Do Vietnamese Domestic Firms Benefit from Foreign Direct Investment?

The role of technology spillovers and absorptive capacity

By

TU, Nguyen Anh

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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ABSTRACT

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FDI has widely been regarded as one of the main drivers of productivity of domestic companies in many developing countries. This thesis will examine the impacts of technology spillovers including horizontal and vertical effects on productivity of manufacturing and non-manufacturing local firms in Vietnam. Using panel firm-level data from 2000 – 2006, It provides evidence of meaningful positive horizontal and negative coefficient of backward linkages in manufacturing sector whereas among non-manufacturing sector, foreign equity participation is not statistically correlated with productivity. The reason for negative backward linkages can be explained by the fact that foreign companies mainly import their inputs from oversea and put local firms in a situation of losing total sales. The thesis, then, tests how the degrees of ownership and firm's size influence to technology spillovers. It also investigates whether absorptive capacity of local firms facilitates spillovers from FDI. Interestingly, the results show that R&D has negative effects on productivity of domestic firms. One explanation could be "disruptive technology" which at first requires adjustment costs and imposing negative effects on firm's performance and then helping them have better productivity later.

Keywords: Foreign direct investment, technology spillovers, Vietnam, horizontal effects, vertical effects.

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I must express my gratitude to Song Thuong, for her willingness to help me in collecting data, Shernett, for giving me innumerable suggestions in running Stata, Mai Phuong, for sharing and experiencing all of the ups and downs of my research. Besides, I am also indebted to so many others for their help. Finally, words cannot express an exceptional appreciation to my family to my parent, brother and sister for all of what you did.

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I. Introduction

In recent decades, many developing and transition countries have been actively encouraging the influxes of FDI with expectation of positive technology spillovers. One of the main goals of FDI attraction is the desire to access and use the advanced technology from developed countries, including technology spillovers in manufacturing and non-manufacturing sector. However, the results from empirical papers on spillover effects from FDI have not reached a consensus. This thesis will examine the impacts FDI spillovers affects the productivity of manufacturing and non-manufacturing local firms in Vietnam by using panel firm-level data. I find evidence of positive intra-industry spillovers and negative backward linkages for manufacturing sector only. Meanwhile non-manufacturing sector does not show any spillover effects through FDI.

The remaining part will be arranged as follows. After introducing briefly current trend of FDI in Vietnam in the next part, I will give a summary of the theoretical framework presenting the model, data set and assessment method. Last part provides the outcomes of research and conclusion.

a. Research Questions

1. How technology spillovers influence the productivity of manufacturing and non-manufacturing local enterprises in Vietnam?

2. How do technology spillovers differ between manufacturing and non-manufacturing sector?

3. Whether absorptive capacity of local firms facilitates spillovers from FDI?

b. Hypotheses

The hypotheses tested in this study are as follows:

H_1: Technology spillovers through FDI positively influences the productivity of manufacturing and non-manufacturing local enterprises in Vietnam

H_2: Spillover effects in manufacturing sector are more statistically significant than non-manufacturing sector

H_3: Absorptive capacity enhances the effects of FDI on technology spillovers in Vietnam.

II. Literature Review

a. Conceptual Framework

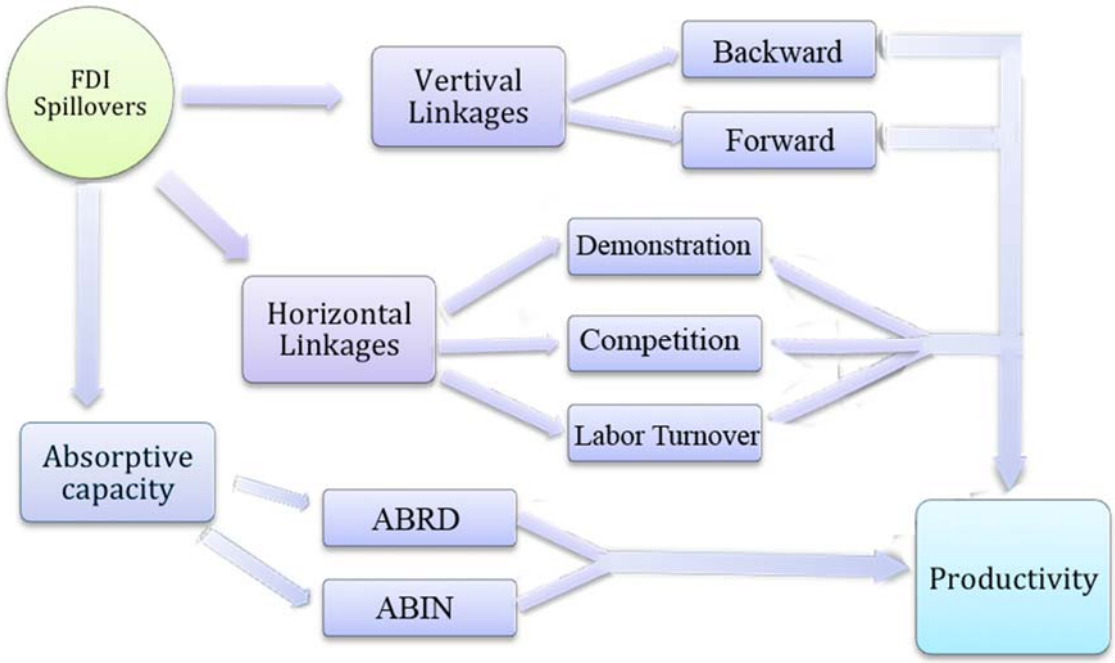


Figure 1 Conceptual Framework

Foreign Direct Investment (FDI) is a form of long term investment by individuals or firms from this nation to others by establishing production facilities and businesses. According to the WTO:

> *Foreign direct investment (FDI) occurs when an investor based in one country (the home country) acquires an asset in another country (the host country) with the intent to manage that asset. The management dimension is what distinguishes FDI from portfolio investment in foreign stocks, bonds and other financial instruments.*

One of the benefits of FDI to host countries can be mentioned is technology spillovers that refer to the effect of new technological know-how and experiences on

domestic firm's productivity and ability of innovation. Because of the nature of technology that is non-rival, the one who possesses technology cannot, to some extent, limit others from using and the cost for additional use is much smaller than the cost of creating them.

In light of beneficial effect of technological spillovers, countries try to attract FDI as much as they can so as to improve productivity of domestic firms. They hope that when multinational companies carrying new technology and management skill invest in their country, their operation will spread to local firms. Spillover effects can generate two types of benefits that are horizontal and vertical linkages. Horizontal FDI emerges when a company opens the same value chain stage producing same products and services in host country through FDI whereas vertical FDI occurs when they move upstream or downstream in dissimilar value chains. (Guide who is 2011)

There are three main ways through which horizontal effects occurs: demonstration effects, worker mobility and competition. Moreover, vertical effect includes two opposite linkages (backward and forward). When foreign firms invest in host country, they have several options to satisfy the inputs: producing themselve domestically, obtain from other foreign firms or local enterprises. Backward linkages arise when they select the last option. More specifically, a foreign firm may want to push up demand by supplying helps to local customers and indicating those ones the

way to utilize the products (Marcin 2008). Forward linkages can be found as foreign enterprises provide training and technical support to customers (Clare 1996).

