic growth in both categories while that of FDI with technology gap shows different impacts on economic growth in which positive but insignificant impacts for developed countries and strong negative impacts for developing countries. This controversial result is due to the fact that developed and developing countries have different levels of technology-absorptive capabilities which are high in the former and low in the latter. Therefore, a larger technology gap would exert a positive (respectively, negative) impacts on economic growth in developed countries (respectively, developing countries).

Endogeneity test in simultaneous equation estimation shows that only during the period 1985-1999 do FDI and economic growth become significantly complementary and form an increasingly endogenous relationship. The policy implications show that FDI and economic growth have become increasingly endogenously related and the promotion of human capital, technological capability, and economic development will lead to more FDI inflows. This in turn will promote further economic growth and enhances competitiveness.

2.1.2 FDI Technology Spillovers and Domestic Firm's Productivity

Effects of FDI on the host economy can be evaluated not only by the host country economic growth, but also by the increased level of productivity of domestic firms and/or industries in the host country as a result of technological advantages diffused from MNC affiliates. This kind of benefits from FDI can be referred to as FDI productivity spillover effects. Thus, this group of studies will provide the summary of previous studies related to FDI technology spillovers and their productivity spillover effects on domestic firms and/or industries in the host country.

Liu (2008) has studied on how FDI generates externalities in the form of technology transferences by investigating on whether the presence of FDI affects productivity level as well as rate of productivity growth of domestic firms in the host country. The study is based on a large panel of Chinese manufacturing firms consisting of 17,675 manufacturing firms over the period 1995 to 1999. A single equation needs to be estimated in which domestic firms' productivity is assumed to be dependent on the foreign equity shares in firm level as well as the foreign investments in industry level. Different to the other studies, this study has examined not only the short-term level effects, but also the long-term rate effects of productivity. There are two sets of empirical estimations conducted in this study. Firstly, the effects of intra-industry or horizontal spillovers are examined. Secondly, the effects of inter-industry or vertical spillovers in conjunction with those of intra-industry spillovers are estimated. It is suggested that there are two types of vertical spillovers in which one takes place through backward linkages between domestic firms and foreign-invested firms in downstream industries and the other occurs via forward linkages between domestic firms and foreign-invested firms in upstream industries.

This study also provides the theoretical analysis of FDI technology spillovers and it is found that the level and rate effects of FDI technology spillover on productivity of domestic firms can go in opposite directions. The negative level effects of FDI technology spillover underscore the fact that technology transfer does not occur automatically and is a costly learning process. The positive rate effects of FDI technology spillover indicate that human capital or knowledge is considered as the ultimate engine of economic growth. For the empirical results, they are by and

large consistent with the theoretical suggestions. FDI technology spillovers lower the short-term productivity level, but raise the long term rate of productivity growth of domestic firms within the same industry. Since the level effects result in a loss of productivity level and the rate effects lead to a gain in productivity growth, therefore the latter dominates the former in the long run and domestic firms will benefit from the presence of FDI in their industries (i.e. intra-industry spillovers). The estimation results also show that FDI technology spillovers through backward and forward linkages between foreign and domestic firms in different industries (i.e. inter-industry spillovers) have similar effects on productivity of domestic firms. Moreover, this study has found that, the backward linkages seem to be statistically the most important channel through which FDI technology spillovers occur.

Joseph (2007) has examined the effects of spillover generated from FDI on productivity and competitive performance of domestic firms in the host country through either horizontal (intra-industry) or backward (inter-industry) spillovers and tried to investigate and the role of domestic firms' absorptive capabilities in absorbing these spillover effects. This study is conducted under the liberalized framework since it is suggested that economic liberalization would help in speeding up the diffusion of knowledge that improves domestic firms' productivity level. It is hypothesized that with the superior technology, marketing skills and marketing networks of MNCs, the presence of foreign firms would help domestic firms to improve their productivity performance and such spillover effects are dependent on domestic firms' absorptive capacities. Therefore, this study aims to test this hypothesis by using a firm level data of Indian manufacturing firms for the period of 1993 to 2004, which is a period of full scale liberalization in India.

