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   Gujarati, Damodar N., 2003, *Basic Econometrics*, 4th edition, McGraw-Hill International Edition, Boston.

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PRODUCTIVITY SPILLOVERS FROM FOREIGN DIRECT INVESTMENT: COLLECTING THE PUZZLE

Suyanto

ABSTRACT

Productivity spillovers from foreign direct investment (FDI) have long been a subject of interest for economists. Recent surveys on empirical literature show that the evidence is mixed in direction and magnitude. This current study surveys the theoretical and empirical literature in order to collect the puzzle of productivity spillovers and presents some important conclusion in respond to the mixed evidence of the previous studies. Two main factors are reviewed to explain the inconclusive results, i.e. variations in methodology and data used and the mediating factors for gaining knowledge spillovers. Many studies take advantages of the variety in measurement of productivity to identify the positive spillovers. Some studies show the importance of absorptive capacities and economic environments as mediating factors for productivity spillovers.

Keywords: *Knowledge spillovers, foreign direct investment.*

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Whether foreign direct investment (FDI) generates positive productivity spillovers on host countries have been an interesting topic to study during the last two decades. A large number of studies have examined this topic and the verdict has largely been inconclusive. This inconclusiveness leads researchers to search for the answers. The literature then develops in several directions to account for the ambiguity in findings of the earlier studies.

This current study reviews the development of the literature, both theoretical and empirical literature in order to identify the ambiguity in the earlier studies. It starts with a discussion on the concept of spillovers in the following section, which is followed by a review on channels of productivity spillovers. It continues by surveying the empirical literature and discussing two important arguments regarding the inconclusive results. Conclusions are drawn in the last section.

FDI, Knowledge Transfer, and Productivity Spillovers

Foreign direct investment (FDI) provides recipient countries with direct and indirect benefits (Figure 1). The direct benefits take the form of new investments that boost national income, provide new employment, and increase tax revenue for governments. The indirect benefits are in the form of knowledge externalities, which are generated through non-market mechanisms, to a recipient economy and the domestic firms within the economy (Hymer, 1960). These externalities are commonly known as FDI spillovers.[1]

Literature on FDI identifies at least three types of FDI spillovers, namely productivity spillovers, market-access spillovers, and pecuniary spillovers. Productivity spillovers are defined as the externalities from FDI that lead to an increase in the productivity of domestic firms (Blomstrom and Kokko, 1998; Aitken and Harrison, 1999). Market-access spillovers exist if the presence of FDI generates an opportunity for domestic firms to access international markets (Blomstrom and Kokko, 1998). Pecuniary spillovers take place when the existence of foreign firms affects the profit function of domestic firms through a reduction in costs and an increase in revenues (Gorg and Strobl, 2004).[2]

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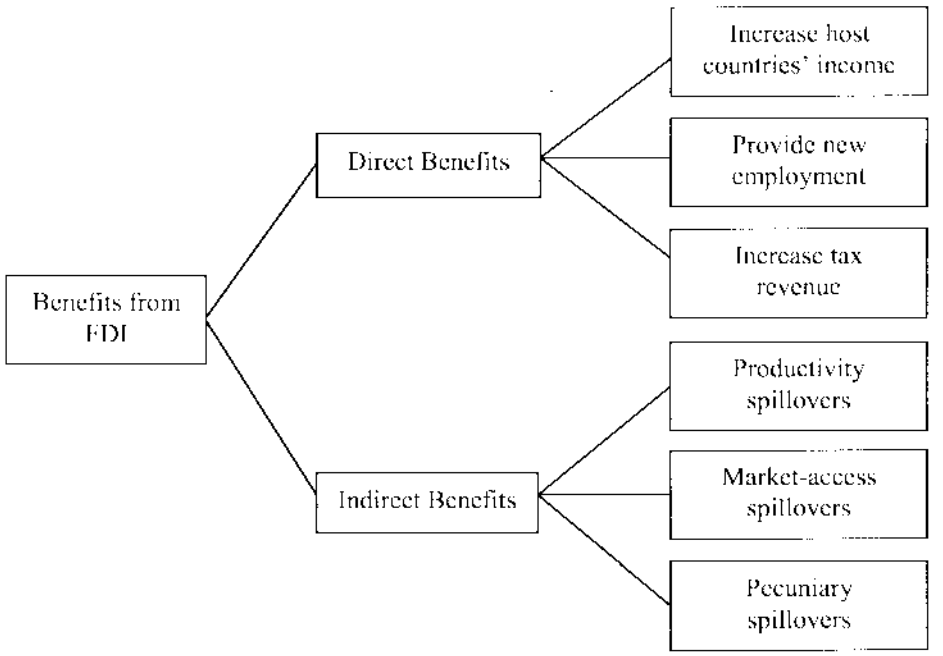
[1] The term of FDI spillovers, externalities, and indirect benefits are used interchangeably to refer to the same idea of benefits provided by FDI through non-market mechanisms.

[2] Lipsey and Sjoholm (2005) include also wage spillovers as FDI spillovers. They argue that wage spillovers occur when the entry of foreign firms in domestic markets raises employees' wages. Under this definition, wage spillovers may be considered as a specific type of negative pecuniary spillover. The rise in wages increases the cost of production and, in turn, negatively affects profits.

Figure 1. FDI Benefits and Productivity Spillovers



Source: Author's Schematization based on Blomstrom and Kokko (1998), Gorg and Strobl (2004), and Lipsey and Sjoholm (2005)

Of the three types of FDI spillovers, productivity spillovers have been a growing concern among policy makers and researchers in the last two decades. There has been great competition among many policy makers in providing a FDI-friendly environment in order to grasp the productivity gains from FDI (Oman, 1999; Bjorvata and Eckel, 2006).[3] Substantial efforts have also been devoted by researchers to evaluate the existence of productivity spillovers.[4] The basic argument supporting

[3] UNCTAD (2003) reports that of the 1,641 national regulatory changes to FDI from 1991 to 2001, 94% provide more favorable incentives for FDI. In addition, Harding and Javorcik (2007) noted that there was a significant increase in the number of national investment promotion agencies between 1990 and 2005, and these agencies provided a variety of incentives for foreign direct investments.
[4] Smeets (2008) provides an excellent survey on the studies.

this concern is that the presence of FDI, in the form of multinational companies (MNCs), may introduce new knowledge[5] to the recipient economy, which in turn will increase domestic firms' productivity. To be more precise, when MNCs transfer knowledge to their subsidiaries, the transferred knowledge may not be fully internalized and, to some extent, may leak to domestic firms. Thus, domestic firms may gain productivity advantages from FDI knowledge transfers.[6]

The Concept of Productivity Spillovers

From the basic argument of FDI spillovers mentioned above, it is suggestive that knowledge transfer to host countries involves two distinct processes (Figure 2). The first process is the knowledge transfer from MNCs to their subsidiaries, which involves a direct transfer of knowledge from a home country to a host economy. The second process is the knowledge transfer from MNC subsidiaries to domestic firms, which happens indirectly and takes the forms of externalities. The productivity spillovers of FDI take place when the externalities from knowledge transfers generate productivity gains to domestic firms. Figure 2 shows the two processes of knowledge transfers and outlines a schematic concept of productivity spillovers. Based on this concept, the discussion in the subsequent sections of this chapter is structured around the circled part of Figure 2 (*i.e.* the FDI productivity spillovers).

As illustrated in the figure, the presence of knowledge externalities from MNCs may generate three different forms of productivity gains to domestic firms. Advanced product and process knowledge leads to technological (or technical) progress in domestic firms, shifting upward their technological frontier (Caves, 1971).[7] Advanced managerial knowledge provides domestic firms skills related to technical efficiency, where domestic firms learn ways to produce more output with the same combination of inputs (*i.e.* output-oriented technical efficiency), or to produce a certain amount of output using less input combinations (*i.e.* input-oriented technical efficiency) (Kravtsova and Zelenyuk, 2007). Cost-efficiency knowledge is an important factor for scale efficiency, where domestic firms learn ways to achieve

[5] Following previous studies (*e.g.* Kokko and Kratsova, 2008; Smeets, 2008), knowledge is defined broadly as superior technology, managerial know-how, and the ability to exploit scale efficiency.

[6] It is generally assumed in the literature that MNCs possess superior knowledge relative to domestic firms (*e.g.* Caves, 1974; Das, 1987; Wang and Blomstrom, 1992). With this superior knowledge, MNC subsidiaries are often believed to have higher performance levels, and in particular to be more efficient and productive, than domestic firms (Blomstrom and Sjoholm, 1999).

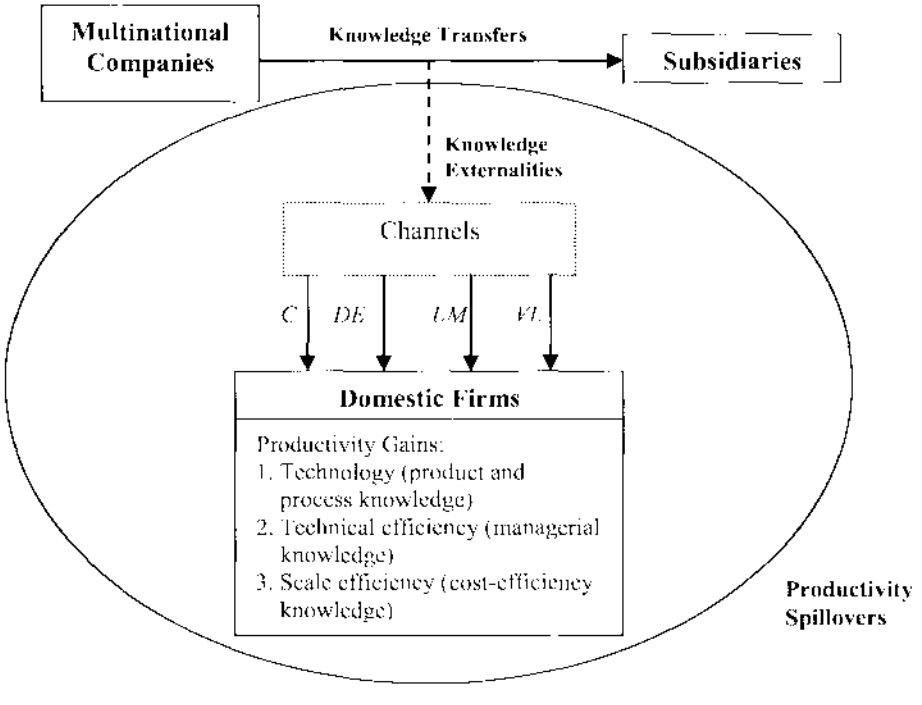
[7] Following the productivity analysis literature, technological progress and technical progress are used as synonymous in this thesis.

optimal level of scale of production, given the existing resources (Girma and Gorg, 2007). These three forms of productivity spillovers are transmitted through four possible channels, as discussed in the following section.

Channels of Productivity Spillovers from FDI

Theoretical literature on FDI suggests two broad categories of transmission mechanisms for productivity spillovers: intra-industry and inter-industry productivity spillovers. If the existence of MNC subsidiaries generates higher productivity to domestic firms in the same industry, these spillovers are considered as intra-industry spillovers. In contrast, if the presence of MNC subsidiaries increases productivity of domestic firms in different industries, the spillovers are regarded as inter-industry spillovers.

Figure 2. The Concept of Productivity Spillovers from FDI



Note: *C* is competition, *DE* is demonstration effect, *LM* is labour mobility, and *VL* is vertical linkages
Source: Author's Schematization based on Caves (1971), Gorg and Greenaway (2004), Girma and Gorg (2007), Kravtsova and Zelenyuk (2007), and Smeets (2008).