There is also one characteristic of firms referring to ability to identify, comprehend, and make use of knowledge from others organization: absorptive capacity (Cohen and Levinthal 1989). In other words, it stands for the distance of enterprises with the technology frontier. A firm with higher absorptive capacity is running adjacent to the industry frontier. Lapan and Bardhan (1973) discuss that "Technical advances applicable to the factor-proportions of capital-rich developed countries are hardly of any use in improving techniques of low capital-intensity in less developed countries".

b. *Empirical Study*

Given the significance of spillovers in economic development, quite a few literatures have investigated technology spillover effects from both horizontal and vertical spillovers although the results differ from countries to countries. Blomstrom (1986) carried one of the first attempts to investigate spillovers in developing countries. Recent papers on spillover effects in developed countries can be mentioned: Flores, Fontoura and Santos (2007) and Nicolini and Resmini (2010). Developing countries even gets more attention including Aitken and Harrison (1999) for

Venuezela, Fu (2008) for China, Crepo, Fontoura and Proenca (2009) for Portugal and Kohpaiboon (2006) for Thailand.

Khalifah and Adam (2009) employs establishment-level data of Malaysian manufacturing industries from 2000 to 2004 and finds that notable positive technology spillovers to local enterprises in the same industry is related to foreign presence. However, he notes that wholly foreign-owned and locally-owned firms have negative insignificant impacts on labour productivity. Similarly, Behera, Dua et al. (2012) also reports positive evidence of spillover effect across Indian munufacturing industries and suggests that the effects "are relatively higher in industries like food products, textiles, chemicals, drugs and pharmaceuticals and non-metallic mineral products" (Behera, Dua and Goldar 2012). Other studies that provide comparable results can be mentioned like Crepo, Fontoura and Proenca (2009), Blomstrom (1986), Dimelis (2005) and Negara and Adam (2012).

On the other hand, quite a few researchers are failed to find evidence of foreign presence's positive effects. Konings (2001), who study on data of three emerging economies: Bulgaria, Romania and Poland find no noteworthy positive association between the foreign presence and higher productive capacity growth in local enterprises. He explains that it may be due to the fact that restructuring takes time to be appeared on the indicators. Focusing on data set of manufacturing sector in

Venezuela, Aitken and Harrison (1999) shows that influx of FDI negatively influences plant's productivity. It indicates that foreign investors focus on more productive plants. Studies on 12 developing countries done by Germidis (1977) for 65 multinational subsidiaries, Haddad and Harrison also find negative or insignificant spillover impacts associated with FDI. The dissimilarities can be described by different approaches and methodologies in each paper as it was served for unalike intentions.

The contradictory results in above papers on spillovers can be explained by several reasons. One of the common explanations is that the technology gap between local and foreign firms is too large that domestic enterprise cannot benefit from observing and learning skills from foreign firms. Another clarification is "market stealing effects" (Nguyen et al. 2013) which refers to the stituation of losing market share of domestic firms because foreign enterprises take advantages of captital and technology. As a result, local firms will not able to achieve productive scale size and further reduce their productivity.

c. Horizontal and Vertical effects

Another contribution of this paper is the analysis of particular channels, which are horizontal and vertical effects, through which FDI spillover takes place. Horizontal effects include demonstration, competition, labor turn over and export externalities.

Demonstration or learning-by-watching impact occurs when new technologies are brought to receiver and then, local companies are able to observe and imitate techniques, skills in order to improve the productivity (Le 2005). Saggi (2002) and Meyer (2004) suggest that domestic enterprises, which, before the international investors come into the host country, lack understanding of technological innovation, begin to grasp new technologies as the uncertainty is reducing. When new technologies are introduced, local enterprises will able to perceive techniques and skills, which generate higher productivity (Wang and Blomstrom 1992).

Besides, greater competition from foreign firms definitely will exert pressure on local firms to enlarge their production more efficiently (Khalifah and Adam 2009). In the context of competitive environment, local enterprises are left with no choice but running more efficiently, increasing productivity while decreasing price by adopting new technologies (Gorg and Strobl 2001). It should be noted that competition also pushes up the rate of adoption/imitating of new technologies (Gorg and Greenaway 2004). However, Aitken and Harrison (1999) showed that foreign presence is the main reason explaining why local firms are losing their market share.

Furthermore, workers previously employed by foreign firms might quit their job and start their own business or work for other local companies, which also known as labor turnover. It would be quite difficult to compute the effect of labor turnover as

it involves tremendous interviews with employees and then measure the knowledge transferred local enterprises. Nevertheless, Gorg and Greenaway (2004) suggests that movement of labor is most foremost prominent channel for spillovers. However, negative impacts may emerge through this channel because of the fact that foreign companies may attract high-skilled worker by offering better working conditions, higher salary and more stable career, leaving domestic firms with low-skilled labors.

In comparison with horizontal effects, some researches also consider vertical effects, which happen between multinational corporations and local enterprise across industries. Vertical effects comprise “backward effects (buyers to suppliers) and forward effects (suppliers to buyers)” (Le and Pomfret 2011). Most studies highlight the significance of backward effects as it provides a direct channel to spread knowledge (Giroud 2003) and involves intensive interaction between buyers and sellers (Lall 1996).

It’s noted that not many studies paid attention to forward linkages as there is less empirical evidence in compare with backward linkages. Using a new data set of manufacturing enterprises in China, Liu (2008) disentangled that backward effects appear to be have bigger proportion within channels we have discussed so far.

Regarding to export spillovers, foreign firms, which are export-oriented, can be stimulus for domestic firms since they extensively involved in building international

distribution system and held understanding of international marketing. By cooperating with foreign firms, local enterprises can improve themselves in foreign markets (Abraham, Konings and Slootmaekers 2010). Additionally, they also believe that local firms can get advantageous from larger market access including

d.Absorptive capacity

Konings (2001) suggests that spillover effects are relatively modest in sector with higher labor productivity gap between domestic and foreign enterprises. At industry level, Konings (2001), by using data in Mexico in 1970, suggests that spillover effects tend to be less significant in sector where afore-mentioned gap are larger. Nevertheless, paper of Sjoholm (1999) in Indonesia indicates a totally different outcome.

Many papers (Fu 2008; Girma, Holger and Mauro 2008) have emphasized the significance of absorptive capacity as a formost element for FDI spillovers. Aborptive capacity is created in numerous way as a side-effect of R&D investment or manufacturing operation. In compare with other countries, capacity of Vietnamese local firms seems to be too low to grasp advanced technologies from foreign enterprises. Consequently, in spite of rising FDI inflow, spillover effects seem to be still modest.

e. Earlier studies on spillovers in Vietnam

Earlier papers have concentrated mainly on examining the factors which decisively affects FDI in Vietnam, whilst some lastes literatures looked into the contribution of horizontal and vertical linkages to export (Nguyen and Anwar 2011; Nguyen and Xing 2008) and to economic growth (Nguyen and Anwar 2010; Vu 2008 and Paitoon, Bangorn and Hoang 2010). Some others have conducted an examination into contribution of foreign investment to payment paid by local private firm in Vietnam (Le and Pomfret 2011).

