VIETNAM NATIONAL UNIVERSITY HO CHI MINH CITY

INTERNATIONAL UNIVERSITY

THE IMPACT OF FDI SPILLOVERS ON THE PRODUCTIVITY OF DOMESTICALLY MANUFACTURING FIRMS AND AVERAGE WAGE IN VIETNAM

In Partial Fulfillment of the Requirements of the Degree of

Doctor of Philosophy

in Business Administration

By

HUYNH THI NGOC HIEN

PBAIU16003

Hồ Chí Minh city

January 2020

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LIST OF ABBREVIATIONS

2SLS	Two-stage Least Squares
3SLS	Three-stage Least Squares
ASEAN	Association of Southeast Asian Nations
B_FDI	Backward FDI spillover
DEA	Data Envelopment Analysis
EX_DUM	Export Orientation
F_FDI	Forward FDI spillover
FDI	Foreign Direct Investment
FE	Fixed Effect
FEM	Fixed Effect Model
FN	Financial Development
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GR	Gender Ratio
GSO	General Statistics Office
H_FDI	Horizontal FDI Spillover
HC	Human Capital
HHI	*Herfindahl-Hirschman Index*
HOR_SP	Horizontal FDI Spillover
IM	Imports
IM_DUM	Import Orientation
IO	Input-Output
J. STOCK	Joint Stock Companies
KL	Capital Intensity
LI	Labor Intensity
LP	Levinsohn and Petrin Approach
MNCs	Multinational Corporations
MNEs	Multinational Enterprises
MS	Market Share
NI	Net Income
ODA	Official Development Assistance
OLS	Ordinary Least Squares
OP	Olley – Pakes Approach
PCI	Provincial Competitiveness Index
R&D	Research and Development
RE	Random Effect
REM	Random Effect Model
ROE	Return on Equity
RQ	Real Output
SOEs	State-Owned Enterprises
TFP	Total Factor Productivity
TG	Technology Gap
UK	United Kingdom
USD	United State Dollars
VCCI	Vietnam Chamber of Commerce and Industry
VSIC	Vietnam Standard Industrial Classification System
W2SLS	Weighted Two-Stage Least Squares
WEF	World Economic Forum
WLS	Weighted Least Squares

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ACKNOWLEDGMENT

To complete this thesis, I received unconditional help from many people. I much appreciate the contribution of everyone involved and apologize to those I do not mention by name.

First of all, I would like to express my gratitude and respect to my first advisor - Assoc. Pro. Nguyen Van Phuong and my second advisor - Dr. Tran Tien Khoa for their supervision and dedicated instructions. Especially, I'm grateful for my first advisor as he spent plenty of his precious time instructing and encouraging me in implementing the thesis. Without his relentless support and encouragement, it is very hard for me to complete the dissertation.

I would like to thank my lecturers at the School of Business for valuable knowledge on research methods providing me a better understanding and practice to struggle with my dissertation. Moreover, their constructive comments and suggestions on my research proposal help me better orient and revise my research design and literature review properly.

Besides, I would like to thank Dr. Nguyen Nhu Ty and Mr. Lai Tran Thanh Son for their dedicated procedure guidance and excellent support during my Ph.D.'s life at International University. Especially, I thank my MBA. Trieu Doan Xuan Hoa for relieving my stress every time I feel depressed and thankful for her dedicated help in the process of STATA programming – a very challenging part of my study.

Thank you, my friends, my colleagues and especially my family who have brought me the best conditions and encouragements throughout the learning and researching process to complete the thesis.

ABSTRACT

The dissertation investigates the effects of FDI spillovers on domestic firms' total factor productivity (period: 2011-2015; 385,976 observations) and recipient country's average wage (period: 2007-2015; 693,720 observations) using a large unbalanced panel data of Vietnamese manufacturing enterprises. The econometric models are conducted using the fixed-effect model (FEM) as recommended by the Hausman test. The issue relating to biased TFP estimation is overcome by the use of the Olley-Pakes (OP) methodology. Further, firm heterogeneities are explored as moderating variables to reflect different levels of FDI spillover effects on productivity. First, the results indicate that the horizontal and forward spillovers associated with FDI presence in Vietnam have overwhelming negative impacts on domestic firms' TFP. In contrast, the greater the effect of backward spillover is, the higher the productivity local firms can reach. Second, human capital is found as a facilitator for productivity spillovers from foreign firms to domestic firms. Third, a negative horizontal spillover effect and a positive backward spillover effect on the domestic firm's TFP is impressively improved with the movement of technology gap from the bottom 25^{th} percentile to the middle 25^{th} -75^{th} percentile. Fourth, it is found that FDI spillovers in both vertical and horizontal channels do not occur at the bottom 25^{th} percentile of financial development while the effect of backward spillovers on firm productivity is significantly enhanced with a higher level of financial development. Fifth, although the relationship between all three FDI spillover channels and TFP varies significantly across regions, it doesn't mean greater spillover effects as a result of higher FDI concentration. Finally, the overall effect of FDI on the average wage in Vietnam is significantly positive, except for domestic private firms. Besides, this research still has certain limitations such as not controlling the impact of macro factors, unable to access more balanced panel data for better measurements and additional methods with instrument variables.

CHAPTER 1. INTRODUCTION

This chapter provides an overview of the thesis, the academic and practical context of the research topic, research issues directly related to the topic of the thesis. The structure of the chapter consists of six sections: (1) problem statement, (2) background to the study – FDI in Vietnam, (3) research objectives, (4) academic and practical significance, new contribution of the research findings, (5) a summary on research methodology and (6) thesis organization.

1.1 Problem statement

The increased foreign presence is expected to boost the productivity because it offers local firms more opportunities for observing and imitating advanced technology in the FDI sector proactively, especially through horizontal spillovers in term of worker mobility, competition and demonstration channels (Hamida and Gugler 2009; Blomstrom and Kokko 1998; Hamida 2013). Also, positive externalities are generated by vertical integration through the successful upstream and downstream linkages between domestic firms and foreign partners (Behera 2017; Fatima 2016; Havranek and Irsova 2012; Le and Pomfret 2011). Besides, the penetration of MNCs may also generate employment and wage spillovers to domestic workers contributing to restructuring the whole economy in a better way (Silajdzic & Mehic, 2016).

To become a more attractive destination for MNCs and promote the internationalization process, the government has provided many incentives policies and law amendments to encourage foreign entries. Many previous authors are discussing the benefits of this indirect effect and its delivering channels such as competition, demonstration, labor turnover, vertical linkages and so on which contribute to capital formation, technology, managerial skill transfer, economies of scale, establishment of high-skilled labor and finally productivity improvement and market expansion (Blomstrom & Kokko, 1998; Gorodnichenko, Svejnar, & Terrell, 2014). Many previously empirical studies found strong evidence that being suppliers for foreign

partners is the most dominant channel of positive spillovers for local firms in the host country (Behera, 2017; Le & Pomfret, 2011; Liao et al., 2012). The others are optimistic that local enterprises can use high-tech outputs from those foreign subsidiaries as their intermediate inputs more easily (Ahmed, 2012; Kee, 2015).

Besides, it is believed that domestic firms are forced to search and invest in more advanced technology to sustain their competitive advantages in the host market instead of being knocked down (Hamida, 2013). It is important to note that MNCs with good management know-how and best business practices can enhance the adaptive capacity of the domestic firms by creating a well-trained local labor force (Parman, 2012). Nevertheless, some argued that a positive demonstration/ imitation effect may be defeated by a higher level of competition in horizontal business relationships (Halpern & Muraközy, 2007). Besides, the movement of labor from foreign subsidiaries to local ones may also be prevented by the wage gap (Huang & Zhang, 2017). However, this scenario seems to be more complicated because the labor hired by MNCs may start their own companies and train the next generations of local labor in the long run. This makes the overall effect of FDI spillover ambiguous, bounded to different contexts and difficult to measure accurately.

It is admitted that FDI spillover can also harm the local firms in the host country by triggering competition pressure and leading to the exit of domestic firms in the same industry (crowding-out effect) (Perri, Andersson, Nell, & Santangelo, 2013). Besides, weak vertical linkage and low absorptive capacity in downstream and upstream sectors with foreign-equity firms are also important barriers for local firms to benefit from the FDI sector (Demena & Murshed, 2018; Fatima, 2016). Also, the local firms with low absorptive capabilities may become the main victims in this global competition as they respond very slowly to market change and are not sufficient capacity to absorb the positive spillovers from the foreign presence (Anwar & Phi, 2011; Jacobs, Zámborský, & Sbai, 2017). Indeed, whether a local firm

can benefit from positive spillovers associated with FDI strongly depending on firms' internal capabilities and host business environment determined by financial market, network, policies and regulations (Perri & Peruffo, 2016).

Recent studies on the impact of foreign presence in Vietnam have indicated that Vietnam is still an attractive destination for foreign direct investment (FDI) in Asia, however, receives a relatively ambiguous externalities from FDI using old data for the period from 2000 to 2010, 2007 and 2009 (Anwar & Nguyen, 2014; Le & Pomfret, 2011; Nguyen, 2015; Thang, Pham, & Barnes, 2016). The authors commonly admitted that the economic growth in Vietnam since the 2000s primarily based on external foreign capital inflows and recognized the close relationship between inward capital from FDI and international trade in terms of exports. Moreover, there are controversial findings on the effect of trade openness on wages. In Vietnam, reforms targeting investment and trade liberalization since the 2000s have facilitated the operation of foreign-invested firms and domestic private firms as well as export and import activities.

In recent years, increasing foreign presence and trade openness have significantly impacted Vietnam's wage patterns. Even when FDI firms appear to implement a generous wage policy, the origin of the foreign investor is also essential to determine the investor's labor demand, skill intensity requirement and wage premium level in the host country (Nelson, 2010; Ni, Spatareanu, Manole, Otsuki, & Yamada, 2017). For example, Chinese investors have a high demand for blue-collar workers and tend to lower the equilibrium wages for both unskilled and skilled workers (Nelson, 2010). In Vietnam, domestic firms are characterized by low-skilled intensive production, whereas FDI firms from more developed countries are well-known for technology- and capital-intensive production. This trend creates a competitive market for high-skilled and qualified workers. Moreover, foreign presence may threaten unskilled employees, who may lose their jobs as a result of a domestic firm's exit or acquisition and labor-saving

technology (Girma & Greenaway, 2013). Subsequent job losses may lead to abundant labor supply, lower average wages, and wage inequality. The gender ratio is also a factor, as female workers tend to receive lower wages and fewer opportunities in the labor market, with many prejudices against them (Nguyen, 2015). Despite this ambiguous overall effect of FDI on average salary, there is a lack of studies investigating this issue in Vietnam.