The effects of FDI technology spillover on domestic firms' productivity level can be measured by using two different spillover variables which are horizontal and backward spillovers in measuring productivity spillovers from foreign firms within the same industry and through outsourcing to domestic firms, respectively. The empirical results show that the effects of both horizontal and backward spillovers on productivity level of domestic firms are positive and statistically significant. This indicates that productivity of domestic firms increases due to the increased change in the rate of relative share of foreign sales in the same industry as well as in

other industries. In order to investigate the role of domestic firms in absorbing the productivity spillovers from FDI, the interactions of domestic firms' capacities measured by their R&D stock level with both types of spillover variables are introduced into the model representing the capacities of domestic firms to absorb horizontal and backward spillovers. Estimated coefficients for horizontal as well as backward spillover absorption are positive and statistically significant. This indicates that the positive productivity impacts of the foreign presence on domestic firms within the same industry as well as in other industries largely depend on the technological capabilities of domestic firms. In other words, domestic firms with increased investment in R&D capabilities significantly benefit from the large presence of foreign firms in improving their productivity performance.

Kohpaiboon (2006b) has examined the role of trade policy regime in explaining cross-industry differences in technology spillovers from FDI in the Thai manufacturing sectors. Econometric analysis is applied using cross-sectional data of the Industrial Census in 1997 (data for 1996). This study has suggested that FDI technology spillovers are not automatic and one important factor determining the magnitude of FDI technology spillover effects is the nature of trade policy regime toward industries. Therefore, the analysis is built on the 'Bhagwati hypothesis' in which the effects of FDI technology spillover tend to be smaller, or even negative, under a restrictive policy or import substitution (IS) regime compared with a liberalizing policy or export promotion (EP) regime. This study aims to test whether the 'Bhagwati hypothesis' is true for the case of Thai manufacturing sectors using two-equation model composed of the equation for productivity determinants and FDI determinants in allowing two-way link between the foreign presence and labor productivity of locally-owned industries. In analyzing the role of trade policy, two alternative measures are introduced to proxy the nature of trade policy, namely the effective rate of protection (ERP) and the nominal rate of protection (NRP).

The estimation results of the productivity equation show that FDI technology spillovers are unlikely to take place in highly trade-restricted industries as compared to more export-oriented ones. Therefore, these empirical results tend to support the 'Bhagwati hypothesis'. From the estimation results of the FDI equation representing the foreign presence, there is also evidence that the trade barriers as well

as the size of the domestic market play an important role in determining inter-industry differences in FDI participation. In summary, the empirical results have suggested that liberalizing the foreign investment regime while retaining a restrictive trade policy is likely to induce the type of FDI inflows that are unlikely to introduce technology spillovers to the host country. A key policy implication is that liberalizing the foreign investment regime has to go hand in hand with liberalizing the trade policy regime to maximize gains from FDI technology spillovers.

2.1.3 FDI Technology Spillovers in the Thai Automotive Industry

Kohpaiboon (2006a) has investigated the role of MNCs and their involvement in the Thai manufacturing through an in-depth firm level case study of the automotive industry covering both car assemblers and parts manufacturers in order to provide an insight into the mechanisms of how the presence of MNCs contribute to the technological capabilities of domestic firms. Information used in this study is mainly gathered by interviewing senior managers. The aim of interviewing MNC affiliates in the car assembly industry is to examine their efforts in creating linkages and to determine any changes in their efforts, with regards to the parts manufacturers, the aim of interviewing is to address the role of backward linkages and technology spillovers. Samples of car assemblers cover both Japanese and US affiliates while the auto part enterprises were initially Thai owned and all of them had experienced as OEM (Original Equipment Manufacture) suppliers for the past thirty years.

The firm interviews have found that there is a considerable level of MNC involvement in the Thai automotive industry occurring through both FDI and non-FDI channels in which MNCs tend to prefer FDI to non-FDI channels because production technology is a proprietary asset. FDI channel seems to be more effective mean in securing their proprietary asset. The firm interviews also confirm the role of MNCs in contributing the technological capabilities to the Thai part suppliers, thus leading to their technological improvement. In other words, there are FDI technology spillovers in the Thai automotive industry and the key FDI channel is through the backward linkages developed between the car assemblers and its local parts suppliers. Nonetheless, the contribution of MNC involvement is different between the import

substitution (IS) and export promotion (EP) regime periods. Backward linkages occurring under an IS regime are policy-induced which are not reliant on economic factors and therefore are rather weak. Thus, there is no evidence that car assemblers significantly assist local parts suppliers to improve production efficiency. In contrast, backward linkages under an EP regime are mostly driven by economic factors which are referred to as natural linkages and seem to be more beneficial to the technological capability of local parts suppliers in which car assemblers tend to be more active to involve in the improvement of their production efficiency.