Notwithstanding the fact that there have been a number of studies in the technology spillovers from MNEs to Vietnamese local companies, those research have some limitations like using industry level data (Le 2005) and focus mainly on manufacturing sector (Le and Pomfret 2011). In this thesis, the author will investigate the impacts FDI on horizontal linkages as well as backward and forward linkages from firm level data of manufacturing and non-manufacturing domestic firms in Vietnam constructed from annual firm survey.

III. Current trend of FDI in Vietnam

a. Overview of Vietnamese Economy

In the context of slow recovery from economic downturn, Vietnam's GDP in first six months of 2014 expanded only 5.18% over the same period in compared with

2013. Although macroeconomics stability continues to improve, economic growth still seems to be modest under the potential. In general, Vietnam is facing with massive challenges regarding to competitive ability, which urgently requires institutional reforms.

Table 1 Target development of Vietnam from 2008 to 2013

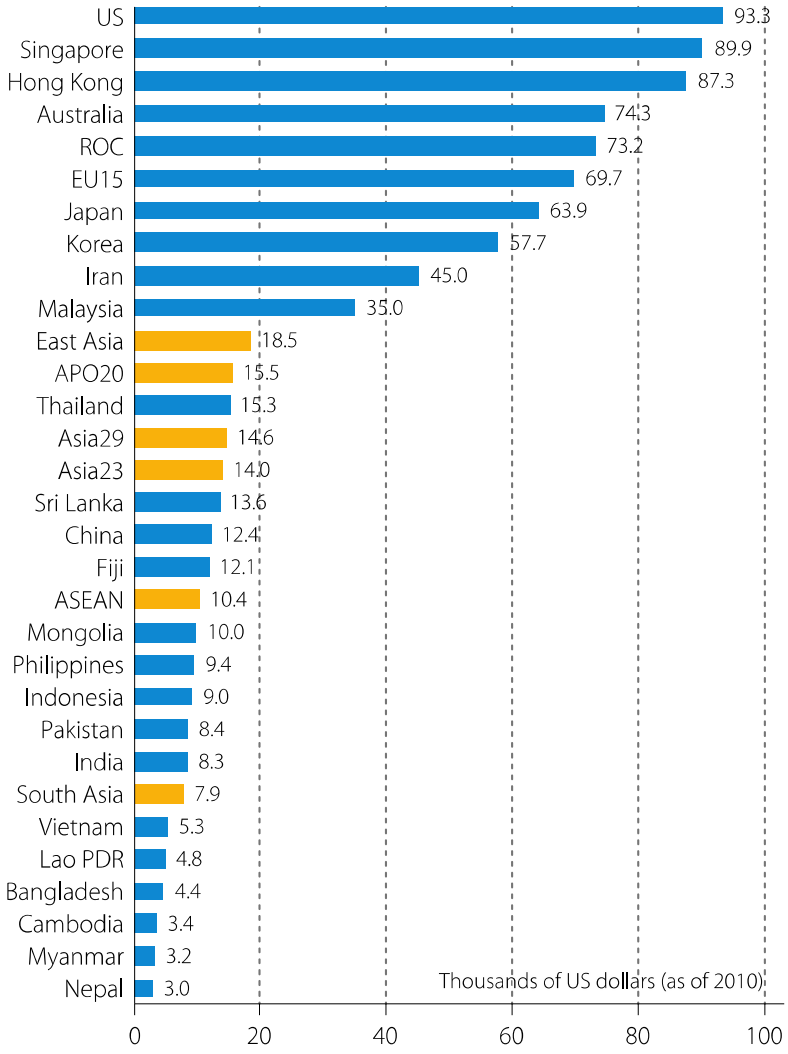
	2008	**2009**	**2010**	**2011**	**2012**	**2013**
GDP growth (%)	5,66	5,4	6,42	6,24	5,25	5,42
CPI (%)	19,89	6,52	11,75	18,58	9,21	6,04
Investment (% GDP)	43,1	42,8	41,9	36,4	33,5	30,4
Budget deficits (%GDP)	4,60	6,90	5,60	4,90	4,80	5,30
Balance of Trade	-18	-12,8	-12,6	-9,8	0,748	0,10
Bad Debt (%GDP)			56,5	54,9	55,7	56

Source: Year book of Autumn Economic Forum 2014, Vietnam

A major contribution to growth belongs to FDI enterprises with trade surplus of US$ 14 billion. Main factor attracting foreign capital flows is source of cheap and abundant labor. However, according to ILO, labor productivity increased by 4.3% over a period from 2001 to 2010, lower than 5.2% in 1991 – 2000. Compared to other nations in the region, Vietnam is inferior, such as 17 times lower than Singapore; 6

times lower than Malaysia (figure 1)…

Figure 2 Labor productivity level by per worker GDP, 2010



Source: APO Productivity database 2012

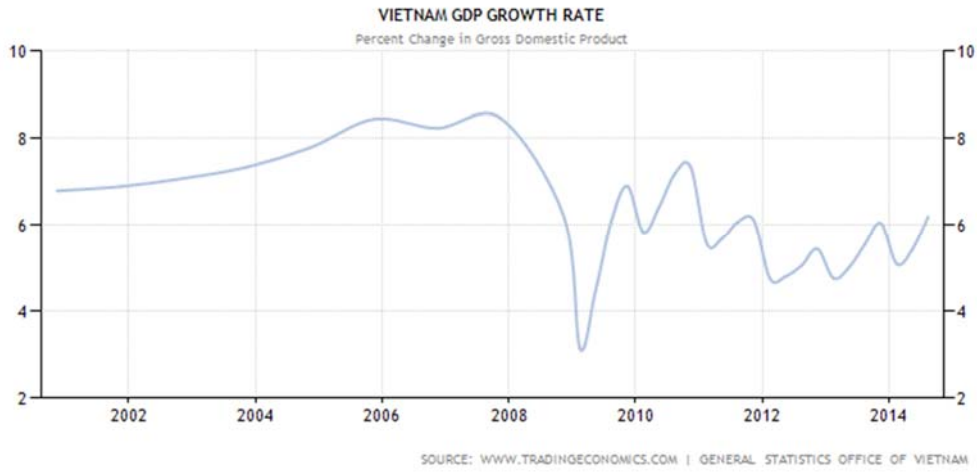
The consumer price index (CPI), as a result of macroeconomic and monetary policy, rose by only 6.04% in 2013 – the lowest level in last 10 years. CPI increased largely as a result of macroeconomic policies, especially monetary policy. In 2013, the State Bank of Vietnam regulated the money supply well so as to control inflation, food prices. Inflation remains low but the risk of increasing again still exists cause the

fact that such low growth level primarily comes from tighten fiscal policy and weak aggregate demand of the economy.

In general, the quality of Vietnam's growth is unsustainable and relies heavily on capital and labor. Data from the General Statistics Office showed that the contribution of capital and labor in GDP growth is always at high level (55.5% and 17.1% in 2013, respectively). Besides, a prominent bottleneck that has been solved these years is bad debt. Asset Management Company of the credit institutions (VAMC) was established to buy back bank debt. Nevertheless, with current economic situation, bad debt settlement would take time and not able to be handled in the short term.