The intra-industry spillovers may occur through three channels: competition, labour mobility, and demonstration effect, while the inter-industry spillovers are channelled through vertical linkages (Figure 2). (1) *Competition*: The entry of MNCs may lead to greater competition in domestic markets. Domestic firms are then forced to defend their market share by increasing their productivity in three potential ways. Firstly, they can introduce new products to the market by utilizing new technologies. Secondly, the domestic firms may adopt a new management method to increase their technical efficiency. Thirdly, they can increase their scale efficiency by producing at a lower cost. Achieving productivity improvements in domestic firms as a result of competition from foreign companies is commonly known as productivity spillovers through competition (Blomstrom and Kokko, 1998; Gorg and Greenaway, 2004).

Some theoretical models have been developed to analyze productivity spillovers through competition. Wang and Blomstrom (1992) show that as long as foreign firms serve host country markets and foreign and domestic products are substitutes, the presence of foreign firms in a domestic market may increase competition. However, the impact of competition on productivity depends crucially on the type of domestic firms. Wang and Blomstrom classify domestic firms into two groups: the active-learning and the passive-watching firms. They argue that only the active-learning domestic firms will enjoy productivity spillovers from competition since these firms devote more resources to learning investments. The passive-watching firms will be left behind in a more competitive environment. In addition, Wang and Blomstrom (1992) highlight that the active-learning firms play an essential role in increasing the rate of knowledge transfer from MNC subsidiaries. Yet, the actions that may be taken by MNCs to limit spillover gains from competition receive little attention in this theoretical model.

Glass and Saggi (2002) extend Wang and Blomstrom's model by taking into account the MNC actions to limit knowledge transfers to domestic firms. Although Glass and Saggi accept the argument that the entry of MNCs increases competition and induces productivity gains to domestic firms, they show that MNCs may limit the spillover effects by increasing the cost of knowledge transfers. Domestic firms may receive knowledge spillovers, but the transfer of knowledge may be only partial and happen gradually over time. Hence, domestic firms may remain disadvantaged relative to MNC subsidiaries. A similar model is also constructed by Tailor (1993). However, Tailor's model differs from Glass and Saggi's in the sense that the former considers product knowledge while the latter focuses on process knowledge.

A different argument of competitive effect from FDI is presented in Markusen and Venables (1999). Markusen and Venables argue that the entry of foreign firms to domestic markets reduces domestic firms' sales, leads to the exit of some domestic firms, and restores sales of remaining firms to zero profit level. When the profit effects are larger than the efficiency effects, the competition from foreign firms may result in negative spillovers to domestic firms. Aitken and Harrison (1999) present a similar argument but focus on the increasing of average costs in domestic firms as a factor for the negative spillover effects.

(2) *Labour mobility*: Productivity spillovers from FDI may also occur when domestic firms recruit MNC personnel (Kaufmann, 1997; Fosfuri *et al.* 2001; Markusen and Trofimenko, 2007). The argument is that MNCs play a more active role than domestic firms in educating and training local workers. Through this training, and subsequent work experiences, workers become familiar with MNC technology and production techniques. Productivity spillovers through labour mobility take place when the trained workers move to domestic firms or establish their own business (de Mello, 1997). The workers bring with them the knowledge of new techniques and apply the knowledge for their new employers or to their own business, increasing the productivity of these firms.

White collar workers (or managers) are particularly important trained workers for productivity spillovers. As reported by Caves (1996), the mobility of managers from Japanese MNCs to US domestic firms contributes significantly to knowledge diffusion. Saggi (2002) also identify productivity spillovers through labour mobility in some Asian countries. He finds that around 88 percent of skilled workers of a Bangladeshi garment firm (Desh), which received knowledge from a Korean MNC (Daewoo), moved to other domestic firms or established their own business. Saggi also discovers that around 63 percent of skilled workers in Taiwan that left MNC subsidiaries had moved to domestic firms. This remarkable evidence that the former MNC workers transfer their knowledge to domestic firms clearly demonstrates the role of labour mobility in channelling productivity spillovers.

(3) *Demonstration effects*: The third channel for productivity spillovers is demonstration effects. The presence of MNC subsidiaries in the domestic market can generate demonstration effects for domestic firms in two ways: direct adoption of foreign firms' technologies through imitation or reverse engineering (Das, 1987), or indirect stimulation through new innovation and research and development by domestic firms (Cheung and Lin, 2004). By demonstration effects, domestic firms can upgrade the level of their managerial skills and production technology, and

therefore may experience increases in productivity. As pointed out by Glass and Saggi (2002), this channel of spillovers mostly occurs for domestic firms in the same industry.

In explaining further demonstration effects, Cheung and Lin (2004) and Hale and Long (2007) highlight two potential forms of demonstration effects. Cheung and Ling (2004) point out patent applications (such as invention, utility model, and external design) as an important form of demonstration effects that may increase the productivity of domestic firms. Hale and Long (2007) indicate that network externalities are a crucial form of demonstration effect for productivity gains in domestic firms.

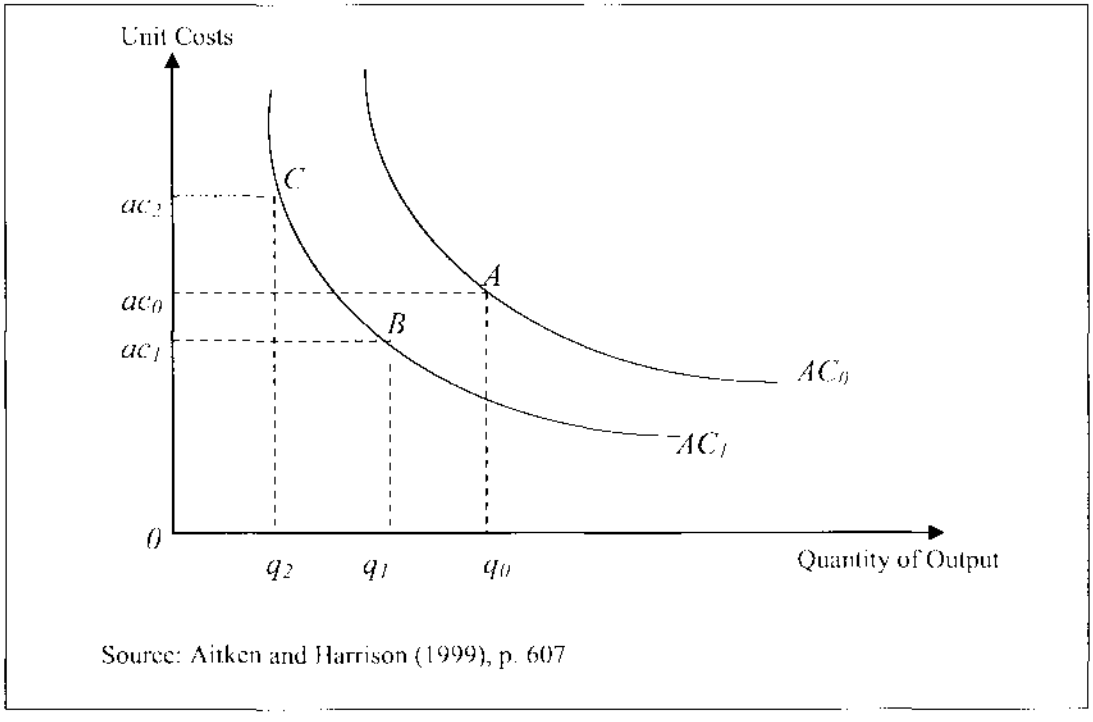
(4) *Vertical Linkages*: When undertaking their activities, MNC subsidiaries are linked to upstream and downstream industries in host countries. This link creates an opportunity for domestic suppliers or buyers to gain productivity spillovers. As pointed out in Rodriguez-Clare (1996), the productivity spillovers to domestic suppliers arise when MNC subsidiaries demand intermediate inputs with a specific standard of quality, which is usually higher than the domestic standard. This demand forces domestic suppliers to increase their efficiency, leading to a productivity improvement. In some case, MNC subsidiaries may also provide technical and managerial training to domestic suppliers to ensure the material inputs meet their qualifications. Through this kind of relationship, domestic suppliers are likely to receive productivity spillovers from MNC subsidiaries. This channel of productivity spillovers is commonly known as backward spillovers.

Domestic buyers (in downstream industries) may also receive productivity spillovers from MNC subsidiaries. As argued by Javorcik (2008), the entry of MNCs provides new and more suitable material inputs for local producers. Access to a greater variety of inputs, especially those with a higher quality, is more likely to increase the productivity of firms in downstream industries. A forward spillover exists when the relationship between MNC subsidiaries and domestic buyers is maintained. This forward spillover together with the backward spillover, sums up to a vertical spillover of FDI in the productivity of domestic suppliers and buyers. This vertical spillover can be seen as a development of an industry by MNC subsidiaries that leads to a development of other related industries.

The four channels of productivity spillovers mentioned above support the case for positive productivity spillovers. However, the presence of FDI on host countries can also generate negative productivity spillovers. Aitken and Harrison (1999) argue that the net spillover effects from FDI on domestic firms' productivity may be

negative in the short run, because foreign firms can 'steal' market share. Foreign firms with lower marginal costs have an incentive to increase production relative to their domestic competitors. The productivity of domestic firms may fall, for they have to spread a fixed cost over a smaller amount of output. In a highly capital-intensive industry, where the fixed cost is significant, the negative impact of a foreign presence will be more severe. Aitken and Harrison (1999) refer to this negative impact of foreign presence as the so called 'market-stealing effect'.

Figure 3. Output Response of Domestic Firms to the Presence of MNC Subsidiaries



Source: Aitken and Harrison (1999), p. 607

The market stealing effect is illustrated in Figure 3. In an imperfect competition market with fixed costs of production, firms face a downward-sloping average cost curve. Before the entry of MNC subsidiaries, the average cost curve associated with domestic firms is AC_0, with output produced by firm i is q_0. By the presence of MNC subsidiaries in the market, domestic firms can be affected in two different ways. Firstly, the presence of MNC subsidiaries generates a positive efficiency effect on

domestic firms, shifting the average cost curve of domestic firms from AC_0 to AC_1. At any level of output, domestic firms can produce their output at lower average costs. Secondly, the competitive pressure from MNC subsidiaries reduces the market share of domestic firms, raising the fixed cost per unit output of domestic firms. The net effect on average cost depends on the amount of output reduction from the competitive pressure. In Figure 3.3, if the entry of MNC subsidiaries reduces output of firm i from q_0 to q_1, the net impact on average cost is still positive. However, if the entry of MNC subsidiaries reduces output of firm i from q_0 to q_2, then the net impact on average cost is negative. The negative net impact on the average cost is an example of negative productivity spillover from MNC presence.

Empirical Literature on FDI Productivity Spillovers

1. International Literature

There are a growing number of econometric studies on FDI productivity spillovers.[8] These studies generally estimate FDI productivity spillovers using a standard production function (Gorg and Greenaway, 2004). A productivity variable is used as the dependent variable and FDI is included as an independent variable, together with input variables. FDI variable is often measured by a proxy, such as the share of foreign firms' output to total outputs or the share of foreign firms' employment to total employments in the same industries. If the estimation of the production function yields a positive and statistically significant coefficient of the FDI variable, this is taken as evidence of positive productivity spillovers. Likewise, if the estimation results show a negative and statistically significant coefficient of the FDI variable, a negative productivity spillover is concluded. In constrast, the insignificance of the coefficient of FDI variable, regardless whether it is positive or negative, it indicates no productivity spillover.

The pioneering econometric studies in this area are Caves (1974), Globerman (1979), and Blomstrom and Persson (1983). Caves (1974) examines productivity spillovers through the competition channel. The study utilizes data of 23

[8] Besides an econometric approach, researchers also use another approach, namely case studies, in identifying FDI spillovers on firms' productivity. Both approaches have their own merits and limitations, which are well documented in the literature on FDI spillovers (for example, Willmore, 1986; Lipsey and Sjoholm, 2005; Weiser, 2005). Whereas the case study approach tries to find any particular example of productivity spillovers, the econometric approach attempts to estimate whether on average domestic firms receive a particular measure of productivity spillovers. Studies that use a case study approach include Larrain *et al.* (2000), Moran (2001), Keller (2004), and Kohpaiboon (2005).

manufacturing industries in Australia for the years 1962 and 1966. The share of MNC ownership is used as a proxy for FDI and value added per worker is considered as a productivity variable. The finding shows that a disparity in value-added between MNCs and domestic firms is smaller when the share of MNC ownership in an industry is larger. Caves interprets this finding as the existence of positive productivity spillovers.