2.1.4 FDI Productivity Spillovers with the CGE Analysis

Deng et al. (2008) have introduced the endogenous productivity increase caused by FDI spillovers into the Computable General Equilibrium (CGE) model in order to examine whether the presence of multinational firms improves productivity of Chinese manufacturing firms via productivity spillovers. In this study, the CGE model is constructed capturing the endogenous productivity spillovers from foreign-invested firms to domestic firms in China. The research on FDI productivity spillover effects conducted in the CGE framework also involves in estimating key FDI productivity spillover coefficients with econometric analysis first and then implementing computer-based simulations of various scenarios to evaluate the overall impacts of productivity spillover from FDI.

The model descriptions are as follows. There are 31 industrial sectors (i.e. manufacturing, constructions and utilities) and 8 non-industrial sectors (i.e. agricultural and services). This study is aimed to provide a more complete and accurate measure of the productivity spillover effects of FDI on domestic firms in a structural way by scrutinizing all the four spillover channels which are labor mobility, industry linkages, exports and demonstration effects with a focus on the manufacturing sectors. Since the productivity spillover effects of FDI in manufacturing sectors is the primary research target, each sector of manufacturing in the Input-Output Table has been disaggregated into three sectors by ownership, namely state-owned enterprises (SOEs), foreign-invested firms (FIEs) and other domestic firms in which the sectors in agriculture and services are not disaggregated by ownership.

For the model data base, the latest 122-sector China Input-Output Table for the year 2002 is employed as a core data base in performing the CGE analysis. The total factor productivity (TFP) level of SOEs, FIEs and other domestic firms are estimated using a firm-level data collected from a survey of 1000 Chinese manufacturing firms by the World Bank in 2000.

Basic findings from econometric part have suggested that the TFP level of FIEs is the highest in this sample. The TFP level of SOEs is higher than that of domestic private firms. Thus, this estimation justifies the possible productivity spillovers from FIEs to SOEs and other domestic firms. The productivity spillover effects via four channels estimated with the micro-level data base are counterintuitive to some extent. The study has found that spillovers via labor turnover are generally negative, but SOEs have gained positive benefits from recruiting people who have work experience in multinational firms. This is consistent with the fact that SOEs have stronger absorptive capability to benefit from the labor turnover. The backward linkages are not a significant channel for productivity spillovers, while the forward linkages, horizontal demonstration and multinational firms' export concentration degree tends to negatively affect the productivity level of domestic firms due to the competition effect. This implies the Chinese firms are still not prepared to absorb the spillovers. Finally, it is found that the firm level R&D expenditure negatively affects the productivity performance of domestic firms.

For the CGE simulation of FDI productivity spillovers, the introduction of FDI can generate positive effects in terms of economic growth, total exports and the upgrading of industry structure. When TFP spillovers are embodied in FDI shock, an economy will grow even more rapidly than otherwise. The gross output and value added of domestic firms (both SOEs and private firms) will basically increase. But the foreign firms will slightly be negatively affected due to the resource constraint such that with higher productivity, domestic firms have absorbed more labor and capital from foreign firms. By introducing monopolistic competition into the CGE simulation of FDI productivity spillovers, the increases of gross output and valued added becomes less than those in the scenario of perfect competition. This implies that the existence of monopoly power and markup makes the economy benefit less from FDI shock due to the waste of resources in the fixed cost.

2.2 Theoretical Framework

There are three subsections determining the theoretical background of FDI and its related spillover effects. The first subsection provides brief explanations about the phenomena of FDI in order to capture the wider scope for its existence and to explain why foreign firms want to invest abroad in terms of performing multinational corporations (MNCs) in the host country. The second subsection provides the general aspect of FDI spillovers or the general view about positive externalities generated from FDI on the host country economy. The perspective on FDI-related technology spillovers is concisely explained in the last subsection.