Despite the fact that the State Bank has issued many policies and measures to encourage credits, local firms are still facing with difficulty in funding. Estimates in 2013, there are approximately, 60,737 firms have been dissolved and suspended operations, increasing 12% over the previous year. Number of newly establishment-registered firms increased by 10% whereas average capital scale decreased from 6.68 billion VND to 5.18 billion VND in 2013.

Figure 3 Vietnam GDP Growth rate



Particularly, the focus of next years will be the budget deficit and public debt. Budget deficits occur during the hard times of economy. Vietnamese government has to find the way to offset through new debt, by issuing more bonds. The plan of raising budget deficit from 4.8% to 5.3% for 2013-2014 has been passed by the National Assembly. They also approved issuing 170,000 billion VND additional bonds during the period 2014-2014 in order to get more funds for investment and development.

Government debt causes ratio of public debt increased significantly. As the end of 2012, such ratio stays at the level of 57.3%. Although current debt is still lower than 65% which is the threshold that the National Assembly allows, but the safety coefficient is declining because installments and interest costs seems to be bigger overtime while the scale of foreign exchange reserves is now lower than the total debt. More importantly, the risk is increasing due to the fact that Vietnam, being out of low-income countries groups, has to pay higher interest rates to borrowers with less favor.

In addition, the bad debts of state-owned enterprises are becoming a major concern to the sustainability of public debt of Vietnam.

According to world economic outlook of many prestigious organizations, economic activities in many countries in general and Vietnam in particular would face various difficulties and obstacles. Therefore, the goal of economic growth in 2014 was 6.2% would be a challenge for policy makers in Vietnam. Table 2 presents the results of the forecast growth and inflation in Vietnam by international and national organization.

Table 2 Forecast growth and inflation in Vietnam by national and international Organizations

Organizations	2014		2015	
	Growth	Inflation	Growth	Inflation
Targets	***5,8***	***7,0***	***6,2***	***5,0***
ADB	5,6	6,2	5,8	6,6
WB	5,5	6,5	5,6	6,3
IMF	5,6	6,3	5,7	6,2
EY	5,4	6,5	6,4	6.0
UBGSTCQG	5.6- 5.7	5,0		

Source: Source: Year book of Autumn Economic Forum 2014, Vietnam

In overall, until now, after many efforts of the government in operating macroeconomic, targeted inflation certainly would be achieved and 2014 economic

growth is also likely closer to the target of 5.8%. The government can promote further stimulus to the economy through monetary policy and fiscal concerns without issue price. The economy in 2015 is expected to be better with a higher growth rate of inflation (approximately 6%).

b. Current trend of FDI in East Asia

Although the world and regional economy is still recovering slowly, total amount of FDI in East Asia and Southeast Asia have increased by 4% and reached $347 billion in 2013. Foreign investment in this region increased by 7% in 2013, reaching $293 billion. In 2013, total inflows of FDI into ASEAN reached $343 billion, accounting for 24% of global FDI inflows. Thus, the expansion of free trade area in and outside of this region has greatly contributed to the growth of FDI and development of regional cohesion.

FDI into China in 2013 reached $124 billion and has helped China become the 2nd biggest country in attracting FDI among the world. FDI in China mostly focuses on non-manufacturing sector and especially commercial real estate. Multinational corporations investing in China under the forms of M&A surged from $10 billion in 2012 to $27 billion in 2013. Meanwhile, Beijing has strengthened its position as a leading country in foreign investment. In the last 2 years, FDI outflows may exceed the inflows into the country. In 2013, Chinese foreign investment increased by 15%,

achieving $101 billion. Chinese companies even invested in many projects in developed countries such as CNOOC-NEXEN projects in Canada worth $15 billion or Shuanghui-Smithfiled project in the US worth $5 billion.

High-income regions/countries in the region continue to maintain positive results in attracting FDI. Typically, Korea has attracted $12 billion, the highest level since 2000, mainly in shipbuilding industry and the electronics industry. By contrast, Korean foreign investment fell by 5% in 2013. Similarly, Hong Kong and Singapore have attracted $77 billion and $63 billion, respectively.

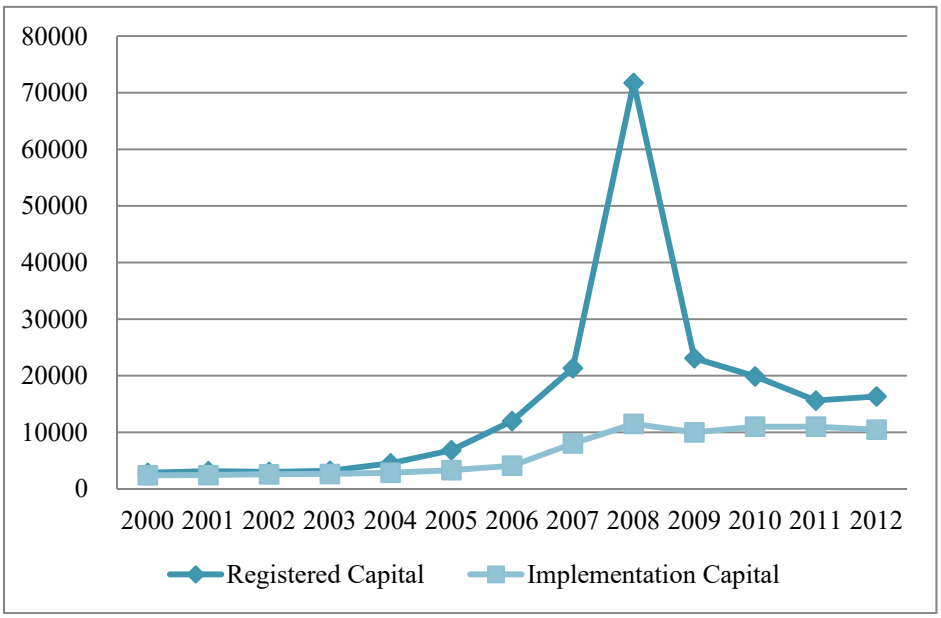
Meanwhile, FDI in ASEAN countries increased by 7% and reached $125 billion. However, the growth rate of FDI in this region has slowed down, particularly in lower income countries. Nevertheless, we can see that FDI has shifted gradually from East Asia to Southeast Asia. Among ASEAN, despite being affected by the financial volatility in mid-2013, Indonesia remained stable and achieved $18 billion. Malaysia is also big countries in attracting FDI. Foreign investment's inflows in this country, mainly in the non-manufacturing sector, surged by 22% worth $12 billion (2013). Besides, 400 FDI projects in Thailand have been affected by political instability and its ability to attracted FDI inflow is also not satisfactory. However, investment from Japan to Thailand has increased significantly in recent years and big multinational companies like Samsung are considering to build new factory in this country. For

Philippines, $4 billion, rising 20% in compared with 2012, the highest level in the history, is number of FDI inflow in spite of natural disasters.

c. FDI in Vietnam

According to summary report of General Statistics Office of Vietnam, Vietnam attracted 14,550 projects from FDI with a total registered capital of nearly $211 billion. FDI essentially contributes to stability growth in recent years, especially when public and private domestic investments tend to decrease gradually. The contribution of FDI to GDP has increased over the years and reached 19% of GDP in 2011, contributing 14.2 billion in revenue for the period 2001 – 2010. Particularly in 2012, this contribution is about $3.7 billion, accounting for 11.9% of gross national income.