Globerman (1979) replicates Caves (1974) by focusing on 49 four-digit manufacturing industries in Canada for the year 1972 and finds consistent evidence of positive spillover effects. Blomstrom and Persson (1983) follow these two studies and estimate productive-efficiency spillovers in 215 manufacturing industries in Mexico for the year 1970.[9] Their findings also suggest the existence of productivity benefits from foreign ownerships. Following these three earlier studies, the empirical literature then develops in a number of country-specific and cross-country investigations. However, the findings of these studies are diverse and inconclusive. Thus, the relationship between FDI and productivity remains an empirical issue.

Studies using cross-sectional data provide fairly consistent results of positive productivity spillovers (Table 3.1). For developed economies, recent cross-sectional studies have been conducted by Driffield (2001) and Dimelis and Lauri (2002). Driffield investigates the relationship between FDI and the productivity growth of the UK manufacturing industry. Using the three-digit industrial data for the year of 1989 and 1992, Driffield finds that the inward FDI stimulates the productivity growth of the manufacturing industry by around 0.75 percent per annum. Demelis and Lauri (2001) evaluate productivity gains from foreign ownership using data for 4,056 manufacturing firms in Greece in 1997. The results show a positive effect of foreign shares on productivity, which is particularly evident for firms with high foreign share levels. For developing economies, the cross-sectional analysis has been provided by Blomstrom (1986) and Kokko (1996) for Mexico; Blomstrom and Sjoholm (1999) and Sjoholm (1999b; 1999a) for Indonesia; Chuang and Lin (1999) for Taiwan; and Li *et al.* (2001) for China. All these studies of developing economies find evidence of positive productivity spillovers from FDI.

In contrast, panel data studies find mixed evidence of the FDI productivity spillovers (Table 3.1). This mixed evidence is mostly found in developing economies. A number of studies confirm positive productivity spillovers, including Javorcik (2004) for Lithuania, Gorg and Strobl (2005) for Ghana, Tomohara and

[9] The Blomstrom and Persson (1983) study appears to be the first to examine productivity spillovers in a developing country.

Yokota (2006) for Thailand, Kugler (2006) for Colombia, and Liang (2007) for China. Studies finding no evidence of productivity spillovers include Haddad and Harrison (1993) for Morocco, Kathuria (2000) for India, and Konings (2001) for Poland. Negative productivity spillovers are identified by Aitken and Harrison (1999) for Venezuela, Djankov and Hoekman (2000) for the Czech Republic, and Thangavelu and Pattnayak (2006) for India.

The mixed findings in the empirical studies imply that the evidence of productivity spillovers is varied among countries, among industries in a country, and even among firms within an industry. Thus, a comprehensive study on productivity spillovers needs to take into account country-specific, industry-specific, and firm-specific characteristics.

Table 1. Summary of the Selected Empirical Studies on FDI Productivity Spillovers not Including Indonesia

No.	Author(s)	Country	Period of Data	Technique	Result
Studies that provide evidence of positive spillovers					
1	Caves (1974)	Australia	1962, 1966	Cross-section	Positive spillovers through competition
2	Globerman (1979)	Canada	1972	Cross-section	Positive spillovers through competition
3	Blomstrom (1986)	Mexico	1970, 1975	Cross section	Positive spillovers through competition
4	Kokko (1996)	Mexico	1970	Cross-section	Positive spillovers through competition
5	Chuang and Lin (1999)	Taiwan	1991	Cross-section	Positive spillovers for complete and partial foreign-owned firms
6	Driffield (2001)	UK	1989, 1992	Cross-section	Positive spillovers through competition
7	Li *et al.* (2001)	China	1995	Cross-section	Positive spillovers through competition
8	Demelis and Lauri (2002)	Greece	1997	Cross-section	Positive spillovers for firms with majority foreign share

9	Javorcik (2004)	Lithuania	1993-2000	Panel data	Positive spillovers through backward linkages
10	Gorg and Strobl (2005)	Ghana	1991-1997	Panel data	Positive spillovers through labour mobility
11	Kugler (2006)	Colombia	1974-1998	Panel data	Positive spillovers through backward linkages
12	Tomohara and Yokota (2006)	Thailand	1999-2001	Panel data	Positive spillovers through horizontal and backward linkages
13	Liang (2007)	China	1998-2002	Panel data	Positive spillovers though backward linkages
Studies that provide evidence of no spillovers or negative spillovers					
14	Haddad and Harrison (1993)	Morocco	1985-1989	Panel data	No productivity spillovers through competition
15	Aitken and Harrison (1999)	Venezuela	1976-1989	Panel data	Negative spillovers though competition
16	Kathuria (2000)	India	1975-1988	Panel data	13 of the total 26 sectors show negative spillovers
17	Djankov and Hoekman (2000)	Czech republic	1992-1996	Panel data	Negative spillovers
18	Konings (2001)	Bulgaria, Romania, Poland	1993-1997	Panel data	No spillovers for Poland, negative productivity spillovers for Bulgaria and Romania
19	Thangavelu and Pattnayak (2006)	India	1989-2000	Panel data	Negative spillovers through backward linkages

Source: Author's compilation.

2. Indonesian Literature

Empirical studies on FDI productivity spillovers in Indonesia are relatively sparse compared to the numerous studies in developed economies. Studies in this

economy have just been conducted since 1999. Blomstrom and Sjoholm (1999) make the first attempt using the cross-sectional data of manufacturing firms (Table 3.2). By focusing on the year 1991, they find that a foreign presence induces positive productivity spillovers to domestic firms through competition. However, they uncover no difference in the degree of spillover effects between the minority and the majority foreign-owned firms.

Using different approaches, two consecutive studies by Sjoholm (1999a; 1999b) also identify positive productivity spillovers from FDI, but the magnitude of spillovers depends on the gaps in technology and the level of aggregation. Sjoholm (1999a) finds that domestic firms gain larger productivity spillovers when the technology gaps between foreign and domestic firms are wider, and Sjoholm (1999b) demonstrates that productivity spillovers exist at the national level but not at the provincial level.

Following the three studies above, several studies are then carried out using more sophisticated estimation methods and a longer data set. Takii (2005) appears to be the first study that benefits from the availability of panel data. In line with Blomstrom and Sjoholm (1999), Takii finds evidence of positive productivity spillovers. However, contradictory to Sjoholm's (1999a) findings, Takii (2005) shows that spillovers are smaller or even negative in industries with large technology gaps. These differences in findings intuitively imply that the evidence of spillovers depends significantly on the type of data used, methodological approach, estimation strategy, and even the construction of the spillover variable. While Sjoholm (1999a) uses cross-sectional data, employs a *Cobb-Douglas* production function and measures spillovers using the share of output, Takii (2005) adopts panel data analyses with a *translog* production function and measures spillovers using the share of employment.

Table 2. Summary of Empirical Studies on FDI Productivity Spillovers in Indonesia

No	Author(s)	Period of Data	Method of Estimation	Dependent Variable	Measure of FDI	Other Independent Variables	Results
1	Blomstrom and Sjoholm (1999)	1991	OLS regression: Cross-section; Non-linear form	Value added	Share of output (five-digit level)	Capital; Skilled labour; Capacity utilization; Scale; Industry dummy	Positive spillovers through competition
2	Sjoholm (1999a)	1980, 1991	OLS regression: Cross-section; Cobb-Douglas	Value added	Share of output (five-digit level)	Labour; Investment; Scale	Positive spillovers. The degree of spillovers is greater when the technological gaps between foreign and domestic firms are wider.
3	Sjoholm (1999b)	1980, 1991	OLS regression: Cross-section	Value added	Share of output (five-digit level)	Labour; Investment; Industry and regional characteristic	Positive spillovers at the national level but no spillovers at the provincial level.
4	Takii (2005)	1990-1995	Panel data: Translog	Value added	Share of employment (three-digit level)	Labour; Capital; Plant specific effect; Time specific effect	Positive spillovers in industries with small technological gaps. Negative spillovers in industries with large technology gaps.
5	Blalock and Gertler (2005)	1988-1996	Panel data: Translog; Fixed effect	Output	Share of output (four-digit level, region, industry)	Labour; Capital; Material; Firm capability	Positive spillovers for firms with greater absorptive capacity. Firms with a narrow technology gap benefit less.
6	Todo and Miyamoto (2006)	1994-1997	Panel data: Cobb-Douglas; Semi-parametric	Value added	Absolute amount of FDI output	Capital; Labour; R&D	Positive spillovers. Firms with R&D receive more spillover benefits.
7	Jacob (2006)	1988 1996	Stochastic frontier: Panel data	Value added	Foreign ownership	Capital per labour; International R&D stock	Foreign ownership plays important role in technology transfer
8	Blalock and Gertler (2008)	1988 1996	Panel data: Translog: Fixed effect	Output	Share of output (four-digit level)	Labour; Capital; Energy; Backward linkage	No intra-industry (or horizontal) spillovers. Positive spillovers to domestic suppliers (backward spillovers)
9	Suyanto *et al.* (2009)	1988-2000	Panel data Stochastic frontier: translog	Value added	Share of output (five-digit level)	Labour, capital, competition, R&D	Positive intra-industry spillovers Competition and R&D facilitate positive spillovers.

Source: Author's compilation.

Utilizing a longer panel data from 1988 to 1996, Blalock and Gertler (2005) find that firm capability is an important factor in determining which firms or industries benefit from productivity spillovers. Firms with greater absorptive capacities are found receiving more spillover benefits but firms with narrow technology gaps are found obtaining less spillover benefits. These findings are in line with Sjoholm (1999a), but are contradicted by Takii (2005).

In a similar study but using a different measure of FDI spillovers, Todo and Miyamoto (2006) focus on R&D activities as an important factor for technology transfer. This study discovers that firms with R&D activities receive more spillover benefits compared to those without R&D activities. This confirms the conventional argument that R&D is a key factor for firms' absorptive capacity.

Using the same period of data as Blalock and Gertler (2005), Jacob (2006) estimates technology transfers in manufacturing firms. However, unlike Blalock and Gertler (2005) who focus on firms in the aggregated manufacturing industry, Jacob examines firms in the disaggregated five-digit industries. Their findings are diverse accordingly. While Blalock and Gertler find positive productivity spillovers for firms in the whole manufacturing industry, Jacob discovers that not all types of firms receive technology transfer from a foreign presence, and those firms receiving positive spillovers are mostly in research-based industries.

An attempt to examine inter-industry spillovers is found in Blalock and Gertler (2008). This study shows the existence of productivity spillovers through backward linkages. According to this study, the technology transfer from foreign firms to local suppliers is a *Pareto* improvement. It increases the welfare of local suppliers in terms of increases in outputs and profits. However, Blalock and Gertler (2008) find no evidence of spillovers to local competitors (*i.e.* domestic firms in the same market as foreign firms), which supports the theoretical argument made by Aitken and Harrison (1999), but contradicts the findings of Blomstrom and Sjoholm (1999).

In contrast to Blalock and Gertler (2008), Suyanto *et al.* (2009) demonstrate positive productivity spillovers from foreign firms to domestic firms in the same market. Also in Suyanto *et al.* study that competition and R&D are found to facilitate positive productivity spillovers, supporting findings in Blomstrom and Sjoholm (1999) and Takii (2005).

Explaining the Mixed Evidence in the Empirical Studies

The mixed evidence from the empirical studies, as noted above, intuitively implies that there is no universal relationship between FDI and domestic firms'

productivity. Two groups of studies, however, try to explain the mixed findings. The first group focuses on the variation in methodology and data used. The second group considers mediating factors that are required by domestic firms to benefit from foreign presence. The following sub-sections discuss these two arguments.