2.2.1 The General Theory of FDI

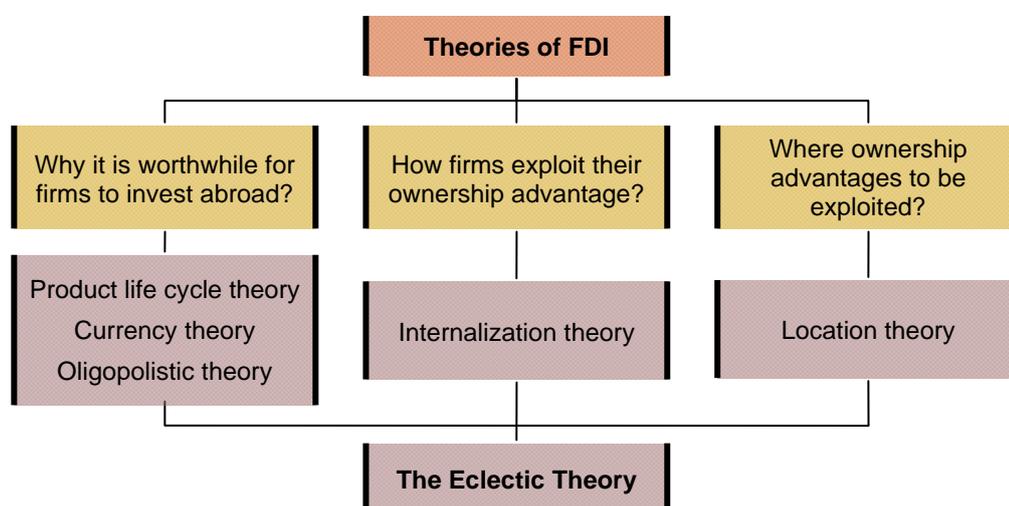
Event though there are several studies concentrating on the major topic of the causes of FDI phenomena in many aspects, there still exists no general theory of FDI. The reason is that the existing theoretical approach still has many loopholes in explaining the FDI phenomena completely. And controversially, they are quite different in fundamental views (Ponjan, 2001).

In the microeconomic basis, or in other words the International Business Approach, most studies on the cause of FDI phenomena are *positive economics* focusing on the benefit and cost advantages of multinational corporations and the reason they invest their money across country. FDI is the result of a firm's decision to diversify some or all operational activities across countries. The key factor that drives a firm to relocate its activities abroad relates to its competencies as well as to business opportunity. This means a firm taking this step is able to use abroad its technology that is proprietary. Hence, investing abroad is a way to maximize benefit from a firm's competitive advantage.

There are many major micro-view theories in explaining the cause of FDI phenomena; the Location advantages theory, Internalization theory, Currency area theory, Product life cycle theory, and Oligopolistic theory. Dunning (1985) has synthesized those into the one known as "International production theory" or "Eclectic theory" as an attempt to generate the general theory of FDI.

The Eclectic theory which has become known as the OLI (Ownership-Location-Internalization) framework combines the five theories in explaining three questions by three advantages which are necessary for a firm to undertake direct investment as shown in Figure 2.1. There are three advantages for a firm to invest abroad: ownership-specific advantage (the “O” in OLI), location advantage (the “L” in OLI) and internalization advantage (the “I” in OLI). The first one tries to explain why it is worthwhile for a firm to invest abroad and there are several theories related to this question; the Product life cycle theory, Currency area theory and Oligopolistic theory. The second one concentrates on how a firm exploits its ownership-specific advantage. The Internalization theory emphasizes that it is the market failure that prompts a firm to internalize the market for inputs and outputs rather than externalize them. Lastly, the reason for MNCs engaging their activities in more than one locality are offered by the Location theory.