Although Vietnam has gradually been narrowing down the gap in the productivity level in the region, the productivity level is still lower than the average productivity level of ASEAN countries (Nguyen, 2015). During the period 2016-2018, the productivity averagely increased by 5.77% per year, higher than the average rate of 4.35% per year of the period from 2011 to 2015. From 2011 to 2018, the productivity level of domestic firms increased by an average of 4.88% per year. If the labor productivity of Singapore, Malaysia, Thailand, and Indonesia in 2011 was higher than Vietnam's labor productivity 17.6 times; 6.3 times; 2.9 times and 2.4 times respectively, the productivity gaps were reduced to 13.7 times; 5.3 times; 2.7 times and 2.2 times respectively in 2018. However, the General Statistics Office (2019) assessed that Vietnam's labor productivity is still very low compared to other countries in the region. This indicates that Vietnam's economy still faces huge challenges in the future to be able to catch up with other ASEAN countries in terms of labor productivity. Regardless government attempts to attract FDI, the empirical evidences for FDI spillovers in Vietnam, especially the productivity spillover through both horizontal and vertical channels is still rare. In respect to wage spillovers associated with FDI, there are little studies in Vietnam to explore whether FDI spillovers benefit local workers in the host developing country in terms of average wages. It is worth to note that positive wage spillovers from foreign firms to local firms may come from the competition in the labor market and labor productivity improvement. MNCs often pay high wages to recruit and retain highly skilled workers, leading to a reduction in the total skilled labor supply in the host labor market. Consequently, domestic firms are forced to pay higher

wages for these premium workers (Aitken & Harrison, 1999; Driffield, 2004). Also, foreign entries may generate positive spillovers on the aggregate labor productivity of domestic firms, thereby pushing up equilibrium wages in the host country (Aitken, Hanson, & Harrison, 1997).

It is worth to notice that the productivity level of domestic firms under the foreign presence as well as FDI spillover effects on wages is very hard to predict and could be explained by a wide range of contextual factors in the host economy such as FDI type, firm heterogeneities and other macro conditions (Willem, 2019). Under the context of an emerging economy, local firms are even more vulnerable to the market stealing effects or play as the newbies in the competition in the same industry or vertical linkage relationships with foreign giants (Newman, Page, Rand, Shimeles, & Söderbom, 2019; Nguyen & Sun, 2012). Therefore, the outcome of inward FDI for Vietnam firm productivity and labor welfare should be measured separately to find out the hidden puzzles with different story-telling as Vietnam's economy is quite young and has just entered the global market in recent years. It has been indicated in recent studies of Demena & Bergeijk (2017); Demena & Bergeijk (2019) and Rojec & Knell (2017) that there are still rooms for studies differentiating different transmission channels of FDI spillover in developing countries to provide more recent empirical evidence because most of the third-world studies on this issue have primarily focused on horizontal FDI externalities. As each country has its input-output matrix for each particular industry which varies across countries and regions, it is valuable to examine the vertical spillovers, specifically through backward and forward interactions (supplier and customer relationships) to better capture the contextual heterogeneities (Lenaerts & Merlevede, 2016). Furthermore, Behera (2017) and Anwar, Sun, & Anwar (2018) have suggested that the sufficient inclusion and investigation of firm heterogeneities such as investment sector, value chain linkages, financial development level, labor training and mobility, technological and innovative capacity, firm size, ownership and so on may contribute significantly to the current literature of FDI spillover

in emerging economies. Thus, the thesis is expected to contribute to the knowledge of FDI spillover, especially in the context of a developing country and a transitional economy like Vietnam.

Besides, another major contribution of the thesis relies on the analysis of horizontal spillovers and their impact on wages. It is admitted that FDI presence may enhance the sustainable development in the host economy by their practice of corporate social responsibility as well as their transfer of managerial knowledge, labor training and welfare regime as well as the entrepreneurial spirit (Huang & Zhang, 2017; Zhang & Shang, 2018). As a result, local employees can benefit from labor productivity improvement and capacity building to bargain for higher compensations (Javorcik, 2015; Nguyen & Ramstetter, 2017). In this way, some researchers pay much attention to wage discrimination between FDI and the domestic sector which somehow reflects the wage gap under the foreign presence and its determinants (Nguyen, 2015; Nguyen & Ramstetter, 2017; Stoyanov & Zubanov, 2014). This also leaves a gap for researching the horizontal spillover effect on the wage in the host economy where the labor competition and the productivity improvement may occur at the same time.

Therefore, the dissertation aims at answering two big questions: (1) whether FDI spillovers affect domestic manufacturing firms' productivity? through which channels? any facilitators or barriers? and (2) whether horizontal FDI spillovers affect labor's average wage in the host economy? The specifications of the research objectives will be presented in a later section.

1.2 Background to the study - FDI in Vietnam

After more than 30 years of implementing the open-door policy, Vietnam has built a relatively synchronous legal framework, creating a favorable business environment to attract foreign investors. Total registered FDI has significantly increased from 735 million USD in

1990 to 19.9 billion USD in 2010, then reach 24.4 billion USD in 2016 (GSO). The number of registered projects also jumped from 211 projects (1988-1990) to 500 projects in 2000 and 2,500 in 2017 as illustrated in the figure below. It has been shown in figure 1-1 that inward FDI remained steady from 2000 to 2003 before witnessing a significant increase over the period from 2004 to 2007 and reaching an unprecedented high peak in 2008. After the world crisis occurred in 2008, FDI inflows into Vietnam in 2009 reduced dramatically, then fluctuated during the period from 2009 to 2016 and slightly recovered in 2017.

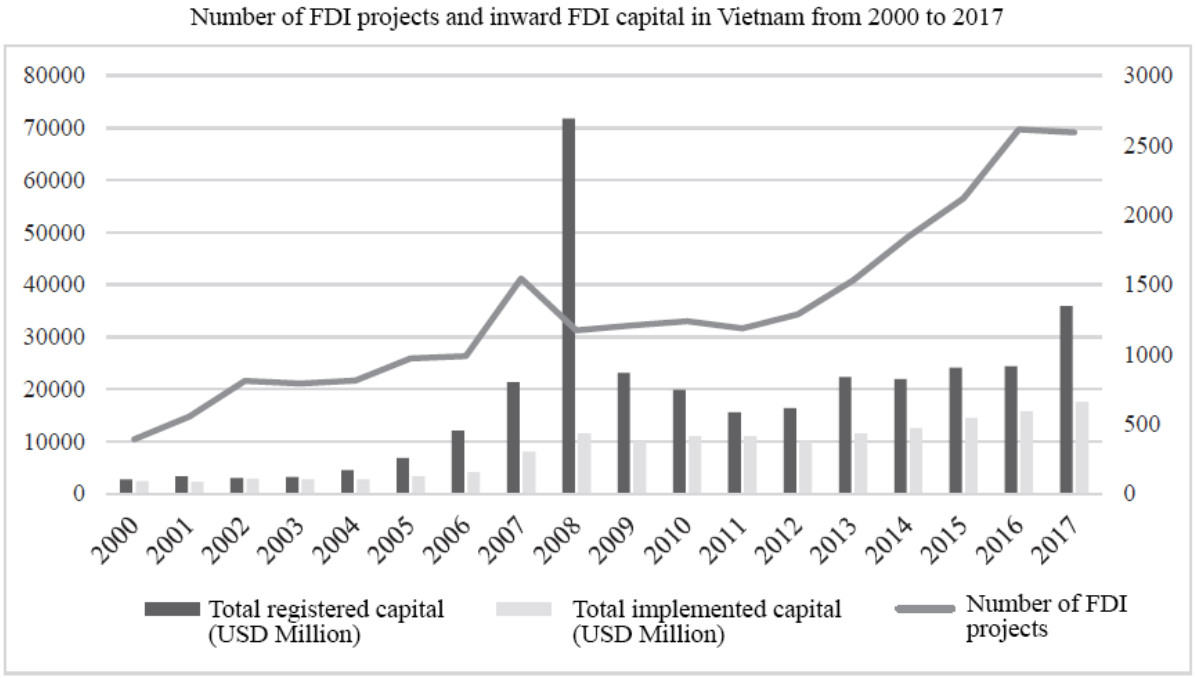

Figure 1-1: Number of FDI projects and inward FDI capital in Vietnam from 2000 to 2017. *Source: GSO, translated by the author*

Concerning FDI share by sectors, the contribution of FDI to total investment increased from 16 percent in the 2001-2005 period to nearly 25 percent in the 2006-2017 period. It is important to note that the manufacturing and production industries have been accounted for the largest share at around 70 percent of inward FDI equity (as shown in figure 1-2). This proportion is far higher than FDI investment in remaining industries such as services, real estate, retail, and construction. That is the reason why this study attempts to explore FDI spillovers from foreign firms to domestic ones in the manufacturing sector which is characterized by major capital investment and technological-intensive production. It is

undeniable that high exposures and integration to foreign subsidiaries may contribute to promote technology transfer and gradually improve the level of domestic production technology. In response to foreign presence, many Vietnamese enterprises have renovated or upgraded their existing technology and equipment to meet the increasing competitive pressure in the economy. As a consequence, Vietnam has now produced many new products not previously made and restricted the import of many kinds of manufactured goods such as construction materials, consumer electronic devices, transportation mediums, etc.

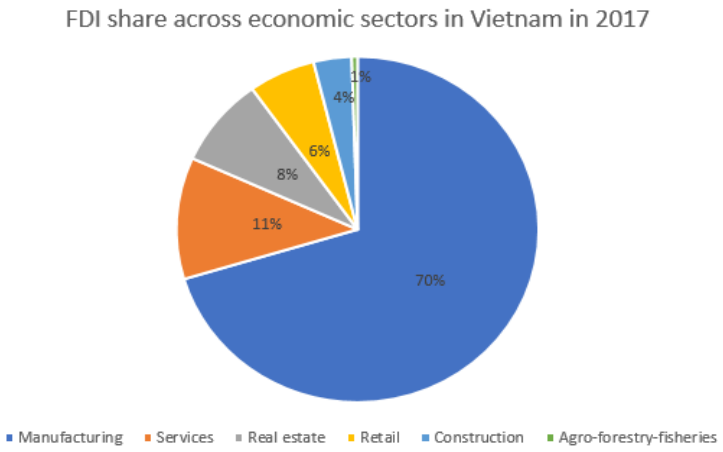

Figure 1-2: FDI share across economic sectors in Vietnam in 2017. *Source: GSO, drawn by the author*

Regarding FDI contribution to GDP, the FDI investment sector has contributed to total national output increased from 15,000 million USD (around 15.7 percent) in 2011 to 35,000 million USD (over 18 percent) in 2015 (as illustrated in figure 1-3). In this way, FDI has played an important role in boosting Vietnam's economic growth. In 2017, FDI has contributed nearly 20 percent of GDP and is an important additional source of capital for development investment in Vietnam occupied 23.7 percent of the total social investment (VCCI, 2017).