1. Variations in Methodology and Data Used

Variations in methodology and data used lead to different findings in empirical studies (Gorg and Strobl, 2001; Takii, 2005). There are five issues in the methodology and data used, which have been identified in recent studies - that may cause the mixed evidence of productivity spillovers. These issues are variation in the measure of productivity, variation in the measure of FDI spillovers, the level of data aggregation, the techniques in data estimation, and the method of analysis.

Based on the existing econometric studies, productivity is often measured in two different ways. Some studies look at total factor productivity (or multi factor productivity), while others focus on labour productivity (or partial productivity). The variation in the measure of productivity across studies makes the findings difficult to compare, or they may not even be comparable. Globerman (1979) argues that the ideal way of measuring productivity is to construct a ratio of net outputs to an index of total factor inputs, such as total factor productivity (TFP). The use of labour productivity as a measure of a firm's productivity has its problems since labour is not the sole source of productivity improvement. Output per worker may rise as a result of the substitution of capital or other non-labour inputs for labour, not only as a result of labour efficiency. Therefore, it is widely recognized that total factor productivity is a preferable index to measure productivity, for it relates output to all associated inputs in determining overall productive efficiency.

The measure of FDI also varies across econometric studies. Variables that are often used as a measure of FDI are the share of foreign firms' output and share of foreign firms' employment. The usage of these different measures results in mixed evidence regarding the productivity spillovers. The direction and magnitude of the spillover effects of FDI may also differ from these divergent measurements (Gorg and Strobl, 2001). The share of foreign firms' output is closely related to the total productivity concept, which is a measure of total output in relation with a variety of inputs, while the share of foreign firms' employment is related more to the concept of labour productivity (Wei and Liu 2006).

Similarly, the level of data aggregation leads to divergence in findings regarding the productivity spillovers of FDI. Some studies utilise industrial level data to

estimate the productivity gains from FDI. Others use firm level data. Takii (2005) argues that firm level data may enable researchers to evaluate in more detail the firm-specific characteristics. Highly aggregated data, such as industry-level data, provide less precise estimations compared to firm-level data. By using firm-level data, the importance of firm characteristics as absorptive capacity for productivity spillovers can be precisely captured.

Additionally, the variations in the level of industrial groups for firm-level data may also lead to differences in findings. The two-digit ISIC groups provide different evidence regarding productivity spillovers than the three- or four-digit ISIC groups. Most econometric studies seem to prefer the more disaggregated level of data and industrial groups, with the advantage of examining productivity spillovers in highly specific industrial sectors (Lipsey and Sjoholm, 2005). However, this advantage comes at a cost in missing productivity spillovers across industrial groups (*i.e.* inter-industry spillovers). In this thesis, both the aggregated and the disaggregated industry groups for the firm-level data are examined in order to evaluate intra-industry as well as inter-industry spillovers.

The technique of data estimation is another factor that contributes to the mixed evidence of productivity spillovers. Gorg and Greenaway (2004) show that cross-sectional studies generally provide evidence of positive spillovers, while panel data studies provide more inconclusive evidence. Although cross-sectional studies report unambiguous findings, the results tend to subject to estimation bias.

Gorg and Strobl (2001) point out two disadvantages of cross-sectional studies that lead to bias in estimation. Firstly, such studies do not account for the time dimension and, therefore, do not depict the growth of firms' productivity over time. Secondly, the positive spillovers in cross-sectional studies may indicate only correlation between foreign presence and domestic productivity, without really capturing the causality direction. Foreign firms may be attracted to industries with high productivity, but may not contribute to productivity in those industries. These two disadvantages are minimized under panel data estimations. As argued by Gorg and Strobl (2001) and Takii (2005), panel data techniques using firm-level data are the appropriate estimating framework for FDI productivity spillovers.

2. Mediating Factors for Gaining Spillover Benefits

The second group of studies argue that the mixed evidence may be attributed to the absence of key mediating factors in some observed economies (Gorg and Greenaway, 2004; Smeets, 2008). Among these mediating factors, two factors are

relevant for the analysis in this thesis. These are absorptive capacities (which are also known as industry-specific or firm-specific characteristics) and the economic environment surrounding domestic and foreign firms.

Absorptive Capacities

Absorptive capacities have been widely recognized as a major mediating factor for productivity spillovers. The existing literature in this field argues that a certain level of absorptive capacity is required for the receiving party (the host country, industry, or firm) to effectively capture productivity spillovers from FDI (Findlay, 1978; Wang and Blomstrom, 1992; Glass and Saggi, 1998). According to this group of studies, there are two important absorptive capacities for productivity spillovers, namely knowledge gaps and research and development (R&D). These two absorptive capacities are discussed below.

(i). Knowledge Gaps: In the earlier literature on absorptive capacity, two opposing arguments prevail.

The first argument suggests the importance of knowledge backwardness as an inducement for capturing productivity spillovers. Studies supporting this argument include Findlay (1978) and Wang and Blomstrom (1992), to name a few. Findlay argues that the greater the disparity in knowledge between two economies, the greater the pressure for backward economies to adopt new knowledge. The presence of MNCs from advanced economies should enhance the level of knowledge of domestic firms, raising their productivities. However, Findlay argues further that, in order for productivity spillovers to take place, the knowledge gap between these two economies should not be too wide. This suggests the importance of a minimum level of absorptive capacity (in terms of the level of knowledge) for spillover effects to take place.

In line with Findlay (1978), Wang and Blomstrom (1992) show formally that domestic firms may gain advantage from their backwardness in knowledge by investing in the learning process. The more domestic firms invest in learning the new knowledge from MNCs, the narrower the knowledge gap between MNC subsidiaries and domestic firms. This argument implies the importance of some minimum level of absorptive capacity (in terms of knowledge investments) for domestic firms to catch up MNC subsidiaries.

The second argument states that the relative backwardness can be a constraint for domestic firms to absorb advanced knowledge from MNCs. Only certain and limited kinds of knowledge can be absorbed by the backward firms since their

capacity may not be advanced enough to assimilate the new knowledge. Lapan and Bardhan (1973) and Glass and Saggi (1998) are among the studies that supporting this argument. Lapan and Bardhan argue that spillovers are negatively related to the complexity of MNC technology and the width knowledge gap. In a more extensive study, Glass and Saggi show formally that the backward domestic firms are not able to absorb much from MNCs' technology for they have limitations in the necessary knowledge to assimilate advanced technology.

A.number of empirical studies have been conducted to test these two opposing arguments (Table 3). Some of these studies show evidence supporting Lapan and Bardran's (1973) argument, on the ground that backwardness has a negative effect on productivity spillovers (Kokko *et al.*, 1996; Liu *et al.*, 2000). However, recent empirical evidence confirms the advantage of being more backward (Griffith *et al.*, 2002; Castellani and Zanfei, 2003; Peri and Urban, 2006).

Using Uruguayan manufacturing plant-level data in 1988, Kokko *et al.* (1996) find evidence of productivity spillovers only in a group of locally-owned firms with moderate technology gaps *vis a vis* foreign firms, but no evidence is found for a group with large technology gaps. This finding indicates the negative effect of backwardness on productivity spillovers, supporting the theoretical argument by Lapan and Bardran (1973) and Glass and Saggi (1998). A similar result is shown by Liu *et al.* (2000) in their study on UK manufacturing industries over the period 1991-1995. Liu et al. show that backwardness has a negative impact on productivity spillovers, as domestic industries with greater technological capability receive greater productivity spillovers from a foreign presence.

In contrast, Griffith *et al.* (2002) find a positive and significant effect of technology backwardness on productivity spillovers. By examining 13,000 manufacturing establishments in the UK, their result confirms the advantage of being backward. A similar finding is presented by Castellani and Zanfei (2003) for a study on manufacturing firms in France, Italy and Spain for the period 1992-1997. Although the measure of backwardness is slightly different than Griffith *et al.* (2002), the result confirms the same hypothesis of the importance of backwardness in technology. Peri and Urban (2006) also make a similar finding for Italian and German manufacturing firms.

Table 3. Empirical Studies on Mediating Factors for FDI Productivity Spillovers

Mediating Factor	Author(s)	Countries	Period of Data	Result
Absorptive capacities				
1. Technology gaps	Kokko *et al.* (1996)	Uruguay	1988	Negative effect of knowledge gaps on productivity spillovers
	Liu *et al.* (2000)	UK	1991-1995	Negative effect of knowledge backwardness on productivity spillovers
	Griffith *et al.* (2000)	UK	1980-1992	Advantage of being backward
	Castellani and Zanfei (2003)	France, Italia, Spain	1992-1997	Positive effect of technology gaps on productivity spillovers
	Peri and Urban (2006)	Italia Germany	1993-1999	Positive effect of knowledge backwardness on productivity spillovers
2. R&D	Kathuria (2000)	India	1975-1989	R&D firms gains positive productivity spillovers. Non-R&D firms receive no spillovers
	Kinoshita (2001)	The Czech republic	1995-1998	R&D firms receive greater spillover effects
	Griffith *et al.* (2004)	12 OECD countries	1974-1990	Positive spillovers on R&D firms
	Todo (2006)	Japan	1995-2002	Positive spillovers on R&D firms
The Economic Environment				
1. Investment and trade regimes	Kokko *et al.* (2001)	Uruguay	1988	No sign of productivity spillovers from more outward-looking policies
	Kohpaiboon (2005)	Thailand	1970-2002	Positive spillovers under outward-looking policies. No spillovers under inward-looking policies
	Naurzad (2008)	46 countries	1981-2001	More open regimes generate higher productivity spillovers

2. Economic crisis	Takii (2007)	Indonesia	1990-2003	The magnitude of positive productivity spillovers decrease during crisis period
	Suyanto *et al.* (2009)	Indonesia	1988-2000	The magnitude of positive productivity spillovers decrease during crisis period

Source: Author's compilation

(ii) Research and Development: R&D has been regarded as an important factor for productivity growth since Solow (1957). However, empirical studies on the role of R&D only began in the late 1980s. In an econometric study of productivity spillovers in Indian manufacturing firms, Kathuria (2000) shows that local firms that invest in R&D activities receive high productivity spillovers from FDI, whereas the non-R&D local firms do not gain much from the presence of foreign firms. This result indicates that the productivity spillovers are not automatic consequences of foreign firms' presence, but they depend on the efforts of local firms investing in R&D activities. Similar evidence is found by Kinoshita (2001) in a study of Czech manufacturing firms between 1995 and 1998. By focusing on electrical machinery and radio and TV sectors, Kinoshita demonstrates that R&D is a necessary condition for productivity spillovers. A recent study by Griffith *et al.* (2004) on twelve OECD countries also confirms that R&D plays an important role in productivity spillovers, besides its role as a medium of innovation. A similar result is also arrived at by Todo (2006) for Japan and Suyanto *et al.* (2009) for Indonesia.

The Economic Environment

The surrounding economic environment clearly influences the ability of domestic firms to grasp productivity spillovers. The literature identifies two environmental factors that potentially affect the signs and magnitude of FDI spillovers. These factors are investment regimes and economic crisis.

(i) Investment regimes: In a well-known theory of immiserizing growth, Bhagwati (1973) argues that a change in trade and investment regimes may influence the effectiveness of an economy to gain FDI benefits. An economy under a fairly open regime tends to gain higher FDI advantages than the one under a regulated investment regime. This argument has been put to test in some empirical studies. Based on Uruguayan firm-level inter-industry analysis, Kokko *et al.* (2001) focus on productivity spillovers conditioned by the country's trade and investment regimes. This study uses the year 1973, where Uruguay embarked on trade and investment reforms, as a benchmark to separate the regulated investment regime and the open

regime. The findings support Bhagwati's argument. Kohpaiboon (2006) tests a similar argument for technology spillovers in Thailand and provides consistent results. In a cross-country investigation, Naurzad (2008) also confirms that economies with an open investment regime tend to receive higher magnitude of FDI benefits than those with a regulated regime.