Figure 4 Total registered and implementation Capital



Source: General Statistics Office of Vietnam

The strong growth of foreign investment can be presented clearly overtime. The proportion of foreign-invested sector in the economic structure during 2000 – 2011 increased by 5.4%. FDI created over 2 million direct jobs and around 3 - 4 million indirect jobs, improving the quality of human resources and labor restructuring and contributing to the cause of transferring technology and experience. It also promotes the reform of state-owned enterprises, administrative innovation.

FDI has strong impact on the restructuring the framework of labor towards industrialization – modernization of Vietnam. In the industrial sector and construction, the rate of foreign investment sector growth is around 18% per year, more significant than the growth rate of the whole industry. In the area of service, FDI has created some high quality non-manufacturing industry such as telecommunications, international travel, finance, banking, insurance, auditing and so on.

In addition, FDI flows are an important contribution to exports. The policy of encouraging export-oriented foreign investment has facilitated Vietnam in improving the export capacity. Thereby, it helps Vietnam to participate and gradually improve its status in the global value chain. More specifically, before 2001, total values of exports including crude oil in FDI sector achieved only 45.2 % of total turnover. However, since 2003, the export in this sector began exceeding domestic firms and turning to be a main element to enhance export, accounting for about 64 % of total exports in 2012.

Moreover, FDI enterprises have contributed to strengthen the structure of export in the direction of decreasing the amount of primary commodity, mineral product, and increasing the percentage of intensive-technology products. FDI sector also contributes to stabilize the domestic market and reduce budget deficit through supplying high-quality product for domestic market from domestic manufacturing enterprises, instead of importing from abroad as before.

d. Drawbacks of attracting FDI

In addition to these results, FDI also has some existing limitations such as: added value which is generated in Vietnam is low, the ability of domestic firms to participate in the value chain seems to be limited, and scale of projects is still small and so on. Foreign investment in recent years mainly focuses on labor-intensive sectors that don't create much value to the country. Besides, FDI from developed countries is still limited if we compare their investment in Thailand, Indonesia or Malaysia. The ratio of actual projects with the registered capital stays only about 47.2%.

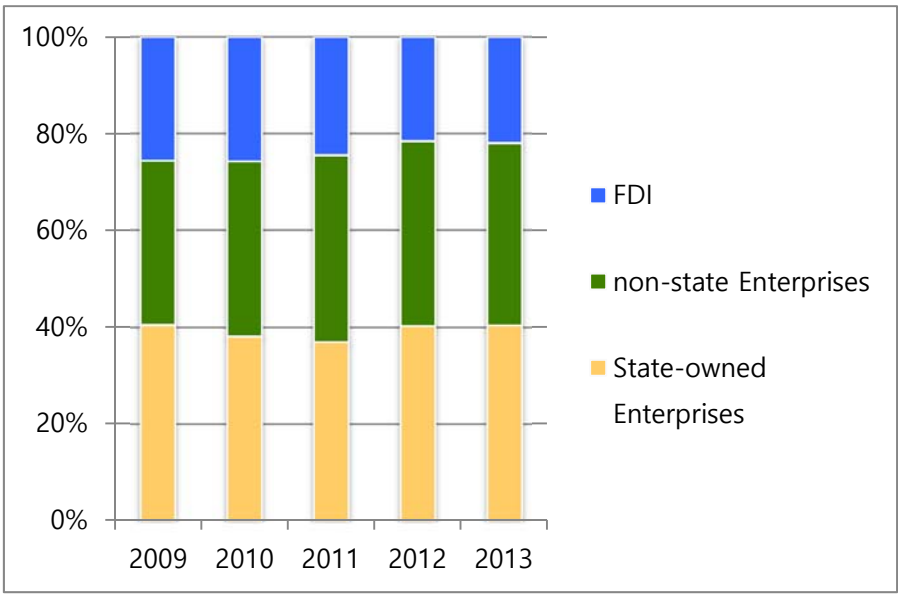
Most of FDI projects are small-sized and medium-sized. The average level of capital for the period of 1988 – 2011 is around $15.4 million per projects. This number decreased to $13.47 million in 2011. Above 80% of FDI firms are using world-averaged technology and only 5 – 6% is using high-tech. The proportion of

new jobs created by FDI is not worth, only 3.4% of total employed workforce in 2011. Although the average income of workers is higher than state-owned sector but lower than private sector.

In recent years, the ability in attracting FDI in Vietnam is showing a signal of remarkable decline. Typically, Japan, despite being one of the biggest investor, is pouring billions of dollars into Burma. Toyota, Mitsubishi, and many other large corporations of Japan announced expanded production facilities in Thailand, Malaysia, but their facilities in Vietnam still stay unchanged. Samsung also declared to open new factories in Thailand….

During first 6 months of 2014, Vietnam attracted US$6.85 billion FDI, decreasing 35% compared to 2013 and it makes up around 20% in total investment (Figure 2). According to sectors, manufacturing and processing accounted for nearly 60% of total FDI attracted while the second and third places belong to real-estate business and hotel and restaurant. Japan ranked first in the list of foreign investors with total registered capital of nearly US$ 5.9 billion followed by Singapore and South of Korea.

Figure 5 Total Investment by ownership



Source: General Statistics Office of Vietnam, 2014

Table 3 foreign direct investments by partners in Vietnam

No.	Investment Partners	Number of Projects	Total registered-invested capital (USD)	Charter capital (USD)
1	Japan	1849	28,699,621,246	8,149,053,836
2	Taiwan	2234	27,129,094,760	10,924,000,860
3	Singapore	1119	24,875,349,749	7,132,496,424
4	South Korea	3197	24,815,962,168	8,557,624,062
5	British Virgin Islands	510	15,386,367,951	5,302,624,922
6	Hong Kong	705	11,966,693,190	3,885,429,926
7	The United State of America	648	10,507,189,345	2,518,764,942
8	Malaysia	435	10,196,424,427	3,587,302,682
9	Cayman Islands	54	7,505,985,912	1,551,590,422
10	Thailand	298	6,063,689,790	2,682,720,169

Source: General Statistics Office of Vietnam, 2013

Regardless of escalated tension between Vietnam and China over disputed territory, FDI flows remain quite stable due to many reasons. Firstly, although

present-day registered FDI has enlarged, China only ranks 13rd in the list of foreign investors. Moreover, according to HSBC, FDI moving-out tendency from China seems to be contributive to ASEAN, particularly Vietnam and Indonesia. It, perhaps, dues to the fact that "Vietnam has a smaller population (89m), its strong, cheap labor supply in rural areas (around 70% of the population live in the countryside) mean that it has an advantage in labor-intensive manufacturing."