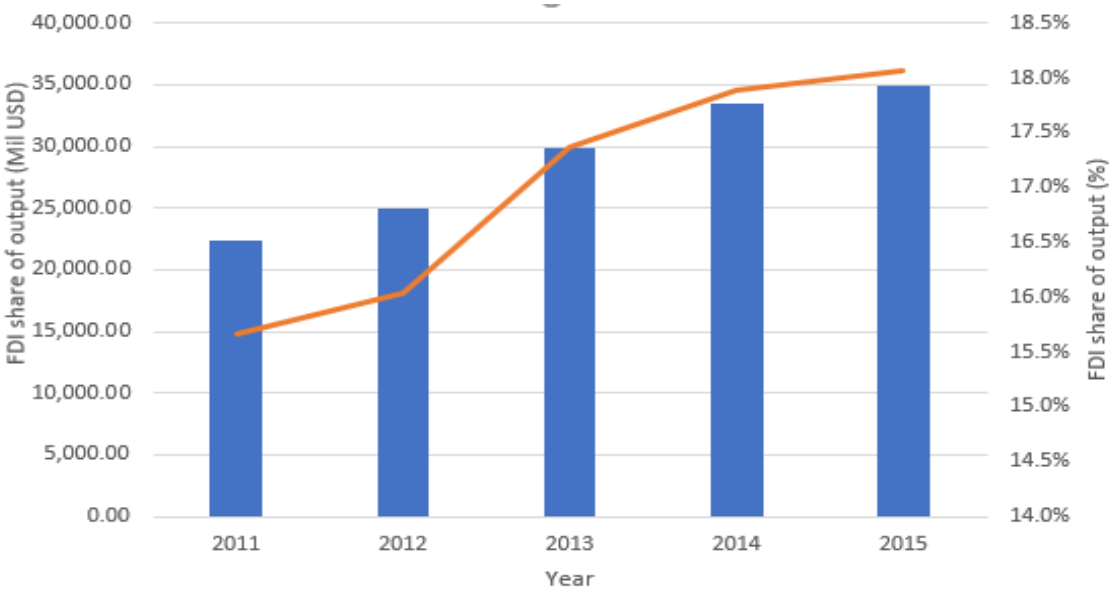

Figure 1-3: Total output accounted by the FDI sector from 2011 to 2015. *Source: GSO, drawn by the author*

Moreover, it has been well indicated in figure 1-4 that the FDI sector has undeniably contributed to promoting Vietnam's exports. During two decades, Vietnam witnessed a strong upward trend in exports from 1998 to 2015, in which FDI accounted for a significant proportion of the total nation's export volume. From a low beginning at around 20 percent in 1998, the FDI share of total export reached the first peak at more than 40 percent in 2000, then the second peak at around 57% in 2006 and the recent peak at nearly 70 percent in 2016. More important, FDI presence has also boosted the export volume of domestic firms over time.

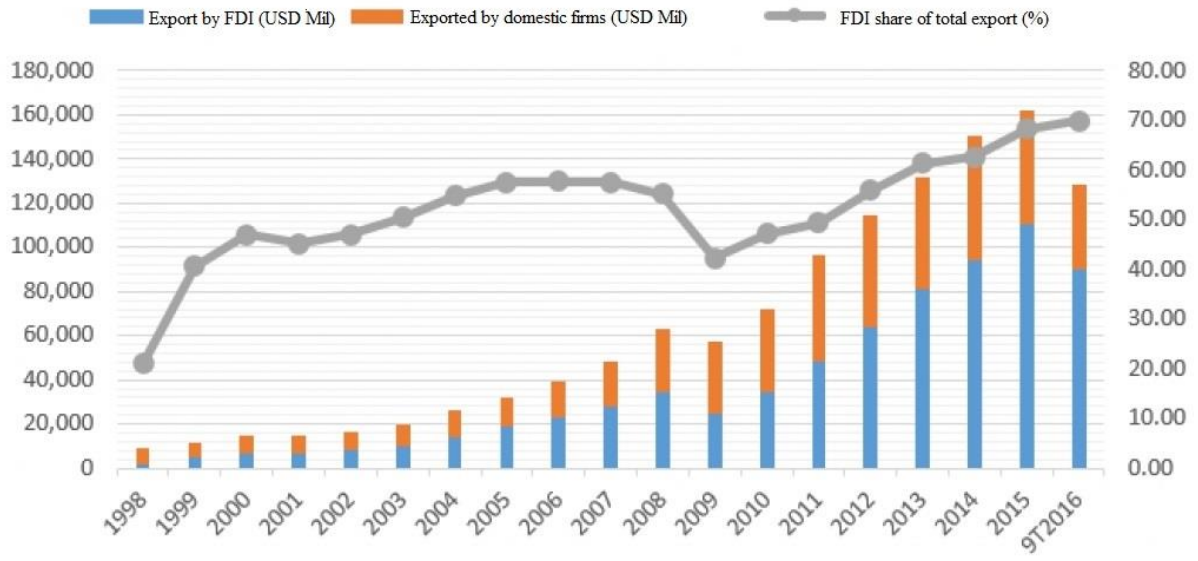

Figure 1-4: FDI share of total export in Vietnam from 1998 to 2016. *Source: VCCI, translated by the author*

With the changes in the labor market, foreign-invested enterprises have created jobs for around 500 thousand workers in 2000, up to 2 million workers in 2008 and reached equivalently 2,8 million workers in 2017 (as shown in figure 1-5). Although the FDI sector has only occupied a small percentage of less than 5% of total labor use in 2017, their presence also helps create millions of other indirect jobs by their supporting industries and local partners. Due to standardized training and high discipline, labor in FDI enterprises is more qualified and productive than those in domestic firms, thereby receiving higher income and more stable jobs. Besides, there are worker mobility and skilled labor competition among FDI and domestic sector which contribute to enhancing worker's compensation and bargaining power.

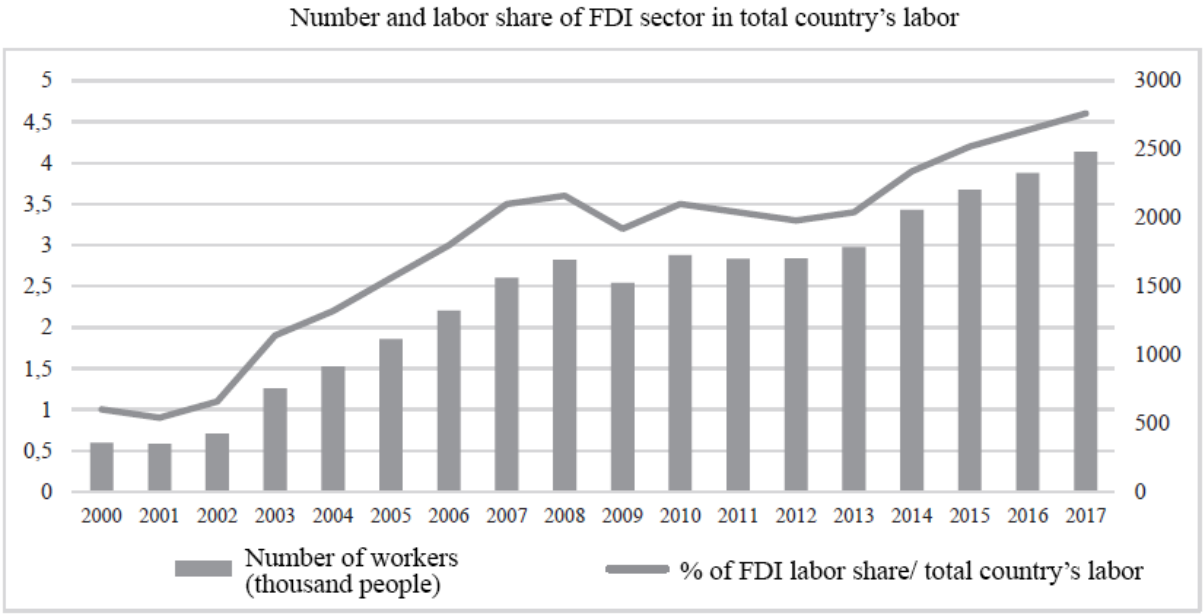

Figure 1-5: Number and labor share of the FDI sector in the total country's labor from 2000 to 2017. *Source: VCCI, translated by the author*

To further comprehend FDI spillovers in transition economies, the World Economic Forum has provided the ranking on some relevant indicators reflecting how efficiently a country can perform to absorb positive FDI externalities over two periods: 2014-2015 and 2017-2018. As in figure 1-6, the ranked indicators across three transition economies Vietnam, China and Thailand include provincial competitiveness index (PCI), availability of new

technology, firm's absorptive capacity, FDI and technology transfer, number of local suppliers, quality of local suppliers, intra-industry distribution, value chain width, and talent attraction. It has been illustrated in figure 1-6 that the lower the column is, the better the performance is. The ranking position of Vietnam's all spillover indicators is far behind two neighboring countries - China and Thailand which appear to be pretty good performers in the region. It is optimistic to observe that Vietnam's indicators are significantly improved in the later period 2017-2018, except the indicator for the quality of local suppliers. The worst indicators in Vietnam belong to the availability of new technology, the firm's absorptive capacity, number and quality of local suppliers and value chain width (around 120th ranking position). Overall, figure 1-6 indicates that Vietnam has not well prepared for absorbing FDI spillovers.

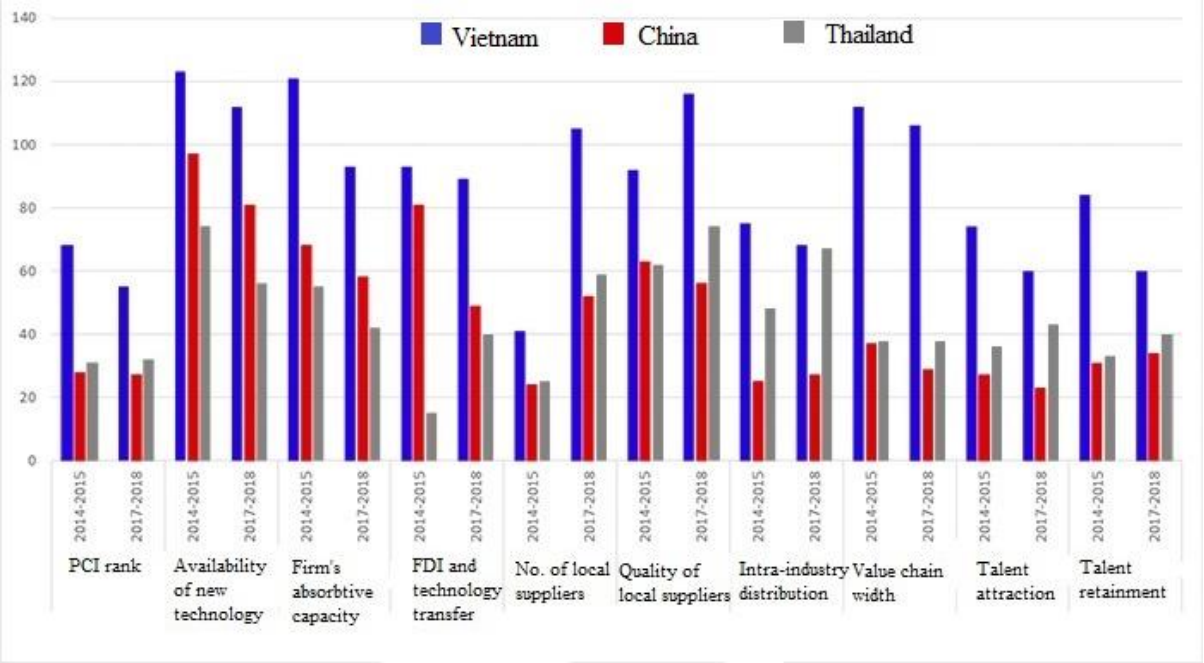

Figure 1-6: Ranking in some indicators of FDI spillover. (Note: the lower the column is, the better the performance is). *Source: World Economic Forum WEF (2014, 2017), translated by the author*

Although Vietnam has achieved high economic growth and is known as a relatively dynamic country under foreign presence, FDI's overall effect is very complicated. The role of FDI has been appreciated by host countries with many expectations for investment capital provision, export promotion, technology transfer, human resource development, and job

creation, etc. However, FDI not only generates positive impacts, but it also incurs opposite effects and unavoidable indirect effects (spillovers) on our economy. Moreover, it is admitted by many economists and scholars that the spillover effects of FDI in the host country are unpredictable and determined by heterogeneity at the firm, sectoral, regional or even country level.