(ii) Economic crisis: Shocks in the economic environment, such as economic crises, may also affect the signs and magnitude of FDI spillovers on domestic productivity. Recent empirical studies in Indonesia have taken into account this factor. In a study of Indonesian manufacturing firms, Takii (2007) shows that the magnitude of FDI spillover decreases during the period of economic crisis. The year 1997, when the Asian economic crisis started, is used as a point of reference to divide the period of crisis with the period before. A similar finding is also provided by Suyanto *et al.* (2009) when examining the chemical and pharmaceutical industries, although this study employs a different method of analysis.

Conclusion

This study reviews theoretical and empirical literature on productivity spillovers from FDI. The theoretical literature identifies four channels for positive FDI spillovers and discusses numerous models used to explain the process of spillover effects. However, the empirical literature finds mixed evidence, where some studies confirm the existence of positive productivity spillovers and others identify no or even negative spillovers. The mixed evidence stems from the differences in methodology used and the absence of important mediating factors.

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Productivity Spillovers from Foreign Direct Investment: Collecting The Puzzle

by 13 Suyanto

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Productivity Spillovers from Foreign Direct Investment: Collecting the Puzzle

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Abstract

Productivity spillovers from foreign direct investment (FDI) have long been a subject of interest for economists. Recent surveys on empirical literature show that the evidence is mixed in direction and magnitude. This current study surveys the theoretical and empirical literature in order to collect the puzzle of productivity spillovers and presents some important conclusion in respond to the mixed evidence of the previous studies. Two main factors are reviewed to explain the inconclusive results, i.e. variations in methodology and data used and the mediating factors for gaining knowledge spillovers. Many studies take advantages of the variety in measurement of productivity to identify the positive spillovers. Some studies show the importance of absorptive capacities and economic environments as mediating factors for productivity spillovers.

Keywords: Knowledge spillovers, foreign direct investment.

Introduction

Whether foreign direct investment (FDI) generates positive productivity spillovers on host countries have been an interesting topic to study during the last two decades. A large number of studies have examined this topic and the verdict has largely been inconclusive. This inconclusiveness leads researchers to search for the answers. The literature then develops in several directions to account for the ambiguity in findings of the earlier studies.

This current study reviews the development of the literature, both theoretical and empirical literature in order to identify the ambiguity in the earlier studies. It starts with a discussion on the concept of spillovers in the following section, which is followed by a review on channels of productivity spillovers. It continues by surveying the empirical literature and discussing two important arguments regarding the inconclusive results. Conclusions are drawn in the last section.

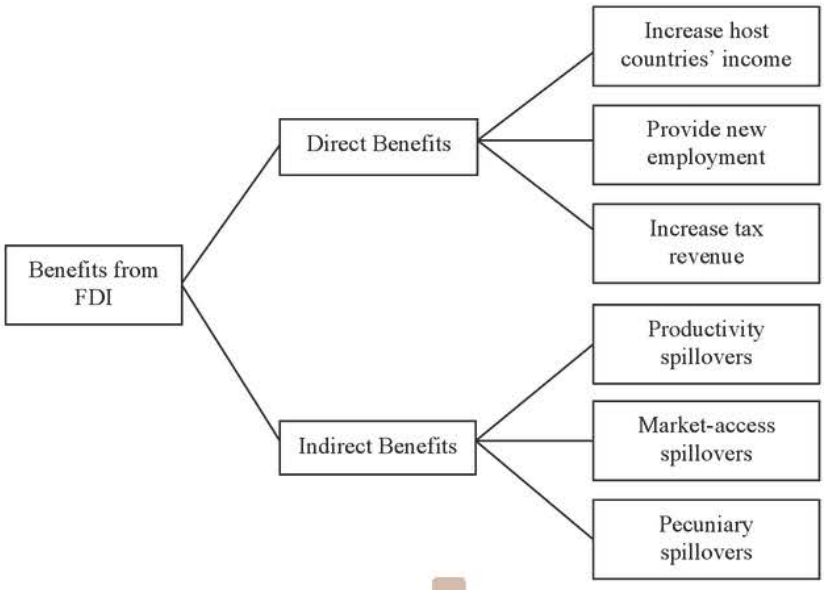
FDI, Knowledge Transfer, and Productivity Spillovers

Foreign direct investment (FDI) provides recipient countries with direct and indirect benefits (Figure 1). The direct benefits take the form of new investments that boost national income, provide new employment, and increase tax revenue for governments. The indirect benefits are in the form of knowledge externalities, which are generated through non-market mechanisms, to a recipient economy and the domestic

firms within the economy (Hymer, 1960). These externalities are commonly known as FDI spillovers.[1]

Literature on FDI identifies at least three types of FDI spillovers, namely productivity spillovers, market-access spillovers, and pecuniary spillovers. Productivity spillovers are defined as the externalities from FDI that lead to an increase in the productivity of domestic firms (Blomstrom and Kokko, 1998; Aitken and Harrison, 1999). Market-access spillovers exist if the presence of FDI generates an opportunity for domestic firms to access international markets (Blomstrom and Kokko, 1998). Pecuniary spillovers take place when the existence of foreign firms affects the profit function of domestic firms through a reduction in costs and an increase in revenues (Gorg and Strobl, 2004).[2]

Figure 1. FDI Benefits and Productivity Spillovers



Source: Author's Schematization based on Blomstrom and Kokko (1998), Gorg and Strobl (2004), and Lipsey and Sjoholm (2005)

Of the three types of FDI spillovers, productivity spillovers have been a growing concern among policy makers and researchers in the last two decades. There has been great competition among many policy makers in providing a FDI-friendly environment

[1] The term of FDI spillovers, externalities, and indirect benefits are used interchangeably to refer to the same idea of benefits provided by FDI through non-market mechanisms.

[2] Lipsey and Sjoholm (2005) include also wage spillovers as FDI spillovers. They argue that wage spillovers occur when the entry of foreign firms in domestic markets raises employees' wages. Under this definition, wage spillovers may be considered as a specific type of negative pecuniary spillover. The rise in wages increases the cost of production and, in turn, negatively affects profits.

in order to grasp the productivity gains from FDI (Oman, 1999; Bjorvata and Eckel, 2006).[3] Substantial efforts have also been devoted by researchers to evaluate the existence of productivity spillovers.[4] The basic argument supporting this concern is that the presence of FDI, in the form of multinational companies (MNCs), may introduce new knowledge[5] to the recipient economy, which in turn will increase domestic firms' productivity. To be more precise, when MNCs transfer knowledge to their subsidiaries, the transferred knowledge may not be fully internalized and, to some extent, may leak to domestic firms. Thus, domestic firms may gain productivity advantages from FDI knowledge transfers.[6]

The Concept of Productivity Spillovers

From the basic argument of FDI spillovers mentioned above, it is suggestive that knowledge transfer to host countries involves two distinct processes (Figure 2). The first process is the knowledge transfer from MNCs to their subsidiaries, which involves a direct transfer of knowledge from a home country to a host economy. The second process is the knowledge transfer from MNC subsidiaries to domestic firms, which happens indirectly and takes the forms of externalities. The productivity spillovers of FDI take place when the externalities from knowledge transfers generate productivity gains to domestic firms. Figure 2 shows the two processes of knowledge transfers and outlines a schematic concept of productivity spillovers. Based on this concept, the discussion in the subsequent sections of this chapter is structured around the circled part of Figure 2 (*i.e.* the FDI productivity spillovers).

As illustrated in the figure, the presence of knowledge externalities from MNCs may generate three different forms of productivity gains to domestic firms. Advanced product and process knowledge leads to technological (or technical) progress in domestic firms, shifting upward their technological frontier (Caves, 1971).[7] Advanced managerial knowledge provides domestic firms skills related to technical efficiency, where domestic firms learn ways to produce more output with the same combination of inputs (*i.e.* output-oriented technical efficiency), or to produce a certain amount of output using less input combinations (*i.e.* input-oriented technical efficiency) (Kravtsova and Zelenyuk, 2007). Cost-efficiency knowledge is an important factor for scale efficiency, where domestic firms learn ways to achieve optimal level of scale of production, given the existing resources (Girma and Gorg, 2007). These three forms of productivity spillovers are transmitted through four possible channels, as discussed in the following section.

---

[3] UNCTAD (2003) reports that of the 1,641 national regulatory changes to FDI from 1991 to 2001, 94% provide more favorable incentives for FDI. In addition, Harding and Javorcik (2007) noted that there was a significant increase in the number of national investment promotion agencies between 1990 and 2005, and these agencies provided a variety of incentives for foreign direct investments.

[4] Smeets (2008) provides an excellent survey on the studies.

[5] Following previous studies (*e.g.* Kokko and Kratsova, 2008; Smeets, 2008), knowledge is defined broadly as superior technology, managerial know-how, and the ability to exploit scale efficiency.

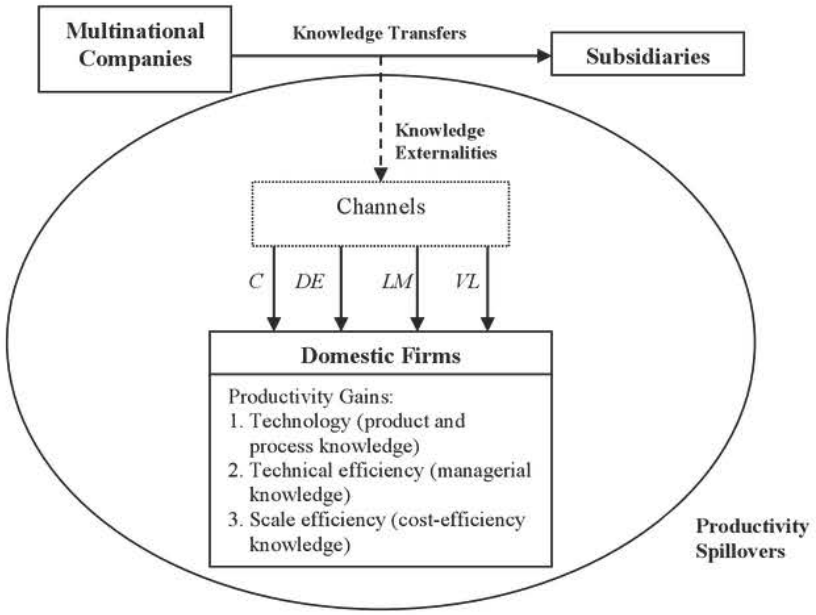
[6] It is generally assumed in the literature that MNCs possess superior knowledge relative to domestic firms (*e.g.* Caves, 1974; Das, 1987; Wang and Blomstrom, 1992). With this superior knowledge, MNC subsidiaries are often believed to have higher performance levels, and in particular to be more efficient and productive, than domestic firms (Blomstrom and Sjoholm, 1999).

[7] Following the productivity analysis literature, technological progress and technical progress are used as synonymous in this thesis.

Channels of Productivity Spillovers from FDI

Theoretical literature on FDI suggests two broad categories of transmission mechanisms for productivity spillovers: intra-industry and inter-industry productivity spillovers. If the existence of MNC subsidiaries generates higher productivity to domestic firms in the same industry, these spillovers are considered as intra-industry spillovers. In contrast, if the presence of MNC subsidiaries increases productivity of domestic firms in different industries, the spillovers are regarded as inter-industry spillovers. The intra-industry spillovers may occur through three channels: competition, labour mobility, and demonstration effect, while the inter-industry spillovers are channelled through vertical linkages (Figure 2).

Figure 2. The Concept of Productivity Spillovers from FDI



Note: *C* is competition, *DE* is demonstration effect, *LM* is labour mobility, and *VL* is vertical linkages
Source: Author's Schematization based on Caves (1971), Gorg and Greenaway (2004), Girma and Gorg (2007), Kravtsova and Zelenyuk (2007), and Smeets (2008).