In two years 2011-2012, the Vietnamese government has actively delayed and reduced the large number of investment projects, which focus on key projects and strengthen the monitoring the quality of public investment. As a result of public investment falling from 17.2% of GDP in 2005-2010 to 13.5% of GDP in 2011 and 12.7% in 2012. Cutting public investment has led to the decline in FDI in the private sector.

IV. Data and Empirical Analysis

a. Data

As mentioned earlier, one possible answer for the inconsistent results can be which kind of data used in the papers. Some literatures apply aggregated industry data (Huang, Liu and Xu 2012) while the others examine firm level data (Girma, Holger and Mauro 2008). Some employs panel data (Haddad and Harrison 1993) while some use cross-sectional data (Kohpaiboon 2000). At industry-level, Gorg and Strobl (2001)

argues that using industry data in fields of economics may be not appropriate like in education, psychology or medicine cause the fact that nature of the data used in economics is usually non-experimental. Moreover, they suggest that cross-sectional data may magnify the spillover effects cause the fact that it doesn't provide for other time-invariant enterprises or specific sector effects and conclude that panel data would prevent such limitations.

In this thesis, the empirical analysis use a firm-level unbalanced panel data set which is built on a sample of both manufacturing and non-manufacturing enterprises in Vietnam. The data is withdrawn from the survey conducted annually by the GSO. Starting from 2000, the survey is designed as an annual enumeration of all firms. The dataset includes information on the total sales, revenues, number of employees, raw materials, fixed assets, intangible assets, spending on R&D, foreign share in total firm's capital and others. The initial number of observation is around one million. After dropping enterprises with total sales that is smaller than 5000 ($250) and number of employees which is smaller than 50, total remainder is 45495 observations for the sample. Due to the fact that there are some firms, which started their operation after 2000, so our dataset is unbalanced or in other words we do not have consecutive data for the whole period. Table 4 describes major statistics of the spillover variables.

Table 4 descriptive statistics for spillover variables

Year	Horizontal		Backward		Forward	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
2000	16.4999	17.16711	16.17024	16.3931	16.70996	17.3856
2001	15.87233	17.30632	15.58588	16.57395	16.25636	17.88382
2002	16.57767	17.53944	16.4816	17.21963	16.91817	17.65316
2003	16.27917	17.9113	15.90995	16.91041	16.30118	17.25262
2004	15.8389	16.07906	15.55458	15.22728	15.9174	15.49671
2005	15.57021	15.06376	15.30931	14.33046	15.61707	14.56111
2006	14.43923	15.84859	14.18034	14.094867	14.1382	15.22157

b. Empirical framework

Based on some recent research (Negara and Adam 2012; Chuang and Hsu 2004), the basic ideas of investigating the evidence of horizontal along with vertical effects is through examining a firm production. The empirical framework can be specified by using a basic Coub-Douglas production function as showed in equation (1)

$$\ln(Y_{it}/\mathrm{L}_{it}) = \alpha + \beta_1 \ln(\mathrm{K}_{it}/\mathrm{L}_{it}) + \beta_2 \ln(\mathrm{M}_{it}/\mathrm{L}_{it}) + \beta_3 \mathrm{FS}_{it} + \beta_4 \mathrm{Horizontal}_{jt} + \beta_5 \mathrm{Backward}_{jt} + \beta_6 \mathrm{Forward}_{jt} + \mathrm{e}_{it} \quad (1)$$

Where Y_{it} is total sales of is firms *i* at time *t,* deflated by industry price index. K_{it} stands for Capital Inputs measured by number of fixed assets and L_{it}, employment, is the number of employees at time t. Material inputs variable (M_{it}) are constructed by value of "raw material inputs" and FS_{it} denotes foreign shares in total

capital of firm (Chang, Chung and Xu 2007).

Horizontal effects capture the foreign firms' participation in the industry and are computed as the ratio of foreign equity share-weighted output over all firms to total sales of each firm in industry j:

$$Horizontal_{jt} = \frac{\sum_{i:i\in j} \mathrm{FS}_{it} \times Y_{it}}{\sum_{i:i\in j} Y_{it}}$$

Backward and forward linkages are proxies for vertical effects which happens between multinational and local enterprises across industries and are defined as follows:

$$\mathrm{Backward}_{jt} = \sum_{k\ if\ k\neq j} \gamma_{jk} \times Horizontal_{kt}$$

$$\mathrm{Forward}_{jt} = \sum_{m\ if\ m\neq j} \delta_{jm} \times Horizontal_{kt}$$

where γ_{jk} is ratio of industry j's output which is supplied to industry k and δ_{jm} is share of inputs that firms in industry j purchase from industry m in total inputs sourced by sector j (Nguyen et al. 2013)

Moreover, in order to investigate whether absorptive capacity of local firms enhances technology spillovers of FDI, variables including innovation intensity ($ABRD_{it}$ and $ABIN_{it}$) are added to the basic function (Marcin 2008). Similar to other papers, measurement of absorptive capacity is based upon the idea of "two faces of R&D" (Cohen and Levinthal 1989). In some research, another measure of absorptive capacity is provided, that is proximity to the frontier. However, it sometimes might be

"viewed as a proxy for potential productivity gains" (Marcin 2008 and Findlay 1978). *ABRD* is defined as the fraction between R&D expenditures with total sales of enterprises. Similarly, *ABIN* involves larger dimension of innovation expenditures and is calculated as a ratio between intangible assets total sales.

Finally, I can construct the regression framework to estimating magnitude, strength and direction of spillover effects on firm's productivity as follows:

$$\ln(Y_{it}/\mathrm{L}_{it}) = \alpha + \beta_1 \ln(\mathrm{K}_{it}/\mathrm{L}_{it}) + \beta_2 \ln(\mathrm{M}_{it}/\mathrm{L}_{it}) + \beta_3 \mathrm{FS}_{it} + \beta_4 \mathrm{Horizontal}_{jt} + \beta_5 \mathrm{Backward}_{jt} + \beta_6 \mathrm{Forward}_{jt} + \omega_{it} + \varepsilon_{it} + \mathrm{e}_{it} \quad (2)$$

Backward and Forward Linkages

γ_{jk} and δ_{jm} will be calculated from I-O tables. It should be noted that for data of each year, we are supposed to use I-O tables for that year. However, in reality, the I-O table is only available for 2000. Therefore, γ_{jk} and δ_{jm} from 2000 to 2006 are computed based on I-O tables 2000. This calculation might still be reasonable, as industrial structure hasn't changed quickly.

The I-O table 2000 includes 112 categories, which later will be combined into 22 industries. Based on that, the input coefficient tables and then, the inverse matrix coefficient tables are constructed. Backward coefficient or index of the power of dispersion are ratio of sum of column to mean value of entire vertical sum in the matrix while forward coefficient or index of the sensitivity of Dispersion is computed

as the ratio of horizontal sum and the mean value of the entire sum of row. Table (5) indicates the result of calculation from 2000 I-O tables.