The attraction of FDI in recent years has also generated many unexpected outcomes. The efficiency in technology and knowledge transfer is still low as many investors only bring outdated or non-key technologies in Vietnam to exploit the advantages of cheap labor and available resources. Moreover, foreign technology transfer is carried out through contracts and approved by the state management agency for science and technology. However, it is very difficult for investment recipients like Vietnam to assess the true value of each type of technology in different industries, especially in high-tech industries. Besides direct technology transfer, technology and knowledge spillovers from FDI may be a more attractive and less-expensive channel. However, MNCs always attempt to protect their intellectual assets and restrict knowledge diffusion. Meanwhile, as illustrated in figure 1-6, most of our domestic enterprises have not prepared themselves ready for absorbing positive externalities from foreign presence. To maximize profits, some FDI enterprises have even defied environmental issues, causing serious consequences. Besides, the imbalance in industry structure and investment area; low disbursement rate; the problem of price transfer, tax avoidance, and low localization rate are raising doubts on the real effects and spillover effects of FDI in Vietnam. Therefore, studying the spillover effects of FDI has become more urgent in the current investment context in Vietnam.

1.3 Significance of the study

1.3.1 Research gap

To provide a more comprehensive picture of the direct and indirect effects of inward FDI on firm productivity and wage, the dissertation has developed a conceptual framework presenting the relevant theoretical concepts and the relationships among these elements, followed by a research model.

Recent meta-analyses on FDI spillovers have emphasized the importance of separating spillover effects through different transmission channels (Demena & Bergeijk, 2017; Demena & Bergeijk, 2019; Rojec & Knell, 2017). To further clarify the issue, Rojec & Knell (2017) have recommended that future researches should differentiate between horizontal and vertical spillovers, especially backward and forward spillovers generated by established vertical linkages between local firms and foreign affiliates. These authors claimed that many previous researchers often focused on analyzing horizontal spillovers while it is less likely to occur than vertical ones. Thus, **the first research objective** attempts to fill this gap investigating FDI spillovers through different spreading mechanisms including horizontal spillover, vertically backward spillover and vertically forward spillover. To achieve this objective, instead of using only one indicator as in most of the previous studies, the thesis further complicates the FDI presence by measuring three dimensions of spillovers. The use of multi-dimensional indicators can help to compare and have a more comprehensive assessment of the FDI spillover effects. Besides, the combination uses of FEM, REM and GMM approaches help reinforce the robustness of research findings.

Besides, Behera (2017) and Anwar, Sun, & Anwar (2018) have indicated the lack of recent substantive evidence and no or deficient inclusion of firm heterogeneity in recent studies leads to the bias against no or negative spillovers. It may not be true due to the efforts of MNCs to prevent the transfer of their technological secrets and intangible assets to their competitors

or outsiders (Demena & Bergeijk, 2017). There is no doubt that not every MNCs are willing to spread their knowledge and not every local enterprise is ready to benefit from foreign presence. In short, the issues relating to biased spillover estimations may come from the following reasons as no differentiation between horizontal and vertical spillovers and no or deficient consideration of host firms' absorptive capacity and heterogeneity (Demena & Bergeijk, 2017; Rojec & Knell, 2017). To overcome this, Rojec & Knell (2017) and (Jacobs et al., 2017) encourage the examination of firm heterogeneity in further researches that may better capture the variability in spillover outcomes such as geographical distance and absorptive capacity of domestic firms defined by firm heterogeneity. To fill this gap, the **research objectives 2, 3 and 4** in the dissertation aim at examining the moderating variables as absorptive capacities in term of human capital, technology gap, financial development, regional and provincial proximity that interact with FDI spillover proxies to recognize the primary facilitators or barriers of the positive spillover effects.

In addition to capital provision and potential productivity spillover, foreign presence in emerging countries may also contribute to employment creation, skills and capacity building for local workers, labor productivity improvement; thereby affecting employees' wages and bargaining power (Javorcik, 2015; Nguyen & Ramstetter, 2017). Nguyen (2015) finds significantly positive wage discrimination between the FDI sector and the local sector in the host country based on data of Vietnamese manufacturing firms from 2000 to 2009. Also, the wages paid by multinational corporations (MNCs) and joint venture and state-owned enterprises (SOEs) are significantly higher than those paid by domestic private firms controlling for size, capital intensity, education and gender ratio (Nguyen & Ramstetter, 2017). Although the wage discrimination between foreign and domestic sectors is reflected in recent researches in Vietnam, there is no or deficient researches on whether foreign presence benefits the wages of local workers and whether this kind of wage externalities vary across ownership

types. Therefore, the research **objectives 5** is targeted to answer the above questions. It has been shown in the research results that productivity and wage diffusion vary significantly across firms and regions with specific characteristics. Besides, the research results from the latest panel data (2007-2015) will provide the up-to-date empirical findings and implications for FDI spillover effects in Vietnam which is useful for managers, policy-makers and further researchers concerning inward FDI spillovers. It is worth to note that the second research branch on wage spillovers could be considered as the most significant gap contributing to the current literature of FDI spillovers in emerging countries.

1.3.2 Research objectives

Based on the above justifications and significance, the dissertation attempts to fulfill the following research objectives by employing a large panel of Vietnamese manufacturing enterprises from 2007 to 2015:

1. First, investigating the effects of FDI spillovers through both vertical and horizontal channels on domestic firms' productivity.
2. Second, exploring the moderating effects of absorptive capabilities in terms of human capital, technology gap and financial development on productivity spillovers from FDI firms to Vietnamese manufacturing firms.
3. Third, examining whether productivity spillovers through vertical and horizontal channels are associated with regional effects.
4. Fourth, examining whether local firms in provinces located within 100 square kilometers (sq. km.) of eight cities/ provinces with the highest FDI concentration receive greater FDI spillovers than those located outside 100 sq. km of these areas.
5. Finally, investigating the effect of horizontal (intra-industry) FDI spillover on the average wage of domestic employees and whether ownership types influence wage spillovers from FDI.

1.3.3 Research questions

Based on the above research objectives, the dissertation aims at answering the following research questions for further hypotheses testing:

1. Is there a positive/negative relationship between the productivity of Vietnamese domestic companies and *horizontal/ vertically backward/ vertically forward* technology spillovers from FDI firms?
2. Whether the relationship between FDI spillovers and productivity of domestic firms is improved with a higher level of human capital?
3. Whether the relationship between FDI spillovers and productivity of domestic firms is lower at the top 25^{th} and bottom 25^{th} percentile of the technology gap and is enhanced at the middle 25^{th}-75^{th} percentile of the technology gap?
4. Whether the relationship between FDI spillovers and productivity of domestic firms is improved with a higher level of financial development?
5. Whether FDI spillover effect on domestic firm productivity vary significantly across geographical/ economic regions and higher in more FDI-intensive regions?
6. Is there a positive relationship between horizontal FDI spillovers and the average wage of local firms? And whether this relationship varies across ownership types?

1.3.4 Practical significance

The findings of the thesis are expected to help the policymakers to review the policies and other institutional factors on national investment and domestic firms, given a backdrop for the very open economy of Vietnam and the fast-changing international trade, global investment, and economy. In this way, the good practices and timely policies at both authorized and managerial levels may enhance the FDI spillovers and benefit the local stakeholders (Krammer, 2015; Willem, 2019). First, the research results of the thesis, especially on the existence of spillover effects from FDI, provide significant empirical evidence for

policymakers and forecasters about FDI's outcomes, spillover mechanisms as well as its influential factors, facilitators or barriers to better orient their policies. FDI presence along with its intensity and externalities have both temporary and long-term impacts on local productivity and economic growth. Therefore, the timely intervention or incentives at policy-making level may generate the positive changes on domestic production factors and local firms' capabilities to build up local strengths and proactively response to the continuous shifts in the economy toward FDI penetration (Demena & Murshed, 2018; Newman et al., 2019; Willem, 2019). It is very necessary to realize the power as well as the drawbacks of knowledge spillovers and make good preparation in terms of policies and long-run industry, regional and national planning (Barnes, Roose, Heap, & Turner, 2016; Willem, 2019). In this way, it is urgent for Vietnam to better understand and know what should be done to sustain local firms and the economy under the situation of increasing FDI inflows.

Second, as the research results indicate the importance of firm heterogeneity in determining the magnitude of productivity spillovers and wage spillovers, it is worth for firms in domestically manufacturing industries to implement appropriate strategies and set priorities. It is worth to realize that positive FDI spillover itself does not only occur automatically but also highly associated with local firms' absorptive capacities as well as relentless efforts through improving competitiveness and strengthening vertical linkage collaborations with foreign partners, especially for newly global participants from the third world (Anwar et al., 2018; Newman et al., 2019). Hence, the local enterprises' top management must understand the spillover transmission channels and the mechanisms of how they occur in reality to maximize the positive effects by enhancing their strengths, recognizing and taking advantage of the relevant strategies and policies.

Third, the thesis is implemented after Vietnam signed some important free trade agreements with strategic partners such as Russia-Belarus-Kazakhstan Customs Union

(December 2014) and South Korea (May 2015). Thus, the research results from the latest panel data (2007-2015) will provide the up-to-date empirical findings for FDI spillover effects in Vietnam which is useful for managers, policy-makers and subsequent researchers in the field of international business. In this way, the findings can serve as a basis for proposing suggestions and implications to promote the effect of positive productivity spillovers and wage spillovers from FDI firms to Vietnamese enterprises and local workers.

1.4 Methodology and Data

1.4.1 Methodology

The thesis uses the Cobb-Douglas production function model as a basis to estimate the impact of FDI spillovers of foreign subsidiaries on the total factor productivity of domestic enterprises. This approach allows analysis and testing of technology spillover effects from FDI through non-traditional factors, namely the total factor productivity. The proxies for FDI spillovers are established using three indicators of horizontal FDI spillovers, vertically backward spillovers, and vertically forward spillovers to investigate the existence of (1) the productivity spillovers and (2) wage spillovers from FDI. In terms of econometric techniques, the model of spillover effects from FDI is estimated using large panel data, including fixed effect model (FEM) and random effect model (REM), then selecting the appropriate model by Hausman test. Additionally, the approach of dynamic panel data (GMM) and statistical tests are conducted to check for the resulting robustness.