(1) *Competition*: The entry of MNCs may lead to greater competition in domestic markets. Domestic firms are then forced to defend their market share by increasing their productivity in three potential ways. Firstly, they can introduce new products to the market by utilizing new technologies. Secondly, the domestic firms may adopt a new management method to increase their technical efficiency. Thirdly, they can increase

their scale efficiency by producing at a lower cost. Achieving productivity improvements in domestic firms as a result of competition from foreign companies is commonly known as productivity spillovers through competition (Blomstrom and Kokko, 1998; Gorg and Greenaway, 2004).

Some theoretical models have been developed to analyze productivity spillovers through competition. Wang and Blomstrom (1992) show that as long as foreign firms serve host country markets and foreign and domestic products are substitutes, the presence of foreign firms in a domestic market may increase competition. However, the impact of competition on productivity depends crucially on the type of domestic firms. Wang and Blomstrom classify domestic firms into two groups: the active-learning and the passive-watching firms. They argue that only the active-learning domestic firms will enjoy productivity spillovers from competition since these firms devote more resources to learning investments. The passive-watching firms will be left behind in a more competitive environment. In addition, Wang and Blomstrom (1992) highlight that the active-learning firms play an essential role in increasing the rate of knowledge transfer from MNC subsidiaries. Yet, the actions that may be taken by MNCs to limit spillover gains from competition receive little attention in this theoretical model.

Glass and Saggi (2002) extend Wang and Blomstrom's model by taking into account the MNC actions to limit knowledge transfers to domestic firms. Although Glass and Saggi accept the argument that the entry of MNCs increases competition and induces productivity gains to domestic firms, they show that MNCs may limit the spillover effects by increasing the cost of knowledge transfers. Domestic firms may receive knowledge spillovers, but the transfer of knowledge may be only partial and happen gradually over time. Hence, domestic firms may remain disadvantaged relative to MNC subsidiaries. A similar model is also constructed by Tailor (1993). However, Tailor's model differs from Glass and Saggi's in the sense that the former considers product knowledge while the latter focuses on process knowledge.

A different argument of competitive effect from FDI is presented in Markusen and Venables (1999). Markusen and Venables argue that the entry of foreign firms to domestic markets reduces domestic firms' sales, leads to the exit of some domestic firms, and restores sales of remaining firms to zero profit level. When the profit effects are larger than the efficiency effects, the competition from foreign firms may result in negative spillovers to domestic firms. Aitken and Harrison (1999) present a similar argument but focus on the increasing of average costs in domestic firms as a factor for the negative spillover effects.

(2) *Labour mobility*: Productivity spillovers from FDI may also occur when domestic firms recruit MNC personnel (Kaufmann, 1997; Fosfuri *et al.* 2001; Markusen and Trofimenko, 2007). The argument is that MNCs play a more active role than domestic firms in educating and training local workers. Through this training, and subsequent work experiences, workers become familiar with MNC technology and production techniques. Productivity spillovers through labour mobility take place when the trained workers move to domestic firms or establish their own business (de Mello, 1997). The workers bring with them the knowledge of new techniques and apply the knowledge for their new employers or to their own business, increasing the productivity of these firms.

White collar workers (or managers) are particularly important trained workers for productivity spillovers. As reported by Caves (1996), the mobility of managers from

Japanese MNCs to US domestic firms contributes significantly to knowledge diffusion. Saggi (2002) also identify productivity spillovers through labour mobility in some Asian countries. He finds that around 88 percent of skilled workers of a Bangladeshi garment firm (Desh), which received knowledge from a Korean MNC (Daewoo), moved to other domestic firms or established their own business. Saggi also discovers that around 63 percent of skilled workers in Taiwan that left MNC subsidiaries had moved to domestic firms. This remarkable evidence that the former MNC workers transfer their knowledge to domestic firms clearly demonstrates the role of labour mobility in channelling productivity spillovers.

(3) *Demonstration effects*: The third channel for productivity spillovers is demonstration effects. The presence of MNC subsidiaries in the domestic market can generate demonstration effects for domestic firms in two ways: direct adoption of foreign firms' technologies through imitation or reverse engineering (Das, 1987), or indirect stimulation through new innovation and research and development by domestic firms (Cheung and Lin, 2004). By demonstration effects, domestic firms can upgrade the level of their managerial skills and production technology, and therefore may experience increases in productivity. As pointed out by Glass and Saggi (2002), this channel of spillovers mostly occurs for domestic firms in the same industry.

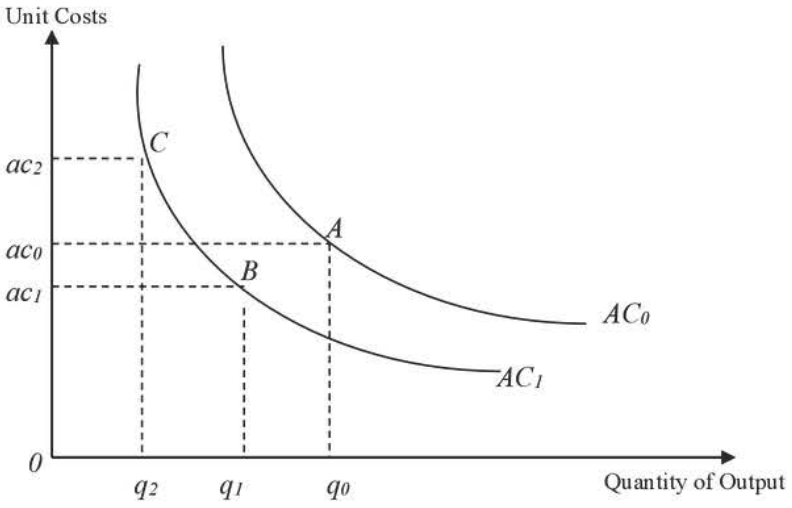
In explaining further demonstration effects, Cheung and Lin (2004) and Hale and Long (2007) highlight two potential forms of demonstration effects. Cheung and Ling (2004) point out patent applications (such as invention, utility model, and external design) as an important form of demonstration effects that may increase the productivity of domestic firms. Hale and Long (2007) indicate that network externalities are a crucial form of demonstration effect for productivity gains in domestic firms.

(4) *Vertical Linkages*: When undertaking their activities, MNC subsidiaries are linked to upstream and downstream industries in host countries. This link creates an opportunity for domestic suppliers or buyers to gain productivity spillovers. As pointed out in Rodriguez-Clare (1996), the productivity spillovers to domestic suppliers arise when MNC subsidiaries demand intermediate inputs with a specific standard of quality, which is usually higher than the domestic standard. This demand forces domestic suppliers to increase their efficiency, leading to a productivity improvement. In some case, MNC subsidiaries may also provide technical and managerial training to domestic suppliers to ensure the material inputs meet their qualifications. Through this kind of relationship, domestic suppliers are likely to receive productivity spillovers from MNC subsidiaries. This channel of productivity spillovers is commonly known as backward spillovers.

Domestic buyers (in downstream industries) may also receive productivity spillovers from MNC subsidiaries. As argued by Javorcik (2008), the entry of MNCs provides new and more suitable material inputs for local producers. Access to a greater variety of inputs, especially those with a higher quality, is more likely to increase the productivity of firms in downstream industries. A forward spillover exists when the relationship between MNC subsidiaries and domestic buyers is maintained. This forward spillover together with the backward spillover, sums up to a vertical spillover of FDI in the productivity of domestic suppliers and buyers. This vertical spillover can be seen as a development of an industry by MNC subsidiaries that leads to a development of other related industries.

The four channels of productivity spillovers mentioned above support the case for positive productivity spillovers. However, the presence of FDI on host countries can also generate negative productivity spillovers. Aitken and Harrison (1999) argue that the net spillover effects from FDI on domestic firms' productivity may be negative in the short run, because foreign firms can 'steal' market share. Foreign firms with lower marginal costs have an incentive to increase production relative to their domestic competitors. The productivity of domestic firms may fall, for they have to spread a fixed cost over a smaller amount of output. In a highly capital-intensive industry, where the fixed cost is significant, the negative impact of a foreign presence will be more severe. Aitken and Harrison (1999) refer to this negative impact of foreign presence as the so called 'market-stealing effect'.

Figure 3. Output Response of Domestic Firms to the Presence of MNC Subsidiaries



Source: Aitken and Harrison (1999), p. 607

The market stealing effect is illustrated in Figure 3. In an imperfect competition market with fixed costs of production, firms face a downward-sloping average cost curve. Before the entry of MNC subsidiaries, the average cost curve associated with domestic firms is AC_0, with output produced by firm i is q_0. By the presence of MNC subsidiaries in the market, domestic firms can be affected in two different ways. Firstly, the presence of MNC subsidiaries generates a positive efficiency effect on domestic firms, shifting the average cost curve of domestic firms from AC_0 to AC_1. At any level of output, domestic firms can produce their output at lower average costs. Secondly, the competitive pressure from MNC subsidiaries reduces the market share of domestic firms, raising the fixed cost per unit output of domestic firms. The net effect on average

cost depends on the amount of output reduction from the competitive pressure. In Figure 3.3, if the entry of MNC subsidiaries reduces output of firm i from q_0 to q_1, the net impact on average cost is still positive. However, if the entry of MNC subsidiaries reduces output of firm i from q_0 to q_2, then the net impact on average cost is negative. The negative net impact on the average cost is an example of negative productivity spillover from MNC presence.

Empirical Literature on FDI Productivity Spillovers

1. International Literature

There are a growing number of econometric studies on FDI productivity spillovers.[8] These studies generally estimate FDI productivity spillovers using a standard production function (Gorg and Greenaway, 2004). A productivity variable is used as the dependent variable and FDI is included as an independent variable, together with input variables. FDI variable is often measured by a proxy, such as the share of foreign firms' output to total outputs or the share of foreign firms' employment to total employments in the same industries. If the estimation of the production function yields a positive and statistically significant coefficient of the FDI variable, this is taken as evidence of positive productivity spillovers. Likewise, if the estimation results show a negative and statistically significant coefficient of the FDI variable, a negative productivity spillover is concluded. In constrast, the insignificance of the coefficient of FDI variable, regardless whether it is positive or negative, it indicates no productivity spillover.

The pioneering econometric studies in this area are Caves (1974), Globerman (1979), and Blomstrom and Persson (1983). Caves (1974) examines productivity spillovers through the competition channel. The study utilizes data of 23 manufacturing industries in Australia for the years 1962 and 1966. The share of MNC ownership is used as a proxy for FDI and value added per worker is considered as a productivity variable. The finding shows that a disparity in value-added between MNCs and domestic firms is smaller when the share of MNC ownership in an industry is larger. Caves interprets this finding as the existence of positive productivity spillovers.

Globerman (1979) replicates Caves (1974) by focusing on 49 four-digit manufacturing industries in Canada for the year 1972 and finds consistent evidence of positive spillover effects. Blomstrom and Persson (1983) follow these two studies and estimate productive-efficiency spillovers in 215 manufacturing industries in Mexico for the year 1970.[9] Their findings also suggest the existence of productivity benefits from foreign ownerships. Following these three earlier studies, the empirical literature then develops in a number of country-specific and cross-country investigations. However, the

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[8] Besides an econometric approach, researchers also use another approach, namely case studies, in identifying FDI spillovers on firms' productivity. Both approaches have their own merits and limitations, which are well documented in the literature on FDI spillovers (for example, Willmore, 1986; Lipsey and Sjoholm, 2005; Weiser, 2005). Whereas the case study approach tries to find any particular example of productivity spillovers, the econometric approach attempts to estimate whether on average domestic firms receive a particular measure of productivity spillovers. Studies that use a case study approach include Larrain *et al.* (2000), Moran (2001), Keller (2004), and Kohpaiboon (2005).

[9] The Blomstrom and Persson (1983) study appears to be the first to examine productivity spillovers in a developing country.

findings of these studies are diverse and inconclusive. Thus, the relationship between FDI and productivity remains an empirical issue.