Table 5 Backward and forward coefficient

No.	Sector	2000	
		BW	FW
1	Agriculture and related service activities	1.1	1.6
2	Forestry and related service activities	0.94	0.91
3	Fishing and aquaculture	1.36	0.87
4	Mining and quarrying	0.78	0.98
5	Manufacture of food products	1.64	1.64
6	Manufacture of beverages and tobacco products	1.27	0.68
7	Textiles, leather and related products	0.63	0.48
8	Manufacture of wood, paper and related products	1.12	1.26
9	Manufacture of chemicals and chemical products	0.97	1.05
10	Manufacture of rubber and plastics products	0.79	0.74
11	Other non-metallic mineral products	1.11	1.05
12	Basic metals and fabricated metal products	0.99	1.19
13	Computer, electronic, optical products and electrical equipment	1.01	1.05
14	Manufacture of transport equipment	0.97	0.66
15	Other manufacturing	0.94	0.78
16	Electricity and water	0.89	1.1
17	Construction	1.07	0.75
18	Wholesale and retail trade	0.82	1.5
19	Transportation, information and communication	0.9	1.17
20	Financial, banking, insurance and real estate activities	0.88	1.05
21	Administration, Defense and social security	0.89	0.65
22	Personal and public and social service	0.93	0.85

VI. Estimation results

In this part, the results of technology spillovers and absorptive capacity will be discussed based on different model specifications. The model (2) will be estimated for all firms and domestic only, manufacturing and non-manufacturing, separately. The result of Hausman test suggests that fixed-effect estimators should be used. The estimation results are presented in below tables.

Table 6 Horizontal and vertical effects on domestic productivity.

	Manufacturing		Non-manufacturing	
Variables	All firms	Domestic	All firms	Domestic
Horizontal	0.0391***	0.0419***	-0.00831	-0.0197
	(0.0106)	(0.0116)	(0.0104)	(0.0122)
Backward	-0.0413***	-0.0446***	0.00577	0.0221
	(0.0128)	(0.0138)	(0.0156)	(0.0184)
Forward	-0.0176*	-0.0176*	-0.00736	-0.0101
	(0.00942)	(0.0105)	(0.00958)	(0.0110)
Observations	9,861	8,807	18,482	17,288
R-squared	0.327	0.325	0.315	0.317
Number of ID	5,452	4,908	8,083	7,500
Number of year	7	7	7	7

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. All of the models include other variables

Manufacturing sector

Table 6 presents the estimation results using fixed effect on a sample of all firms and domestic firms. For horizontal effects, the result clearly shows that spillovers exists for local manufacturing firms. It suggests that an enlargement in foreign participation is associated with an enhancement in productivity of local

enterprises. The positive and significant coefficient of 0.0419 tell us that if foreign share increases by 1% then productivity would go up by about 4.19% as a result of horizontal effects. Table 6 also indicates some empirical evidence of negative and significant effects of backward spillovers on firm's productivity. Meanwhile, the coefficient of the forward linkages is not statistically significant.

This result suggests that the strongest channel through which Vietnam enterprises can benefit from the participation of foreign firms is through horizontal spillovers. Vietnamese local enterprises in an industry with high FDI investment can produce a higher output in compared with other similar companies in other industries with lower FDI proportion. It seems that competition is the major determinant among intra-industry effects because with the participation of foreign firms, domestic companies are forced to improve their own productivity and reduce cost so as to survive in the market. Negative coefficient of backward linkages can be explained by the fact that domestic companies get difficulties in absorbing new technology because of growing expenses of local providers (due to FDI competition).

Non-manufacturing sector

Collumn 4 reports the estimates for non-manufacturing sector of local firms. Interestingly, no statistically meaningful coefficients are found through both intra-industry and inter-industry mechanisms. There many reasons for the result of no

spillovers. One of which can be related to investment forms. In the 90s of last century, many foreign joint ventures have operated successfully in Vietnam. Such form of joint venture positively facilitated spillovers. Meanwhile, since 2000, the proportion of 100% foreign-owned enterprises, which less economically affects to technology spillovers, has risen up significantly. Justification can be the fact that joint venture is no longer attractive to foreign investors. Initially, newly foreign investors, especially in non-manufacturing sector, establish a joint venture to take advantage of favorable conditions including tax exemptions, infrastructure and other incentives. They brought low-effective and old-dated production line which have no spillover effect to Vietnam in order to be loss-making. They, then, gradually acquire the entire shareholding to be 100% foreign-owned enterprises. This happened quite common during the period of 2000 – 2005 among wholesale and retail trade, construction and social service industries.

Firm size

I, then, differentiate the between small, medium and large firms. It is clear that the size of firms has correlation with ability to observe and absorb spillover effects. Each country has own criteria to define firm size. In Vietnam, according to decree 56/2009/ND-CP, Large firms are defined as firms with more than 300 employees, Medium firms have from 200 to 300 employees and small firms have less than 200

employees. Table 7 compares the technology spillover by firm size.

The result is quite mixed. For manufacturing sector, only small companies are affected both positively and negatively by horizontal and backward effects whereas there is no evidence of spillovers in Medium and large firms. It suggests that small firms with lower market share and capital have to innovate themselves to compete with foreign firms and can interact better than medium large-sized firms, and therefore can utilize technology from multinationals. Meanwhile medium and large firms with more stable market and bigger market share don't show any evidence of spillover effects.

By comparison, only medium-sized firms present significant and positive coefficient of backward linkages. One possible reason is that they can purchase improved intermediate products from foreign firms, leading to technological upgrading of their own products.

Table 7 Impact of firm size on spillover effects to domestic firms

	Manufacturing			Non-manufacturing		
Variables	Small firms	Medium firms	Large firms	Small firms	Medium firms	Large firms
Horizontal	0.0555***	0.0402	0.0402	-0.0244	-0.0894**	-0.00582
	(0.0187)	(0.0396)	(0.0396)	(0.0231)	(0.0434)	(0.0161)
Backward	-0.0623***	-0.0213	-0.0213	0.0123	0.159***	0.0361
	(0.0220)	(0.0374)	(0.0374)	(0.0261)	(0.0606)	(0.0300)
Forward	-0.0157	-0.0317	-0.0317	0.00916	-0.0575*	-0.0462**
	(0.0177)	(0.0304)	(0.0304)	(0.0151)	(0.0303)	(0.0189)
Observations	4,642	1,113	1,111	9,830	2,234	5,224
R-squared	0.294	0.225	0.225	0.213	0.279	0.284
Number of IDDN	2,974	812	810	5,128	1,350	2,248

Geographical areas

Table 8 reports the estimation from spillover effect at province level. Those are five provinces that are biggest destination for FDI, including Hanoi and Bac Ninh (located in the North), Ho Chi Minh (HCM), Dong Nai and Binh Duong (located in the South). Most of FDI manufacturing projects centralize in the South. In 2006, the number of FDI firms in the North reached nearly 1000 while this number in the South is almost 3000.

The presence of significant backward and vertical spillovers in Binh Duong is heavily connected to the structure of firm's distribution here. Positive coefficient of forward in Binh Duong is heavily connected to technology transfer and/or new

management skills to upgrade quality with lower cost of products demanded by upstream FDI. HCM city, although, has always been a leading province in attracting FDI. However, most of projects here focus on real estate and banking and finance, explaining why no spillovers are noted in this region. The same situation is also happening in Hanoi, the capital of Vietnam.