1.4.2 Data

The thesis uses secondary panel data at the enterprise level for the period from 2007 to 2015. Data is collected from the Enterprise Survey conducted by the General Statistics Office. After the screening and filtering process, the final data set included in the analysis is 385,976 observations (period: 2011-2015) for estimating productivity spillovers from FDI and 693,720 observations (period: 2007-2015) for examining the effect of horizontal FDI spillover on the

average wage. Besides, the thesis also uses input-output matrices in 2012 and 2015 to estimate vertical FDI spillovers between FDI firms and their locally upstream suppliers or downstream consumers.

1.5 Thesis organization

The organization of the thesis is divided into five chapters. Firstly, chapter 1 briefly provides an introduction to the thesis. Secondly, chapter 2 aims at reviewing relevant theoretical and empirical literature of foreign direct investment and spillover effects, thereby developing the conceptual framework, research model and hypotheses. Thirdly, chapter 3 is targeted to identify and present the research methodology with proper justification. Fourthly, chapter 4 analyzes and discusses research results. Finally, Chapter 5 provides conclusions and implications on the spillover effects of FDI in Vietnam.

CHAPTER 2. LITERATURE REVIEW

Chapter 2 presents the theoretical concepts on FDI, MNCs, types of FDI and effects on the host economy, thereby recognizing the existence of FDI spillovers in terms of (1) productivity spillovers and (2) wage spillovers – two main focuses of this study. The chapter is expected to provide a big picture of both theoretical and empirical aspects of FDI spillovers, thereby justifying the research gap and establishing an appropriate econometric model estimation. Specifically, this chapter will discuss the different transmissions channels of FDI spillovers and the possible moderating variables to identify the research gap for proposing a theoretical framework. The relevant empirical background is presented in the next section with a discussion of previous empirical results from different perspectives to propose and estimate the research model as well as make the relevant comparisons and implications among different authors' research findings and suggestions.

2.1 FDI definition

Foreign direct investment (FDI) has become a popular form of investment for decades and has been defined by scholars, international economic organizations as well as national laws of most countries. According to Boddewyn (1985) and Moosa (2002), FDI can be considered as a form of long-term investment of individuals or companies of a country (delivering country) into another country (receiving country) by establishing production and business. In other words, FDI is the transfer of capital, property, technology or any asset from the home country to the host country to establish or control an enterprise for profit-making purposes.

By their investment, foreign individuals or companies will acquire the ownership of assets and the control of all business and manufacturing activities of their establishment in the host country. In this way, the management aspect of control is the key to distinguish FDI from other financial instruments (Li & Rugman, 2007). In most cases, the properties/ assets the

investor manages abroad are business establishments. In such cases, investors are often called "parent companies" and assets are well-known as "subsidiaries" or "branch companies"(Schneider & Frey, 1985). As a result, the global expansion of these subsidiaries in the host economies leads to the establishment of “Multinational companies/ corporations” (MNCs) as in (Blomstrom & Kokko, 1998; Chittoor, 2009) that will be defined more clearly in the latter part.

Further, Vietnam’s Investment Law in 2014 defines FDI as follows: FDI refers to the fact that foreign investors bring their capital in cash or any assets into Vietnamese territory to conduct the investment (Assembly, Republic, & Investment, 2014). Direct investment is a form of investment that the investors invest their capital and get involved in the management activities of their investment in the host economy (Assembly et al., 2014). By this definition, FDI can be distinguished from foreign indirect investment. To be considered as a foreign direct investment, the investment must be large enough to take control of the company abroad. The United Nations determined that the parent company must own at least 10 percent or more of the company's shares or voting rights. More important, FDI is an investment occurring through a private channel, which is different from the official development assistance (ODA) investment of the Government or international organizations. Besides, Vietnam’s Investment Law in 2014 also mentions the concept of FDI enterprises including enterprises established by foreign investors to carry out investment activities in Vietnam; and Vietnamese enterprises are bought; merged or acquired by foreign investors (Assembly et al., 2014).

To further clarify the FDI definition, Brewer (1992) discussed the particular characteristics of FDI enterprises including (1) establish the rights and obligations of investors to where (the firm in the host country) they are invested, (2) establish their ownership with the right to manage the invested capital, (3) FDI can also be seen as the market expansion of multinational enterprises and organizations, (4) Demonstrate investors' rights to transfer

technology and techniques to local firms in the host country and (5) there is the involvement and companion of many financial markets and international trade. Based on these characteristics, the effect of FDI on the host economy will be discussed later.

2.2 Multinational corporations (MNCs) definition

In the popular book focusing on FDI theories and practices, Moosa (2002) defines multinational corporations (MNCs) or multinational enterprises (MNEs) are companies that have business operations or service provisions in at least two countries. Specifically, MNCs initially establish their parent company in one country (origin/ home country), then make direct investments in other countries to form affiliates in term of subsidiaries (incorporated with major administrative power (stake > 50 percent) and voting right); associates (incorporated, stake at least 10 percent and non-dominant voting right) or branches (unincorporated, refer to host country's fixed assets, wholly-owned or joint venture).

There are many different terms mentioned to describe the business activities of a company in many different countries such as 'international', 'multinational' and 'transnational' due to recent changes like the international business operation (Moosa, 2002; Blomstrom & Kokko, 1998; Byun & Wang, 1995). These changes include the establishment of business operations and production in many different countries; cross-border import and export worldwide regardless of where the goods are produced; new forms of transnational buying-selling activities (payment, transportation, etc…) (Chittoor, 2009). Indeed, these terms can be used interchangeably. Thus, in this thesis, the term "multinational corporations (MNCs)" or FDI firms will be used interchangeably to refer the foreign firms implementing FDI in a host economy.

Similar to other kinds of business entities, MNCs' fundamental goal is to maximize the shareholders' wealth. The achievement of this target is reflected in the increasing value of

stocks and dividends at moderate risk. Therefore, MNCs have strongly focused on implementing international expansion and product diversification strategy (Görg & Greenaway, 2004). The inter-connected relationships in MNCs and their advantages are reflected by the transfer of technology, knowledge, resources and management know-how from the parent firm to its affiliates or among affiliates themselves (Wang & Blomström, 2002).

Multinational companies (MNCs) can be classified into three large groups according to their production orientation, strategy and integration degree (as mentioned before) in the host country (Blomstrom & Kokko, 1998). Firstly, horizontal MNCs are established and operated in terms of horizontal FDI integration (as mentioned in the previous part – FDI classification) to produce similar products in different countries; for example, the worldwide fast-food chain of McDonald's from the US. Similarly, vertical MNCs are motivated to establish the subsidiaries in other countries aimed at developing upstream and downstream sectors (supply of inputs, distribution) of their core product; for example, Adidas – the sports fashion corporation from Germany with different subsidiaries producing unrelated products. Finally, multi-dimensional MNCs have production facilities in different countries that collaborate both horizontally and vertically; for instance, Microsoft - The world's largest software production corporation.

Besides, Temiz & Gokmen (2014) emphasized the importance and impacts of MNCs in the world economy by providing a comprehensive picture of MNCs' penetration worldwide. According to these authors' statistics, 500 largest multinational companies are controlling more than two-thirds of world trade, in which most transactions are made between MNCs and their subsidiaries or among their affiliates. However, the location of these MNCs is uneven, with the majority of more than 63,000 MNCs in the world having headquarters in the US, Europe, and Japan.

2.3 FDI classifications and its natures

The types of FDI or foreign affiliates are primarily driven by various investors' motivations and targets (Dunning, 2000). In practice, there are many different ways to classify FDI depending on investment motivations, investors' perspective, the host country's perspective and ownership structure (Moosa, 2002; Denisia, 2010).

2.3.1 Classified by foreign investment motivations

Based on investment motivations, FDI can be categorized by four different types including resource-seeking FDI, market-seeking FDI, efficiency-seeking FDI, and strategic-asset-seeking FDI.

(1) Resource-seeking FDI: in this case, the nature of the foreign capital inflows is to exploit cheap and abundant natural and human resources in the host country, especially emerging countries (for example; cheap labor in Southeast Asia, oil in Middle Eastern) (Calvet, 2014; Denisia, 2010; Harrison & Aitken, 1999). Importantly, abundant labor resources that may be poor in skills but at low prices are very attractive for MNCs (Blomstrom & Kokko, 1998). Also, this kind of capital is aimed at exploiting available assets in the host country such as popular tourist destinations and intellectual properties (Chittoor, 2009; Temiz & Gokmen, 2014). Besides, the dispute for strategic resources from competitors is undeniably a wise purpose of foreign investors.

(2) Market-seeking FDI: the investment capital is aimed at penetrating new markets or maintaining existing markets (Contractor, Kumar, & Kundu, 2007; Welch & Welch, 1996). In addition, the purpose of the investment is to take advantage of economic cooperation agreements and trade preferential agreements between host countries and other countries and regions, using the receiving country as a springboard to penetrate regional and global markets (Ni et al., 2017).

(3) Efficiency-seeking FDI: the purpose of the foreign investment is to improve firm efficiency by taking advantage of economies of scale and scope as well as utilizing cost-effective inputs in the host country such as raw materials, labor, and production factors (electricity and water, communications and transportation costs, rented premises, preferential tariff, legal regulations, etc.) (Beugelsdijk, Smeets, & Zwinkels, 2008; Globerman, 1979).

(4) and **Strategic-Asset-Seeking FDI**: the purpose of the investment is to prevent the loss of resources to competitors and sustains the competitiveness of MNCs (Singla & George, 2013). For example, oil production and mining companies may not need that oil reserves at present, but still have to find ways to protect it so as not to fall into the hands of competitors.

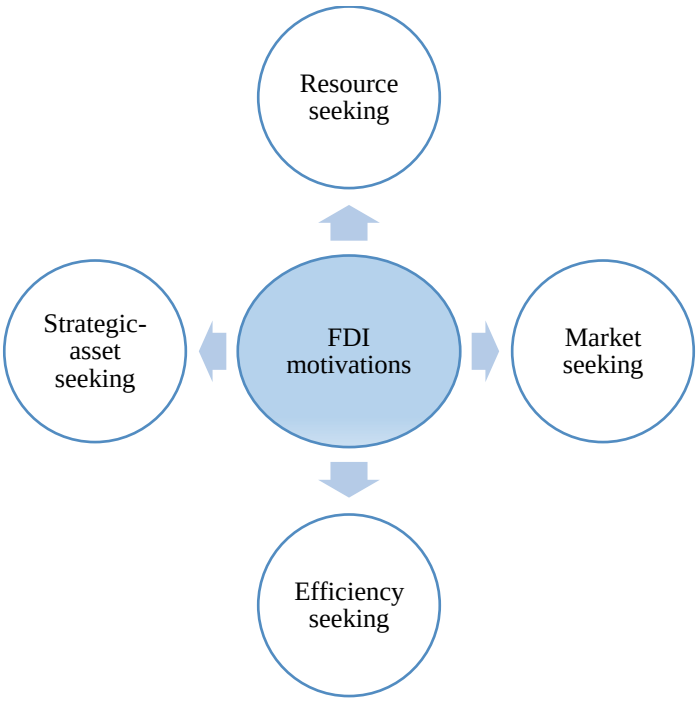

Figure 2-1: Classification of FDI by foreign investors' motivations/ purposes. *Source: author*

2.3.2 Classified by host country' orientation

Based on host country's perspective and government' orientation, Moosa (2002) and Li & Rugman (2007) have discussed three primary types of FDI: (1) FDI to substitute import, (2) FDI to enhance export and (3) FDI toward other orientations of the government.