Studies using cross-sectional data provide fairly consistent results of positive productivity spillovers (Table 3.1). For developed economies, recent cross-sectional studies have been conducted by Driffield (2001) and Dimelis and Lauri (2002). Driffield investigates the relationship between FDI and the productivity growth of the UK manufacturing industry. Using the three-digit industrial data for the year of 1989 and 1992, Driffield finds that the inward FDI stimulates the productivity growth of the manufacturing industry by around 0.75 percent per annum. Demelis and Lauri (2001) evaluate productivity gains from foreign ownership using data for 4,056 manufacturing firms in Greece in 1997. The results show a positive effect of foreign shares on productivity, which is particularly evident for firms with high foreign share levels. For developing economies, the cross-sectional analysis has been provided by Blomstrom (1986) and Kokko (1996) for Mexico; Blomstrom and Sjoholm (1999) and Sjoholm (1999b; 1999a) for Indonesia; Chuang and Lin (1999) for Taiwan; and Li *et al.* (2001) for China. All these studies of developing economies find evidence of positive productivity spillovers from FDI.

In contrast, panel data studies find mixed evidence of the FDI productivity spillovers (Table 3.1). This mixed evidence is mostly found in developing economies. A number of studies confirm positive productivity spillovers, including Javorcik (2004) for Lithuania, Gorg and Strobl (2005) for Ghana, Tomohara and Yokota (2006) for Thailand, Kugler (2006) for Colombia, and Liang (2007) for China. Studies finding no evidence of productivity spillovers include Haddad and Harrison (1993) for Morocco, Kathuria (2000) for India, and Konings (2001) for Poland. Negative productivity spillovers are identified by Aitken and Harrison (1999) for Venezuela, Djankov and Hoekman (2000) for the Czech Republic, and Thangavelu and Pattnayak (2006) for India.

The mixed findings in the empirical studies imply that the evidence of productivity spillovers is varied among countries, among industries in a country, and even among firms within an industry. Thus, a comprehensive study on productivity spillovers needs to take into account country-specific, industry-specific, and firm-specific characteristics.

Table 1. Summary of the Selected Empirical Studies on FDI Productivity Spillovers not Including Indonesia

No.	Author(s)	Country	Period of Data	Technique	Result
Studies that provide evidence of positive spillovers					
1	Caves (1974)	Australia	1962, 1966	Cross-section	Positive spillovers through competition
2	Globerman (1979)	Canada	1972	Cross-section	Positive spillovers through competition
3	Blomstrom (1986)	Mexico	1970, 1975	Cross-section	Positive spillovers through competition
4	Kokko (1996)	Mexico	1970	Cross-section	Positive spillovers through competition
5	Chuang and Lin (1999)	Taiwan	1991	Cross-section	Positive spillovers for complete and partial foreign-owned firms
6	Driffield (2001)	UK	1989, 1992	Cross-section	Positive spillovers through competition
7	Li *et al.* (2001)	China	1995	Cross-section	Positive spillovers through competition
8	Demelis and Lauri (2002)	Greece	1997	Cross-section	Positive spillovers for firms with majority foreign share
9	Javorcik (2004)	Lithuania	1993-2000	Panel data	Positive spillovers through backward linkages
10	Gorg and Strobl (2005)	Ghana	1991-1997	Panel data	Positive spillovers through labour mobility
11	Kugler (2006)	Colombia	1974-1998	Panel data	Positive spillovers through backward linkages
12	Tomohara and Yokota (2006)	Thailand	1999-2001	Panel data	Positive spillovers through horizontal and backward linkages
13	Liang (2007)	China	1998-2002	Panel data	Positive spillovers though backward linkages
Studies that provide evidence of no spillovers or negative spillovers					
14	Haddad and Harrison (1993)	Morocco	1985-1989	Panel data	No productivity spillovers through competition
15	Aitken and Harrison (1999)	Venezuela	1976-1989	Panel data	Negative spillovers though competition
16	Kathuria (2000)	India	1975-1988	Panel data	13 of the total 26 sectors show negative spillovers

Table 1 continued to the next page

Table 1. Summary of the Selected Empirical Studies on FDI Productivity Spillovers not Including Indonesia (continued from the previous page)

No.	Author(s)	Country	Period of Data	Technique	Result
17	Djankov and Hoekman (2000)	Czech republic	1992-1996	Panel data	Negative spillovers
18	Konings (2001)	Bulgaria, Romania, Poland	1993-1997	Panel data	No spillovers for Poland, negative productivity spillovers for Bulgaria and Romania
19	Thangavelu and Pattnayak (2006)	India	1989-2000	Panel data	Negative spillovers through backward linkages

Source: Author's compilation.

2 Indonesian Literature

Empirical studies on FDI productivity spillovers in Indonesia are relatively sparse compared to the numerous studies in developed economies. Studies in this economy have just been conducted since 1999. Blomstrom and Sjoholm (1999) make the first attempt using the cross-sectional data of manufacturing firms (Table 3.2). By focusing on the year 1991, they find that a foreign presence induces positive productivity spillovers to domestic firms through competition. However, they uncover no difference in the degree of spillover effects between the minority and the majority foreign-owned firms.

Using different approaches, two consecutive studies by Sjoholm (1999a; 1999b) also identify positive productivity spillovers from FDI, but the magnitude of spillovers depends on the gaps in technology and the level of aggregation. Sjoholm (1999a) finds that domestic firms gain larger productivity spillovers when the technology gaps between foreign and domestic firms are wider, and Sjoholm (1999b) demonstrates that productivity spillovers exist at the national level but not at the provincial level.

Following the three studies above, several studies are then carried out using more sophisticated estimation methods and a longer data set. Takii (2005) appears to be the first study that benefits from the availability of panel data. In line with Blomstrom and Sjoholm (1999), Takii finds evidence of positive productivity spillovers. However, contradictory to Sjoholm's (1999a) findings, Takii (2005) shows that spillovers are smaller or even negative in industries with large technology gaps. These differences in findings intuitively imply that the evidence of spillovers depends significantly on the type of data used, methodological approach, estimation strategy, and even the construction of the spillover variable. While Sjoholm (1999a) uses cross-sectional data, employs a *Cobb-Douglas* production function and measures spillovers using the share of output, Takii (2005) adopts panel data analyses with a *translog* production function and measures spillovers using the share of employment.

Table 2. Summary of Empirical Studies on FDI Productivity Spillovers in Indonesia

No	Author(s)	Period of Data	Method of Estimation	Dependent Variable	Measure of FDI	Other Independent Variables	Results
1	Blomstrom and Sjoholm (1999)	1991	OLS regression; Cross-section; Non-linear form	Value added	Share of output (five-digit level)	Capital; Skilled labour; Capacity utilization; Scale; Industry dummy	Positive spillovers through competition
2	Sjoholm (1999a)	1980, 1991	OLS regression; Cross-section; Cobb-Douglas	Value added	Share of output (five-digit level)	Labour; Investment; Scale	Positive spillovers. The degree of spillovers is greater when the technological gaps between foreign and domestic firms are wider.
3	Sjoholm (1999b)	1980, 1991	OLS regression; Cross-section	Value added	Share of output (five-digit level)	Labour; Investment; Industry and regional characteristic	Positive spillovers at the national level but no spillovers at the provincial level.
4	Takii (2005)	1990-1995	Panel data; Translog	Value added	Share of employment (three-digit level)	Labour; Capital; Plant specific effect; Time specific effect	Positive spillovers in industries with small technological gaps. Negative spillovers in industries with large technology gaps.
5	Blalock and Gertler (2005)	1988-1996	Panel data; Translog; Fixed effect	Output	Share of output (four-digit level, region, industry)	Labour; Capital; Material; Firm capability	Positive spillovers for firms with greater absorptive capacity. Firms with a narrow technology gap benefit less.
6	Todo and Miyamoto (2006)	1994-1997	Panel data; Cobb-Douglas; Semi-parametric	Value added	Absolute amount of FDI output	Capital; Labour; R&D	Positive spillovers. Firms with R&D receive more spillover benefits.
7	Jacob (2006)	1988-1996	Stochastic frontier; Panel data	Value added	Foreign ownership	Capital per labour; International R&D stock	Foreign ownership plays important role in technology transfer
8	Blalock and Gertler (2008)	1988-1996	Panel data; Translog; Fixed effect	Output	Share of output (four-digit level)	Labour; Capital; Energy; Backward linkage	No intra-industry (or horizontal) spillovers. Positive spillovers to domestic suppliers (backward spillovers)
9	Suyanto *et al.* (2009)	1988-2000	Panel data Stochastic frontier; translog	Value added	Share of output (five-digit level)	Labour, capital, competition, R&D	Positive intra-industry spillovers Competition and R&D facilitate positive spillovers.

Source: Author's compilation.

Utilizing a longer panel data from 1988 to 1996, Blalock and Gertler (2005) find that firm capability is an important factor in determining which firms or industries benefit from productivity spillovers. Firms with greater absorptive capacities are found receiving more spillover benefits but firms with narrow technology gaps are found obtaining less spillover benefits. These findings are in line with Sjoholm (1999a), but are contradicted by Takii (2005).

In a similar study but using a different measure of FDI spillovers, Todo and Miyamoto (2006) focus on R&D activities as an important factor for technology transfer. This study discovers that firms with R&D activities receive more spillover benefits compared to those without R&D activities. This confirms the conventional argument that R&D is a key factor for firms' absorptive capacity.

Using the same period of data as Blalock and Gertler (2005), Jacob (2006) estimates technology transfers in manufacturing firms. However, unlike Blalock and Gertler (2005) who focus on firms in the aggregated manufacturing industry, Jacob examines firms in the disaggregated five-digit industries. Their findings are diverse accordingly. While Blalock and Gertler find positive productivity spillovers for firms in the whole manufacturing industry, Jacob discovers that not all types of firms receive technology transfer from a foreign presence, and those firms receiving positive spillovers are mostly in research-based industries.

An attempt to examine inter-industry spillovers is found in Blalock and Gertler (2008). This study shows the existence of productivity spillovers through backward linkages. According to this study, the technology transfer from foreign firms to local suppliers is a *Pareto* improvement. It increases the welfare of local suppliers in terms of increases in outputs and profits. However, Blalock and Gertler (2008) find no evidence of spillovers to local competitors (*i.e.* domestic firms in the same market as foreign firms), which supports the theoretical argument made by Aitken and Harrison (1999), but contradicts the findings of Blomstrom and Sjoholm (1999).

In contrast to Blalock and Gertler (2008), Suyanto *et al.* (2009) demonstrate positive productivity spillovers from foreign firms to domestic firms in the same market. Also in Suyanto *et al.* study that competition and R&D are found to facilitate positive productivity spillovers, supporting findings in Blomstrom and Sjoholm (1999) and Takii (2005).

Explaining the Mixed Evidence in the Empirical Studies

The mixed evidence from the empirical studies, as noted above, intuitively implies that there is no universal relationship between FDI and domestic firms' productivity. Two groups of studies, however, try to explain the mixed findings. The first group focuses on the variation in methodology and data used. The second group considers mediating factors that are required by domestic firms to benefit from foreign presence. The following sub-sections discuss these two arguments.

1. Variations in Methodology and Data Used

Variations in methodology and data used lead to different findings in empirical studies (Gorg and Strobl, 2001; Takii, 2005). There are five issues in the methodology and data used, which have been identified in recent studies - that may cause the mixed evidence of productivity spillovers. These issues are variation in the measure of productivity,

variation in the measure of FDI spillovers, the level of data aggregation, the techniques in data estimation, and the method of analysis.

Based on the existing econometric studies, productivity is often measured in two different ways. Some studies look at total factor productivity (or multi factor productivity), while others focus on labour productivity (or partial productivity). The variation in the measure of productivity across studies makes the findings difficult to compare, or they may not even be comparable. Globerman (1979) argues that the ideal way of measuring productivity is to construct a ratio of net outputs to an index of total factor inputs, such as total factor productivity (TFP). The use of labour productivity as a measure of a firm's productivity has its problems since labour is not the sole source of productivity improvement. Output per worker may rise as a result of the substitution of capital or other non-labour inputs for labour, not only as a result of labour efficiency. Therefore, it is widely recognized that total factor productivity is a preferable index to measure productivity, for it relates output to all associated inputs in determining overall productive efficiency.