Table 8 Spillover effects at province level

Variables	(1) Bac Ninh	(2) HCM	(3) Dong Nai	(4) Binh Duong	(5) Hanoi
Horizontal	0.155**	0.0276*	0.0326	0.0364	0.0403
	(0.0645)	(0.0142)	(0.0268)	(0.0230)	(0.0290)
Backward	-0.112	-0.00851	-0.00875	-0.137***	-0.0500
	(0.0825)	(0.0226)	(0.0381)	(0.0409)	(0.0355)
Forward	-0.0580	-0.0336**	-0.0452	0.0869***	-0.0104
	(0.0428)	(0.0132)	(0.0318)	(0.0328)	(0.0170)
Observations	255	6,079	760	914	4,981
R-squared	0.257	0.325	0.290	0.331	0.346
Number of ID	104	2,144	258	324	1,568

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. All of the models include other variables

Table 9 Impact of ownership structure on spillover effects to domestic firms

Variables	Manufacturing			Non-manufacturing		
	State-owned Firms	Collective Firms	Private Firms	State-owned Firms	Collective Firms	Private Firms
Horizontal	-0.0106	0.0127	0.0642***	-0.0236	-0.192***	0.00879
	(0.0187)	(0.0455)	(0.0174)	(0.0224)	(0.0619)	(0.0185)
Backward	0.0129	-0.0372	-0.0608**	0.0402	0.191***	-0.0449
	(0.0204)	(0.0488)	(0.0243)	(0.0268)	(0.0633)	(0.0351)
Forward	-0.0184	0.0230	-0.0263	-0.0205	0.0103	0.0210
	(0.0138)	(0.0430)	(0.0197)	(0.0165)	(0.0302)	(0.0228)
Observations	9,116	462	12,803	12,777	969	16,104
R-squared	0.283	0.282	0.335	0.231	0.136	0.215
Number of ID	1,760	145	4,069	2,424	314	5,310

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. All of the models include other variables

Table 9 presents the impact of ownership structure on technology spillovers. In general, a local private company can learn from experience of foreign enterprises better than state-owned and collective enterprises. This finding confirms my expectations that related to the nature of private firms. Without subsidy and help from government, private firms have to always try to improve productivity so as to compete with others. Interestingly, the opposite is true for collective firms in non-manufacturing firms. As the natural characteristic of collective firms which is low effective, they could not compete with foreign firms with better technology. However, collective firms also present positive backward linkages because they can buy high-quality intermediate inputs from foreign firms and then improve quality of their products.

Absorptive capacity

In order to examine how absorptive capacity influences to domestic firms with the participation of foreign companies, I divided into two alternative specifications. The first contains ABRD and its interaction with backward linkages while in the second specification, ABIN and its interaction would be tested. Interestingly, results from both manufacturing and non-manufacturing show that R&D has negative coefficient on productivity of firms. And interaction between R&D and spillovers effects does not show any statistical significant evidence for non-manufacturing sector while it's meaningful through backward and forward in manufacturing sector.

It, initially, sounds vague and incorrect. However, R&D does not necessary lead to better firm's performance. Various studies have showed that disruptive technology which at first requires adjustment costs and imposing negative effects on firm's performance and then helping them have better productivity later (Parham 2006). Parcharidis and Varsakelis (2007)) studying in Greek market also found that R&D investment has negative impacts on firm's performance because the production lines require a period for learning and absorbing technology. Besides, Fu indicates that R&D has delayed effects on productivity and sometimes a negative relationship with productivity. He suggests that local firms should make continuous investment on R&D in order to get the higher productivity in long term.

Table 10 Absorptive capacity and its interaction with Spillover effects

Variables	Manufacturing		Non-manufacturing	
	(1)	(2)	(3)	(4)
ABRD	-1.464***		-0.926***	
	(0.258)		(0.295)	
ABRD . HZ	0.0602		-0.0773	
	(0.0379)		(0.0549)	
ABRD . BW	-0.277***		0.0833	
	(0.0502)		(0.101)	
ABRD . FW	0.179***		-0.000864	
	(0.0384)		(0.0513)	
ABIN		-0.146***		-0.161***
		(0.0439)		(0.0264)
ABIN . HZ		0.0164**		-0.0168*
		(0.00653)		(0.00900)
ABIN . BW		-0.0227***		0.0160
		(0.00702)		(0.0132)
ABIN . FW		0.00503		0.00369
		(0.00701)		(0.00813)
Observations	22,381	22,381	23,927	23,927
R-squared	0.376	0.333	0.232	0.239
Number of ID	5,974	5,974	6,911	6,911

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. All of the models include other variables

As mentioned earlier, 2000 – 2006 is early stage of development for Vietnamese firms, explaining the fact of negative coefficient. Similarly, non-manufacturing enterprises also show the same result of manufacturing firms. Another possible explanation can be the fact that in the upper market where R&D is indispensable, the gap between local and foreign companies in both manufacturing and non-manufacturing sector is too large so domestic firms could not improve their

technologies depending only on R&D activities.

Dissimilar from some papers in developing countries, no evidence for the role of R&D activity in facilitating positive horizontal spillovers in Vietnam. One likely clarification is that positive correlation between foreign participation and local firm's productivity doesn't stem from leakages of technology but from imitating by domestic companies.

I, then, replicate the analysis with ABIN and it interaction with horizontal and vertical linkages. ABIN includes not only R&D but also other factors such as patents or license in intangible assets. The result is quite similar as the first specification. Although the coefficients are not worth considering but it partially suggests that investing in intangible assets may help local companies to benefit from foreign participation in the same sector.

VII. Conclusion

This paper re-investigates the issue of possible technology spillovers from FDI in Vietnam based on firm-level analysis. The baseline result of this paper is that the participation for foreign companies affects productivity of domestic companies in different ways. Our finding differ from previous literatures in some prominent ways. Firstly, this paper differentiate technology spillovers from FDI between manufacturing and non-manufacturing sector, between large, medium and small firms

and degree of ownership. Secondly, it also sheds the light on absorptive capacity of domestic companies. The results show that FDI would trigger improvement of technology in the local firms the mainly through horizontal linkages whereas backward linkages have negative influence on local firm's productivity. Moreover, absorptive capacity seems to be a burden on firms. However, I believe that after the period of "disruptive technology", absorptive capacity would definitely be prominent precondition for improving productivity of local firms.

Regarding to policy implication, through researching and finding the impacts of spillover effects, Vietnam should reconsider and assess the extent of spread of FDI on the economy: avoid distribute FDI ineffectively, set reasonable criteria for attracting FDI in terms of current situation of social economy, focusing on intensive-technology sector. More importantly, negative coefficient of backward linkages indicates that the domestic production could not provide inputs for foreign investors because the technology gap or shortage capital. Firstly, Vietnamese government should consider whether participating in this global value chain would bring value added to Vietnam or not. If the answer is yes, then, local firms need supporting policies in this area regarding to capital and other support in technology in order to reach the requirement from foreign companies.

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