Firstly, **import-substituting FDI** often occurs under the context of developing or less developed countries describing the movement of the host economy from importing particular goods to the self-production of those goods to meet the demand in the host country (Denisia, 2010; Li & Rugman, 2007; Moosa, 2002). This leads to a decrease in both the host country' s imports and the investing country's exports. Several factors are influencing this type of FDI such as domestic market capacity, the availability of raw materials and production inputs, trade barriers and transaction costs (Demena & Murshed, 2018; Halaszovich & Lundan, 2016). For example; although there are high reserves of natural oil and gas in the East Sea, Vietnam often has to import oil and gas from foreign countries to meet the production demand due to inadequately exploiting skills, techniques, and machinery. Under this circumstance, Russian oil and gas corporation has cooperated with Petrolimex in Vietnam and invested in oil and gas exploitation in the East Sea to help Vietnam restrict petroleum imports (Vietnam Energy Outlook Report, 2017).

Secondly, **export-enhancing FDI** is oriented when the host country identifies its comparative advantages in supplying raw materials and producing intermediate inputs to increase exports to other countries (all demanded countries including MNCs' home countries and its affiliates' host countries) (Li & Rugman, 2007; Moosa, 2002). This is an attempt to improve the balance of payments. This type of FDI is determined by several factors such as input costs, elimination of export restrictions, regional free trade agreements (FTA) and other production incentives. For example, the joint-ventures in Vietnam - Singapore Industrial Park in Di An, Binh Duong are oriented to produce products that meet the demand of the Vietnamese market and export to regional countries (Saisho, 2018).

Finally, **FDI toward other orientations of the government or government-initiated FDI** aims at encouraging FDI firms to invest in and develop weak manufacturing industries or difficult economic sectors in the host country to improve the balance of payments (Li &

Rugman, 2007; Moosa, 2002). For example, the Vietnamese government has recently offered many incentives for foreign investors investing in developing green energy projects such as solar power plants or biomass-power plants. These projects are environmentally friendly and contribute to sustaining the energy supply in Vietnam in the long run (Wte, 2018).

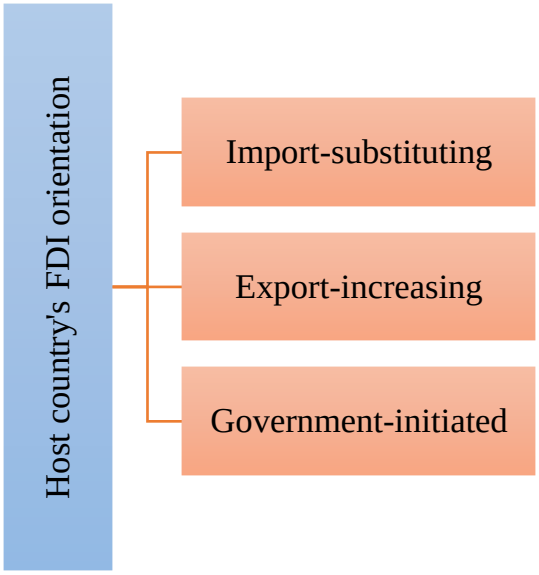

Figure 2-2: Classification of FDI by the host country's orientation. *Source: author*

2.3.3 Classified by FDI ownership

In practice, foreign direct investors can choose the level of control they wish to maintain in the new establishments (Denisia, 2010; Moosa, 2002). This can be achieved through full or partial ownership. Ownership indicates the level of control over business issues - for example, new product decisions, business expansion and profit-sharing (Riahi-Belkaoui, 1996). Companies can choose between a wholly-owned enterprise or a joint venture to gain their expected control (Li & Rugman, 2007). This choice will determine the level of financial commitment or the equity share of the company to foreign ventures.

(1) **Wholly owned** direct investment establishes an enterprise that foreign investors hold 100 percent of their assets abroad. In this way, the parent company has complete control over the operations of the subsidiary.

(2) **A joint venture** describes a cooperation partnership in which an enterprise is established through joint property or investment of two or more firms. A partner in a joint venture may hold a majority, 50-50 or hold very little ownership. Ownership often refers to the level of control; however, how the board of management is established and how voting rights are distributed among partners will more accurately reflect the relative strength of partners.

2.3.4 Classified by foreign investors' orientation and FDI integration level

Based on investors' orientation and the degree of FDI integration, FDI can be classified into three types of horizontal FDI, vertical FDI and conglomerate FDI (Caves, 1974; Moosa, 2002).

Firstly, **vertical FDI** describes firm's expansion activities to develop the upstream and downstream sector of its value chain (Blomström & Sjöholm, 1999; Giroud, 2007). Vertical FDI includes forward vertical integration and backward vertical integration. Forward vertical integration means that the FDI company develops the ability to sell its outputs by investing in a downstream value chain – for instance, marketing and sales activities (Behera, 2017). Further, forward integration is less popular than backward vertical integration, whereby the company seeks to supply inputs to its own domestic or foreign subsidiaries by investing in value chain's upstream sector – for example, factories or assembly plants (Javorcik & Spatareanu, 2011). Foreign-invested firms can establish both forward and backward FDI activities to enhance their procurements, production, and distribution. For example, Honda owns both auto parts suppliers and auto dealers/ distributors in different countries.

Secondly, **horizontal FDI** describes MNCs' entry mode to the same industry in a foreign country and produce the identical products as in the home country (Caves, 1974; Christophe & Pfeiffer, 2002; Le & Pomfret, 2011). For example, Microsoft's core business is

computer software development. In addition, to produce operating systems, text editors and accounting software, the company also develops overseas subsidiaries manufacturing other types of software. For example, Microsoft bought a Montreal company that produced software for creating cartoons. From this example, it can be seen that companies invest abroad in their field to expand their capabilities and scales. It has been well illustrated that a company can buy another company in a homogenous value chain to achieve the economic benefits of scale, production system expansion, increase in profitability or, in some cases, to eliminate opponents.

Thirdly, **conglomerate FDI** involves both horizontal and vertical FDI that MNCs establish foreign subsidiaries in the host countries to produce the products not manufactured in the source (home) country (Caves, 1974; Moosa, 2002). In other words, a conglomerate is an enterprise consisting of a parent company and many affiliates operating in different industries. It is often the result of mergers and acquisitions. The motivation for establishing this type of company is to reduce risk through gathering enterprises of different industries in different countries into one corporation. For example, the Korean firm - Chaebol can be considered as a conglomerate because it takes the form of a parent company, and has many foreign subsidiaries operating in different industries to meet the intermediate input supplies and service requirements of the parent firm.

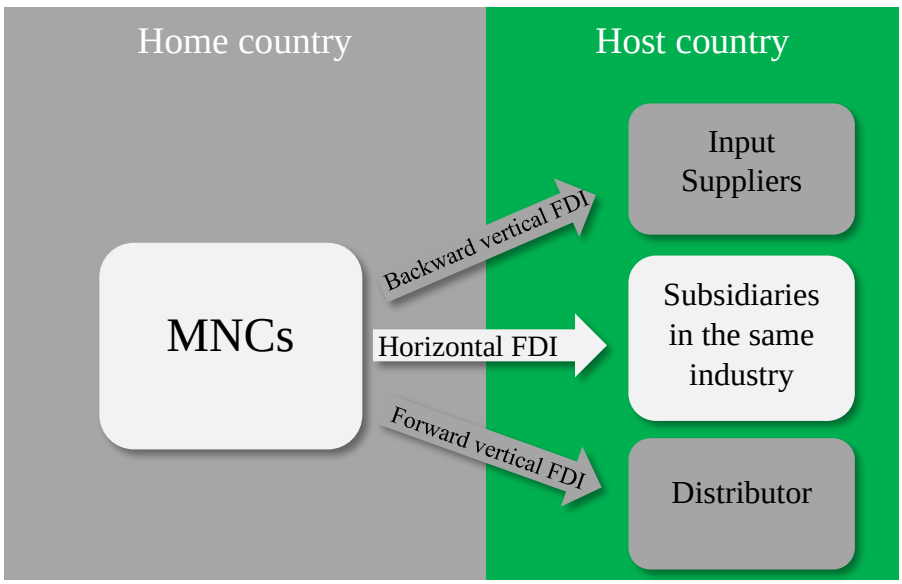

Figure 2-3: Vertical FDI and horizontal FDI integration. Source: author, adapted from Corporate Finance Institute (CFI)

To sum up, the classifications in term of FDI integration and motivations provides a comprehensive view on how inward FDI integrates into the host economy that may lead to the tremendous competition, interactions, demonstration, cooperation and linkage relationships between foreign firms and domestic firms (Aitken, Hanson, & Harrison, 1997). Moreover, during this process, the unavoidable externalities from foreign presence can be generated and affect the host economy at both the macro and micro levels (Blomström & Persson, 1983; Harrison & Aitken, 1999). ***Therefore, in this dissertation, such types of FDI classifications are used to investigate and measure the channels of FDI spillovers from MNCs to domestic owned firms.***

2.4 Effect of FDI on the host economy

As the world witnessed a huge wave of globalization and trade liberalization, MNCs competed to implement FDI to pursue tremendous advantages from efficient production locations outside its home country's border (Dominguez & Mayrhofer, 2015). Accordingly, these companies promote investment abroad to exploit the comparative advantages of the recipient countries and take advantage of preferential policies, thereby reducing production costs and improving their competitiveness (Amber, 2014). The growth of MNCs is also an indicator of important changes in the ongoing political and economic world. Internationally, MNCs are also considered as pioneers in the research and development of new technologies and an important source for poverty reduction in Third World countries (Herrera-Echeverri, Haar, & Estévez-Bretón, 2014). Under the increase of liberal global trade, MNCs are the key actors conducting trade activities and holding more power in establishing international trade regulations.

On the one hand, MNCs are praised to contribute to the economic growth of recipient countries and domestic firms' productivity, especially emerging countries by providing capital, transferring technology and managerial skills and positive externalities (Blomstrom & Kokko, 1998; Goh, 2005; Javorcik, 2004a; Wang & Blomström, 2002). Moreover, MNCs also create more jobs, increase gross domestic income, as well as improve standards of living in the host country (Herrera-Echeverri et al., 2014). By implementing their direct investment and business activities, MNCs can also help host countries change the economic structures, expand import and export, and thereby integrate more deeply into the global economy (Beugelsdijk et al., 2008; Silajdzic & Mehic, 2016).