The measure of FDI also varies across econometric studies. Variables that are often used as a measure of FDI are the share of foreign firms' output and share of foreign firms' employment. The usage of these different measures results in mixed evidence regarding the productivity spillovers. The direction and magnitude of the spillover effects of FDI may also differ from these divergent measurements (Gorg and Strobl, 2001). The share of foreign firms' output is closely related to the total productivity concept, which is a measure of total output in relation with a variety of inputs, while the share of foreign firms' employment is related more to the concept of labour productivity (Wei and Liu 2006).

Similarly, the level of data aggregation leads to divergence in findings regarding the productivity spillovers of FDI. Some studies utilise industrial level data to estimate the productivity gains from FDI. Others use firm level data. Takii (2005) argues that firm level data may enable researchers to evaluate in more detail the firm-specific characteristics. Highly aggregated data, such as industry-level data, provide less precise estimations compared to firm-level data. By using firm-level data, the importance of firm characteristics as absorptive capacity for productivity spillovers can be precisely captured.

Additionally, the variations in the level of industrial groups for firm-level data may also lead to differences in findings. The two-digit ISIC groups provide different evidence regarding productivity spillovers than the three- or four-digit ISIC groups. Most econometric studies seem to prefer the more disaggregated level of data and industrial groups, with the advantage of examining productivity spillovers in highly specific industrial sectors (Lipsey and Sjoholm, 2005). However, this advantage comes at a cost in missing productivity spillovers across industrial groups (*i.e.* inter-industry spillovers). In this thesis, both the aggregated and the disaggregated industry groups for the firm-level data are examined in order to evaluate intra-industry as well as inter-industry spillovers.

The technique of data estimation is another factor that contributes to the mixed evidence of productivity spillovers. Gorg and Greenaway (2004) show that cross-sectional studies generally provide evidence of positive spillovers, while panel data

studies provide more inconclusive evidence. Although cross-sectional studies report unambiguous findings, the results tend to subject to estimation bias.

Gorg and Strobl (2001) point out two disadvantages of cross-sectional studies that lead to bias in estimation. Firstly, such studies do not account for the time dimension and, therefore, do not depict the growth of firms' productivity over time. Secondly, the positive spillovers in cross-sectional studies may indicate only correlation between foreign presence and domestic productivity, without really capturing the causality direction. Foreign firms may be attracted to industries with high productivity, but may not contribute to productivity in those industries. These two disadvantages are minimized under panel data estimations. As argued by Gorg and Strobl (2001) and Takii (2005), panel data techniques using firm-level data are the appropriate estimating framework for FDI productivity spillovers.

2. Mediating Factors for Gaining Spillover Benefits

The second group of studies argue that the mixed evidence may be attributed to the absence of key mediating factors in some observed economies (Gorg and Greenaway, 2004; Smeets, 2008). Among these mediating factors, two factors are relevant for the analysis in this thesis. These are absorptive capacities (which are also known as industry-specific or firm-specific characteristics) and the economic environment surrounding domestic and foreign firms.

Absorptive Capacities

Absorptive capacities have been widely recognized as a major mediating factor for productivity spillovers. The existing literature in this field argues that a certain level of absorptive capacity is required for the receiving party (the host country, industry, or firm) to effectively capture productivity spillovers from FDI (Findlay, 1978; Wang and Blomstrom, 1992; Glass and Saggi, 1998). According to this group of studies, there are two important absorptive capacities for productivity spillovers, namely knowledge gaps and research and development (R&D). These two absorptive capacities are discussed below.

(i). Knowledge Gaps: In the earlier literature on absorptive capacity, two opposing arguments prevail. The first argument suggests the importance of knowledge backwardness as an inducement for capturing productivity spillovers. Studies supporting this argument include Findlay (1978) and Wang and Blomstrom (1992), to name a few. Findlay argues that the greater the disparity in knowledge between two economies, the greater the pressure for backward economies to adopt new knowledge. The presence of MNCs from advanced economies should enhance the level of knowledge of domestic firms, raising their productivities. However, Findlay argues further that, in order for productivity spillovers to take place, the knowledge gap between these two economies should not be too wide. This suggests the importance of a minimum level of absorptive capacity (in terms of the level of knowledge) for spillover effects to take place.

In line with Findlay (1978), Wang and Blomstrom (1992) show formally that domestic firms may gain advantage from their backwardness in knowledge by investing in the learning process. The more domestic firms invest in learning the new knowledge from MNCs, the narrower the knowledge gap between MNC subsidiaries and domestic firms. This argument implies the importance of some minimum level of absorptive

capacity (in terms of knowledge investments) for domestic firms to catch up MNC subsidiaries.

The second argument states that the relative backwardness can be a constraint for domestic firms to absorb advanced knowledge from MNCs. Only certain and limited kinds of knowledge can be absorbed by the backward firms since their capacity may not be advanced enough to assimilate the new knowledge. Lapan and Bardhan (1973) and Glass and Saggi (1998) are among the studies that supporting this argument. Lapan and Bardhan argue that spillovers are negatively related to the complexity of MNC technology and the width knowledge gap. In a more extensive study, Glass and Saggi show formally that the backward domestic firms are not able to absorb much from MNCs' technology for they have limitations in the necessary knowledge to assimilate advanced technology.

A number of empirical studies have been conducted to test these two opposing arguments (Table 3). Some of these studies show evidence supporting Lapan and Bardran's (1973) argument, on the ground that backwardness has a negative effect on productivity spillovers (Kokko *et al.*, 1996; Liu *et al.*, 2000). However, recent empirical evidence confirms the advantage of being more backward (Griffith *et al.*, 2002; Castellani and Zanfei, 2003; Peri and Urban, 2006).

Using Uruguayan manufacturing plant-level data in 1988, Kokko *et al.* (1996) find evidence of productivity spillovers only in a group of locally-owned firms with moderate technology gaps *vis a vis* foreign firms, but no evidence is found for a group with large technology gaps. This finding indicates the negative effect of backwardness on productivity spillovers, supporting the theoretical argument by Lapan and Bardran (1973) and Glass and Saggi (1998). A similar result is shown by Liu *et al.* (2000) in their study on UK manufacturing industries over the period 1991-1995. Liu et al. show that backwardness has a negative impact on productivity spillovers, as domestic industries with greater technological capability receive greater productivity spillovers from a foreign presence.

In contrast, Griffith *et al.* (2002) find a positive and significant effect of technology backwardness on productivity spillovers. By examining 13,000 manufacturing establishments in the UK, their result confirms the advantage of being backward. A similar finding is presented by Castellani and Zanfei (2003) for a study on manufacturing firms in France, Italy and Spain for the period 1992-1997. Although the measure of backwardness is slightly different than Griffith *et al.* (2002), the result confirms the same hypothesis of the importance of backwardness in technology. Peri and Urban (2006) also make a similar finding for Italian and German manufacturing firms.

Table 3. Empirical Studies on Mediating Factors for FDI Productivity Spillovers

Mediating Factor	Author(s)	Countries	Period of Data	Result
Absorptive capacities				
1. Technology gaps	Kokko *et al.* (1996)	Uruguay	1988	Negative effect of knowledge gaps on productivity spillovers
	Liu *et al.* (2000)	UK	1991-1995	Negative effect of knowledge backwardness on productivity spillovers
	Griffith *et al.* (2000)	UK	1980-1992	Advantage of being backward
	Castellani and Zanfei (2003)	France, Italia, Spain	1992-1997	Positive effect of technology gaps on productivity spillovers
	Peri and Urban (2006)	Italia Germany	1993-1999	Positive effect of knowledge backwardness on productivity spillovers
2. R&D	Kathuria (2000)	India	1975-1989	R&D firms gains positive productivity spillovers. Non-R&D firms receive no spillovers
	Kinoshita (2001)	The Czech republic	1995-1998	R&D firms receive greater spillover effects
	Griffith *et al.* (2004)	12 OECD countries	1974-1990	Positive spillovers on R&D firms
	Todo (2006)	Japan	1995-2002	Positive spillovers on R&D firms
The Economic Environment				
1. Investment and trade regimes	Kokko *et al.* (2001)	Uruguay	1988	No sign of productivity spillovers from more outward-looking policies
	Kohpaiboon (2005)	Thailand	1970-2002	Positive spillovers under outward-looking policies No spillovers under inward-looking policies
	Naurzad (2008)	46 countries	1981-2001	More open regimes generate higher productivity spillovers
2. Economic crisis	Takii (2007)	Indonesia	1990-2003	The magnitude of positive productivity spillovers decrease during crisis period
	Suyanto *et al.* (2009)	Indonesia	1988-2000	The magnitude of positive productivity spillovers decrease during crisis period

Source: Author's compilation

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(ii) Research and Development: R&D has been regarded as an important factor for productivity growth since Solow (1957). However, empirical studies on the role of R&D only began in the late 1980s. In an econometric study of productivity spillovers in Indian manufacturing firms, Kathuria (2000) shows that local firms that invest in R&D activities receive high productivity spillovers from FDI, whereas the non-R&D local firms do not gain much from the presence of foreign firms. This result indicates that the productivity

spillovers are not automatic consequences of foreign firms' presence, but they depend on the efforts of local firms investing in R&D activities. Similar evidence is found by Kinoshita (2001) in a study of Czech manufacturing firms between 1995 and 1998. By focusing on electrical machinery and radio and TV sectors, Kinoshita demonstrates that R&D is a necessary condition for productivity spillovers. A recent study by Griffith *et al.* (2004) on twelve OECD countries also confirms that R&D plays an important role in productivity spillovers, besides its role as a medium of innovation. A similar result is also arrived at by Todo (2006) for Japan and Suyanto *et al.* (2009) for Indonesia.

The Economic Environment

The surrounding economic environment clearly influences the ability of domestic firms to grasp productivity spillovers. The literature identifies two environmental factors that potentially affect the signs and magnitude of FDI spillovers. These factors are investment regimes and economic crisis.

(i) Investment regimes: In a well-known theory of immiserizing growth, Bhagwati (1973) argues that a change in trade and investment regimes may influence the effectiveness of an economy to gain FDI benefits. An economy under a fairly open regime tends to gain higher FDI advantages than the one under a regulated investment regime. This argument has been put to test in some empirical studies. Based on Uruguayan firm-level inter-industry analysis, Kokko *et al.* (2001) focus on productivity spillovers conditioned by the country's trade and investment regimes. This study uses the year 1973, where Uruguay embarked on trade and investment reforms, as a benchmark to separate the regulated investment regime and the open regime. The findings support Bhagwati's argument. Kohpaiboon (2006) tests a similar argument for technology spillovers in Thailand and provides consistent results. In a cross-country investigation, Naurzad (2008) also confirms that economies with an open investment regime tend to receive higher magnitude of FDI benefits than those with a regulated regime.

(ii) Economic crisis: Shocks in the economic environment, such as economic crises, may also affect the signs and magnitude of FDI spillovers on domestic productivity. Recent empirical studies in Indonesia have taken into account this factor. In a study of Indonesian manufacturing firms, Takii (2007) shows that the magnitude of FDI spillover decreases during the period of economic crisis. The year 1997, when the Asian economic crisis started, is used as a point of reference to divide the period of crisis with the period before. A similar finding is also provided by Suyanto *et al.* (2009) when examining the chemical and pharmaceutical industries, although this study employs a different method of analysis.

Conclusion

This study reviews theoretical and empirical literature on productivity spillovers from FDI. The theoretical literature identifies four channels for positive FDI spillovers and discusses numerous models used to explain the process of spillover effects. However, the empirical literature finds mixed evidence, where some studies confirm the existence of positive productivity spillovers and others identify no or even negative spillovers. The mixed evidence stems from the differences in methodology used and the absence of important mediating factors.

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