Figure 2.1
The Eclectic Theory



Source: Ponjan (2001)

It has been suggested that a firm will engage in foreign value-adding activities if and only if the three following conditions are satisfied. First of all, a firm must possess ownership-specific advantage. The ownership advantage is anything that gives the firm enough valuable market power to outweigh the disadvantages of doing

business abroad. This could be a product or production process to which the other firms do not have access, such as a patent, blueprint or trade secret. But the advantage could also be as intangible as trademark or reputation for quality. The second condition is that the firm possessing ownership-specific advantage must have benefit from internalizing the use of resources, in which it has an advantage, rather than selling them on external markets. This advantage is called as internalizing advantage which is the most abstract of the three conditions, but the advantage can be highlighted by considering alternatives to direct investment. The third condition is that the country where FDI taking place must offer some special location advantage to be used in conjunction with ownership and internalization advantages which make it more profitable to produce in the foreign country than to produce at home and export to the foreign market. Tariffs, quotas, transport costs, and cheap factor prices are the most obvious sources of location advantages.

2.2.2 The General Aspect of FDI Spillovers

Attracting foreign investment from abroad by providing generous incentive packages has become a major phenomenon in many countries. The major argument in favor of such generous foreign investment policies is the expectation of the possible externalities generated by foreign affiliates on domestic producers in the host country. These externalities generated by MNCs are often referred to as ‘spillovers’ which indicates the importance of how its influence is transmitted.

According to Kohpaiboon (2006a), the spillover effects generated from MNC involvement in the host country are kind of indirect impacts of FDI in which it is likely to influence the economic structure as well as the conduct and performance of locally owned firms in the host country. FDI means there are new entrants in industries and this can affect industry concentration. Their entry can increase domestic market competition and eventually influence the behavior and performance of incumbent firms. FDI inflows can create linkages to upstream and downstream industries, thereby promoting complementary domestic investment in host economy. In addition, superior technology associated with MNE affiliates can spill over into the rest of the host economy and benefit local non-affiliated firms and other foreign-

invested firms. All of these impacts can result in the productivity improvement of local non-affiliated firms. Such indirect impact is referred to as FDI technology spillover. In other words, spillover is said to take place when the presence of a foreign firm generates productivity or efficiency benefits of the host country's local non-affiliated firms (Blomström and Kokko, 1998). Of all the gains from FDI, it is often argued that the spillovers are the most desirable benefits of FDI for the host country economy. There are at least three channels through which FDI spillovers can occur:

(1) Demonstration Effects

The presence of foreign firms can have demonstration effects which allow local firms to become familiar with superior technologies, marketing and managerial practices used in foreign affiliates. For instance, local firms might not know about certain technologies and production processes until they become available in the domestic economy, owing to the entry of foreign firms. Thus, spillovers can take place in the form of imitating the foreign subsidiaries' technology. Apart from enhancing the demonstration effects, the presence of foreign affiliates can exert pressure on local firms exhibiting technical or allocation inefficiencies to adopt more efficient methods. This allows local firms to survive successfully or even compete with foreign firms. In the short run, local firms respond to the presence of foreign affiliates by improving their X-efficiency such as by enforcing more cost-conscious management and motivating employees to work harder. In the longer term, local firms seek new technology or innovations to upgrade their existing production. Since both demonstration and competition effects are likely to occur simultaneously, these two effects are regarded as a single channel of spillovers.

(2) Linkage Effects

Where foreign investors are linked to upstream and downstream industries in the host country, the linked indigenous firms have the possibility of gaining technological benefits. The former is referred to as backward linkage and the latter as forward linkage. By backward linkage, foreign investors establish an inter-firm relationship with local supplies and create a demand for inputs from local suppliers in upstream industries. When these local firms are engaged to supply certain raw materials, the high quality, reliability and speed of delivery that MNC affiliates

demand force them to enhance productivity. Moreover, in some cases, local suppliers in upstream industries receive technical and managerial training in the production of the required inputs. This is likely to generate additional economic activity and income, and transfer technological and management skills to the host country.

Forward linkage effects are created when one industry uses another industry's output as its inputs. Every activity that does not by its nature cater exclusively to final demand induces attempts to utilize its outputs as inputs in other industries. The sum of the backward and forward linkages gives a total linkage effect which can be seen as the growth in other new industries induced by establishing as MNC affiliates.