On the other hand, some scholars criticize FDI enterprises as exploiters of natural resources, cheap labor and actors of serious pollution in host countries while most of their profits are repatriated (Chung, 2014; Decreuse & Maarek, 2015; Rugman, 2016). Thus, if the proportion of FDI accounted for is too large in the total investment capital in a host country, that country's economy has become vulnerable, external dependent and unstable in the long run. Besides, FDI enterprises, by their financial and technological strengths, also exert fierce competitive pressure on domestic enterprises leading to exit or crowding-out effects (Hamida, 2013; Perri et al., 2013).

There is no doubt that inward FDI affects different aspects of the host country's economy in both positive and negative ways. Moosa (2002) discussed different direct and indirect effects of FDI presence including the effects on recipient countries' economic growth, employment and wage, trade flows, productivity, technology transfer, and linkage relationships.

2.4.1 The effects of FDI on economic growth

Investment is an extremely important factor affecting economic growth. Investment capital for economic development is mobilized from two main sources, domestic capital, and foreign capital. Domestic capital is formed through savings and investment. Foreign capital is formed through commercial loans, indirect investment and foreign direct investment (FDI) activities. In transition economies, it has been revealed that that FDI is a very important factor for economic development, especially in an inefficient domestic credit market (Anwar & Nguyen, 2010; Silajdzic & Mehic, 2016). FDI, by its nature, has created an effective measure is to raise capital for investment, mobilize resources to develop the host country ’s economy.

Inward FDI in a host economy may stimulate other MNC's capital inflows and even domestic savings to enhance investments and improve the balance of payments. These inward financial resources are characterized by long-term commitment and stability in comparison to other kinds of capital inflows such as ODA or commercial loans (Moosa, 2002). Moreover, MNCs' presence may not only result in the capital provision but also the spillovers of superior technology, machinery and intangible assets such as management know-how, innovative processes, and skills (Blomstrom & Kokko, 1998; Globerman, 1979). As a result, the combination of sufficient capital stock and efficient utilization of existing resources undeniably converge the favorable conditions for an increase in labor productivity and output leading to economic growth in the host country.

2.4.2 The effect of FDI on employment and wage

Inward FDI will lead to the establishment of new businesses or an increase in the size/ scale of existing firms in the host economy; thereby creating more jobs (Denisia, 2010). This triggers the positive effects on developing countries’ labor market which is characterized by abundant labor resources. Under the emergence and expansion of FDI enterprises, local workers employed and trained by the FDI sector also acquire plenty of knowledge to improve

their technical skills, working styles (disciplines, work organization) and further bargaining power (Onaran & Stockhammer, 2008). Interestingly, the workforce at the management level will acquire a wide range of cross-cultural and regional superior knowledge such as international market access, negotiation, trade promotion, and human resource management.

To provide a more comprehensive picture of wage spillovers from FDI, Javorcik (2015) conducted a theoretical and empirical review of previous studies on the effect of FDI on wages under worker perspective and host-country perspective. The author aims at answering the question "Does FDI bring good jobs to the host countries?". From a worker perspective, the author analyses whether and to which extent foreign presence influences wage, training opportunities and job stability of local workers in the host country (Barnes et al., 2016; Fukase, 2014). From a host-country perspective, knowledge transfer, productivity advantages and FDI externalities are key points of attention and discussions (Blomstrom & Kokko, 1998; Wang et al., 2012). To achieve the research objectives, the authors focus on analyzing a wide range of FDI-related indicators such as TFP, value-added per worker, output, employment, average wage, intra-industry(horizontal) spillover, investment, export share, import input share, K-L ratio, skilled labor ratio, capital utilization. To sum up, Javorcik (2015) indicated higher compensation and better jobs in terms of training and increase in aggregate productivity from both worker and host-country perspective. Another finding is positive intra-industry spillover on productivity which is supported by many previous studies (Damijan, Rojec, Majcen, & Knell, 2013a; Du, Harrison, & Jefferson, 2012).

In addition, FDI inflows also contribute to improving workers' income because wages paid by FDI enterprises are often greater than wages paid domestic ones (Nguyen, 2015; Nguyen & Ramstetter, 2017). Moreover, FDI firms often organize onsite or offsite training courses for local workers; thereby forming a skilled workforce and accumulated human capital for the recipient country (Görg, Strobl, & Walsh, 2007). It is widely proved that the competition

between FDI enterprises and domestic enterprises in the labor market is a factor that motivates the workforce to raise their qualifications to obtain higher compensations (wages) and bargaining power.

However, FDI projects lead to the loss in many traditional jobs as a result of land acquisition for FDI projects. In particular, the worker mobilization of FDI enterprises is more inclined to exploit cheap and low-skill labor resources and even use a probationary mechanism to continuously replace labor. Besides, the host country can also bear the "brain drain" effect because FDI projects often attract talents through high compensation and a professional working environment (Sampson, 2013). Indeed, FDI enterprises have many strategies to prevent the turnover of skilled workers from MNCs to domestic firms (Görg et al., 2007).

2.4.3 The effects of FDI on trade flows

The relationship between FDI and trade are substitutes or complements also depends on host countries and industry-specific characteristics (Moosa, 2002). By identifying host countries' differences, similarities in terms of factor endowments, foreign investors may decide to establish vertical FDI or horizontal FDI for implementing their substitute or complement strategies (Trigeorgis & Reuer, 2017). The substituting production of identical products implemented by horizontal FDI refers to a decline in host countries' imports. On the other hand, complementing production implemented by vertical FDI lead to an increase in host countries' imports of intermediate inputs and exports of finished goods.

Moreover, inward FDI is often motivated by the goals of market and export expansion. In this way, the comparative advantages of the host country in production input factors are exploited more effectively in the international division of labor. Because developing countries are not able to produce at a competitive cost, they still face difficulties in penetrating the international market (Wang & Blomström, 2002). It is admitted that MNCs play an important

role in expanding exports due to their position, prestige, and reputation in the international market. Therefore, encouraging export-oriented FDI is a special incentive in FDI attraction policies of these countries. Through FDI, domestic firms in the recipient country can access the world market and enhance their competitiveness and internationalization experiences over time.

2.4.4 The effect of FDI on productivity

Previous parts discussed the importance of export-enhancing FDI on stimulating positive trade flows, economic growth and productivity spillovers (Blomstrom & Kokko, 1998; Caves, 1974). This part continues to emphasize its power to optimize the economies of scale leading to lower unit cost and higher productivity. In contrast, import-substituting FDI may prevent local firms from reaching an optimized production scale and achieving a higher level of productivity (Schaumburg-Müller, 2003). In such cases, small market size may be a determinant for production inefficiency.

Nevertheless, besides the impacts of FDI on scale efficiency and unit costs, productivity of domestic-owned enterprises are more likely affected by other host determinants at firm, industry and country level such as firm's absorptive capacity and efficient use of resources, industry characteristics (for example labor-intensive industry versus capital-intensive industry) and government restrictions or incentives to business practices (Moosa, 2002). Furthermore, it is worth to note that the process of technology diffusion delivered by FDI is a necessarily decisive condition for FDI – productivity relationships. This issue will be discussed in the following part.

2.4.5 FDI and technology transfer

FDI is considered as an important source to promote technology development of the country receiving FDI. In practice, new technology is introduced by foreign investors through

the acquisition of patents or innovations and the improvement and customization of imported technology for domestic use (as the cases of Japan and Korea) (Forte & Moura, 2013). When implementing an investment project in a country, foreign investors not only bring capital, machinery, equipment and raw materials, but also the intellectual and intangible assets such as technology, scientific knowledge, management know-how, and market access experiences into the host economy (Denisia, 2010). It is believed that FDI presence not only increases domestic firms' exposures and opportunities in bolstering technology transfer but also accelerate this progress (Wang & Blomström, 2002).

Moreover, there is the mobilization of foreign and indigenous experts in the areas related to the project. This allows local firms in recipient country easily import technology and be more accessible to MNCs' advanced technology, innovative processes, and knowledge (Blomstrom & Kokko, 1998). Besides, FDI also contributes to enhancing the host country's research and development capacity (Calvet, 2014). It is undeniable that most of the R&D activities of foreign subsidiaries overseas are improving their existing technologies to suit local use conditions. In this way, foreign investors have created many interrelated linkages to provide technology services from domestic research and application institutions; thereby strengthening local capacity in technology development.

2.4.6 FDI and inter-industries linkages

Based on their investing purposes, MNCs attempt to establish inter-linkage relationships with local enterprises in the receiving country to expand and sustain their production network and subsidiaries (Blomström & Sjöholm, 1999). In this way, foreign affiliates may trigger the direct impacts or indirect externalities (spillovers) in terms of productivity and employment on domestic firms via such kinds of inter-industry linkages. On the one hand, FDI firms are motivated to build upstream linkages with local manufacturers/ suppliers to ensure a stable and standardized supply of materials/ inputs. On the other hand, to expand the market and ensure

the consumption of outputs, foreign subsidiaries also need to establish their links to distributors in downstream sectors and sell their finished goods to domestic enterprises.

However, MNCs have thoughtful analyses on different scenarios and risks associated with each scenario to consider whether local-produced inputs or imported inputs are more profitable. Indeed, these calculations determine the extent of inter-linkages in the host country. It is observed that most MNCs expanding global through vertical integration or take-over model that establishes inter-industry subsidiaries functioning their complementary stages of production and distribution (Lin & Saggi, 2011; Moosa, 2002). Thus, the proportion of technology transfer from MNCs is still very limited. This makes inter-linkages with domestically host enterprises less motivated and attractive to MNCs. It has revealed the fact that many emerging countries receiving long-term FDI for many decades have still been characterized by low-tech industries and in the race to strengthen local capabilities to compete with foreign competitors.

Table 2-1: Summary of FDI effects on the host country

No.	Affected indicators	Effects
1	Economic growth	-Stimulate other MNCs capital inflows and even domestic savings to enhance investments and improve the balance of payments; -Provision of capital and intangible assets; → sufficient capital stock and efficient utilization of existing resources → economic growth.
2	Employment and wage	-Establishments of new businesses or increase in size/ scale of existing firms in the host economy → more employments; -Improve workers' income and bargaining power due to skilled labor competition; -Training for local workers → accumulated human capital for the recipient country; -Exploit cheap labor, pay higher wages to prevent labor turnover.