(3) Labor Mobility

In addition to demonstration effects and linkages, FDI technology spillovers can take place through labor mobility. Generally, foreign affiliates play a more active role than local firms in educating and training local labor. Through this training and subsequent work experience, workers become familiar with the foreign affiliates' technologies and production methods. Technology spillovers through this channel occur when employees of foreign affiliates move on to local employers or set up their own business, using knowledge learned during their previous employment.

2.2.3 The Perspective on FDI-Related Technology Spillovers

According to Marin and Bell (2004), the analysis of technological spillover impacts of FDI on the host country economy have typically assumed the impacts to be the outcomes of two linked steps. The first involves MNC parent-to-affiliate international transfer of technology that is superior to the prevailing technology in the host economy. The second involves the subsequent spread of this technology to domestic firms known as technological spillover effects. Note that the latter has been addressed in a growing number of spillovers studies in various host economies (Görg and Strobl, 2001). This subsection provides the alternative perspectives on FDI-related technology spillovers in the host country economy from previous approaches which are the conventional and alternative views and also examines two mediating variables related to FDI technology spillovers.

(1) The Conventional Centrally Driven Supply-side Origins of Spillovers

– The Original ‘Pipeline’ Model

There is a long history of empirical analysis of FDI-related technological spillovers, running from the early work in the 1970s to the rapidly growing number of such studies in the last ten years. Since the work of Hymer (1976), a core element in the theoretical framework underlying in this work has concerned the MNC’s possession and exploitation of technological assets – an ownership specific advantages seen as the main reason for the MNC’s existence. A second, usually implicit, element is the assumption that the MNC is a tightly integrated organization with the behavior of subsidiaries closely shaped by central strategies and decisions. The combination of centrally accumulated technological assets and tightly integrated organizational behavior sets the basis for the two-step ‘pipeline’ that delivers spillovers of superior technology from MNC parents to domestic firms without any significantly active role on the part of the local MNC affiliates. They are simply leaky containers at the end of the transfer stage of the process.

– Mediating Variables: Limited Absorptive Capability

Research attention has shifted to explore whether the limited capabilities of locally owned firms act as a constraint on their abilities to absorb the potentially available spillovers from MNCs – a suggested constraint on the demand side of the spillover process. However, there are two problems arise. First, it does not question the centrally driven supply side model. It merely bolts on the end a postulated demand-side explanation for the inconclusive and negative results from the simple ‘pipeline’ models. Second, the evidence from these approaches is still mixed.

– Mediating Variables: Industry Differences and Corporate Strategy

Industry differences and corporate strategy are considered as supply side constraints. It has been questioned the assumed homogeneity of MNC behavior that has underpinned most empirical analyses to date. In particular, two kinds of MNC diversity have been seen as possibly influencing the types of technology transferred from MNCs to affiliates and hence the scale and significance of the knowledge resources in affiliates that may subsequently leak to domestic firms.

The first is diversity in the characteristics of industries in which MNCs operate. 'Advanced' industries such as electronics, are thought to possess greater potential than more 'traditional' industries for generating spillovers because they use more recent vintages of technology, employ greater numbers of skilled workers and undertake more R&D. Also, within a particular type of industry, the intensity of the value-adding activities might provide, it is argued, differing opportunities for technology spillovers. The structure of world markets in particular industries may also be a source of variability in the content of technology transferred through FDI and hence in the potential for subsequent spillovers.

The second type of heterogeneity is about differences in the centrally driven strategies of MNCs. Wang and Blomström (1992) developed a model in which international technology transfer emerge from parent company decisions in the light of expected strategic interaction between their foreign affiliates and the technological characteristics of host country firms: the higher the host country firms' investment in learning, the more advanced the technology transferred in order to ensure profitability in the face of more technologically capable competition.

(2) The Alternative Locally Driven Sources of Spillovers

The locally driven sources of spillovers are considered as MNC affiliates' technological capabilities. A body of recent research has addressed issues about FDI from the 'bottom up' focusing primarily on the development of affiliates as unique and differentiated organizational entities. It has shown that a variation in innovative capabilities across affiliates, and over time, depends on much more than the centralized decisions of the parent company including: (1) the decisions and strategies of affiliates themselves and (2) the aspects of local environment that create constraints and opportunities for affiliates.