3	Trade flows	-Establish vertical FDI or horizontal FDI for implementing: +Substitute strategy: a decline in host countries' imports +Complement strategy: an increase in host countries' imports of intermediate inputs and exports of finished goods
4	Productivity	-Export-enhancing FDI: → optimize the economies of scale leading to lower unit cost and higher productivity. -Import-substituting FDI: prevent local firms from reaching an optimized production scale and achieving a higher level of productivity. - The importance of the host country's characteristics at firm, industry and country level. -Technology diffusion from FDI as a decisive condition.
5	Technology transfer	-Introduction of new technology and the improvement and customization of imported technology for domestic use. -Diffusion of intellectual and intangible assets such as technology, scientific knowledge, management know-how, etc… -Mobilization of foreign and indigenous experts in the areas related to the project. -Enhancing the host country's research and development capacity → Higher productivity
6	Inter-industry linkages	-Upstream linkages with local manufacturers/ suppliers to ensure a stable and standardized supply of materials/ inputs. -Downstream linkages to local distributors sell their finished goods to domestic enterprises. -Vertical integration or take-over model make inter-linkages with domestically host enterprises less attractive. → Higher productivity

Source: synthesized by author

2.5 The theories of FDI

Moosa (2002) has synthesized the theories of FDI in a very systematic way to recognize the main assumptions, drawbacks as well as provide empirical evidence for these theories. Three categories of FDI theories mentioned in the book include (1) theories assuming perfect markets, (2) theories assuming imperfect markets and (3) other theories providing different perspectives to explain why firms invest in a foreign country.

2.5.1 Theories assuming perfect markets

Firstly, the theories of perfect markets assume that no producer or consumer has the right or ability to control the market and affect the prices (Denisia, 2010). Perfect competition is expected to lead to high economic efficiency (Li & Rugman, 2007). Studies of the perfect market provide the basis for the theory of supply and demand. Important assumptions for a perfectly competitive model can be established as follows:

- All exchanged goods are considered the same. That is, goods must be of the same quality and quantity. Goods sold are not different in terms of specifications, qualities, and designs. Buyers do not have to care about who they buy those units of goods from.
- All sellers and buyers have a full understanding of the information related to trading and exchanging.
- There is nothing to prevent a buyer or seller from entering or exiting from the market.

Therefore, to maintain competitive advantages, the firms in the perfect market are forced to find various ways to reduce costs in terms of FDI or differentiate their products from competitors. Because the above assumptions rarely occur in practice, perfect market is just an

ideal model. The following table summarizes FDI theories based on the assumptions of perfect market.

Table 2-2: FDI theories assuming perfect market

No.	Hypothesis	Contents
1	Differential Rates of Return (Watkins, 1916)	- Perfect substitute: the intentional movement of capital from low rate of return (RR) country to high RR country to equate marginal return on investment and marginal cost. -The importance of human capital as a facilitating factor for a higher rate of return in both rich and poor countries.
2	Portfolio Diversification (Tobin, 1958; Markowitz, 1959)	-When the risk is not neutral and has a high probability to arise, investment diversification across industries and countries could be a wise decision for FDI firms to ensure the rate of return. - FDI is more attractive for MNCs than portfolio diversification in terms of the degree of control which determines the ability to reduce risk.
3	Market Size (Balassa, 1966)	-The host country's market size is an important determinant of inward FDI volume in that country as it reflects the MNCs' revenues there. -The larger the market size is, the more the capacities are provided to foreign firms to optimize production factors and minimize costs.

Source: synthesized by author

2.5.2 Theories assuming imperfect markets

The theory of imperfect market suggests that the existence of imperfect factors makes the business less efficient (Li & Rugman, 2007). In this way, the entry mode of FDI is expected to enable MNCs to overcome market imperfections and increase their performance (Denisia,

2010; Görg & Greenaway, 2004). There are two main types of market imperfections: trade barriers and special knowledge.

- Trade barriers: A form of market imperfection is trade barriers such as import duties or quotas.
- Special knowledge: This kind of knowledge includes the expertise of techniques, technology, marketing, managerial skills, etc.... It can undeniably create the extraordinary competitiveness of a company against its competitors.

The following table summarizes FDI theories based on the assumptions of imperfect market.

Table 2-3: FDI theories assuming imperfect market

No.	Hypothesis	Contents
1	Industrial Organization (Hymer, 1976; Kindleberger, 1969; Caves, 1982; and Dunning, 1988)	-A firm expanding globally suffers from liability of foreignness (language, culture, legal regulations, etc…) and find difficult to compete with local firms. -However, foreign firms' specific factors such as brand name, advanced technology, and managerial skills, capital, marketing, access to raw materials, economies of scale, bargaining and political power, etc... could be a great comparative advantage.
2	Internalization Hypothesis (Coase, 1937; Buckley and Casson, 1976)	-When a firm pursues an international expansion effort, it is fighting to deal with high transaction costs, long time tags and market failure (lacking intermediate inputs, human capital, knowledge expertise, etc…) in its home country. - There are many alternatives for FDI such as export, licensing, franchising, subcontracting. Choosing FDI as the mode of entry may be a result of thoughtful consideration and preparations. -The internationalization efforts contribute to reducing uncertainties, including both export and import choice.

No.	Hypothesis	Contents
3	Location hypothesis (Horst, 1972b)	-MNCs are motivated by production factors' immobility when investing abroad. Thereby, they can create the locational advantages by investing in preferential areas with the availability of desired low-cost labor and natural resources. -Labor productivity, skill and labor disputes may affect the cost of production (wage) and FDI decisions.
4	Eclectic theory Dunning (1977, 1979, 1988)	-The combination of industrial organization, internationalization, and location hypothesis to some extent to clarify the following ideas. (1) whether demand for a specific product in a country could be met by local supply and importing of that product. (2) There are many different channels for production expansions instead of FDI. - Conditions for FDI implementation: + The existence of comparative advantage (firm-specific advantages). + The choice between using advantages or selling/leasing them must be driven by benefits. + The existence of preferential production factors in the host economy.
5	Product Life Cycle (Vernon, 1966, 1971; Petrochilos, 1989)	-Explain the changes in the development trend of internationalization over time. The theory of the product life cycle is built based on successive product innovation and promotion. -The product life cycle is divided into 4 stages: (1) Stage 1: Launch of new products → the initial consumption country is also the manufacturing country because of the close relationship between innovation and demand. The manufacturer often comes from an advanced industrial country and starts exporting its innovative products to other high-income countries.

No.	Hypothesis	Contents
		(2) Stage 2: The production process begins to take place in other leading industrial countries and gradually replaced the exports of launched products to these markets. (3) Stage 3: Other countries' demand for new products reaches a scale that allows producers to take advantage of outsourced large-scale production. They continue to become net exporters (export volume is greater than import volume) to countries that do not produce new products, thereby replacing exports from the initially innovative country. (4) Stage 4: Finally, when technology and products are increasingly standardized for untrained low-skill workers, low-cost developing countries start exporting this product and continue to replace exports of countries where the products are created and launched. In this way, the origin country of first-stage products started to produce new products and is ready for launching a new product cycle.
6	Oligopolistic Reactions (Knickerbocker, 1973; Streeten, 1977)	-The theory explains one firm's FDI implementation in an effort for market expansion may be reacted by the competitors in the industry → lead to similar actions to maintain the market shares. - In this way, there is an increase in intra-industry competition level and entry concentration; however, a decrease in product diversity.

Source: synthesized by author

2.5.3 Other FDI theories

The other theories of FDI reflect the different perspectives of MNCs such as internal financing, entry mode decision, and host country's characteristics and fiscal and legal regulations.

Table 2-4: Other FDI theories from different perspectives

No.	Hypothesis	Contents
1	Internal financing (Barlow and Wender, 1955)	-The theory describes the situation that MNCs use foreign affiliate's profit in one country to reinvest in the process of FDI expansion and business activities in that country in the long run. - It is more appropriate to interpret FDI in emerging countries due to barriers to funds transfer as well as inefficient institutions and financial markets in the host economies.
2	Currency area (Aliber, 1970, 1971)	-FDI decisions depend on the currency strength of the origin country. -Taking the exchange rate into account, firms in country with a powerful currency are motivated in investing their capital abroad and vice versa.
3	Diversification with barriers to international capital flows (Agmon and Lessard, 1977)	-The theory emphasizes two conditions of FDI implementation: (1) FDI is a more attractive channel with lower barriers and costs in comparison with portfolio investment. (2) Investors' awareness of MNCs' exceptional diversification chances. -The level of MNC's presence worldwide is reflected in the stock prices. It is undeniable that MNCs' stock prices are in favor of MNCs with a strong and high-covered subsidiary network.
4	Kojima (Kojima 1973, 1975, 1985)	-FDI as a source of factor endowments in kind of capital, technology, and skills transfer from home countries to host countries. -Two kinds of FDI is mentioned: (1) Trade-orientated FDI: enhancing trade, welfare and industrial restructuring in both countries (2) Anti-trade-orientated FDI: adverse effects

No.	Hypothesis	Contents
5	Political Risk and Country Risk (Simon, 1984)	-For the emerging country with high political vulnerability, uncertainties associated with the frequent changes in the host country's legal and fiscal system may be a big challenge for FDI firms as it can determine the business outcome and investment return.
6	Tax policies (Hartman, 1985; Jun 1989)	-Tax policy in both home and host country is an important determinant of FDI.
7	Trade barriers (Smith, 1776; Ricardo, 1817; Graham, 1996)	-The elimination of trade barriers such as tariffs, quota, etc… in home economies may discourage outward FDI.
8	Government regulations (Wallace, 1990; Stoever, 1999)	-The theory describes two sides of government regulations in response to MNCs' presence: (1) Encourage inward FDI by providing incentives on fiscal (tax exemption/ reduction, depreciation, etc…); financial (subsidies, grant, etc…); market; information and flexible legal framework. (2) Discourage inward FDI by requiring MNCs to invest in particular regions/ sectors with the use of local workers and the strict allocation of profit (tax) between home and host countries.
9	Strategic and long-term factors (Reuber, 1973)	-The theory figures out a set of strategic and long-term factors explaining foreign presence in other countries as follows: + Defense of market shares and investment against competitors + Sustain long-term input supply + Expand and strengthen the network of the parent firm and its affiliates as well as bargaining power across different host markets. + Locational advantages for outsourcing and development of new products.

No.	Hypothesis	Contents
10	Entry mode (Lall and Streeten, 1977)	-The theory identifies key factors for entry mode (export versus FDI) decision-making including cost advantages, host country's government regulations and policies, oligopolistic reactions, product life cycle and production factor advantages in upstream and downstream sectors. -Three penetration forms of FDI entry: greenfield FDI, mergers and acquisitions.

Source: synthesized by author

2.6 Definition of FDI spillover effect

Blomstrom, Kokko, Sjoholm, Wang, Aitken, Harrison and Caves are considered as the pioneers in grounding the initial theories and providing empirical evidences of FDI's spillover effect with series of researches in this field (Aitken & Harrisosn, 1999; Aitken et al., 1997; Aitken & Harrison, 2013; Blomstrom & Kokko, 1998; Blomström & Persson, 1983; Blomström & Sjöholm, 1999; Caves, 1974; Du, Harrison, & Jefferson, 2012; Harrison & Aitken, 1999; Wang & Blomström, 2002; Wang & Blomstrom, 1992). These authors figure out the direct and indirect effects of FDI in the host economy and discuss the importance of spillover effect and how the advanced technology, best practices, and management know-how is transferred from MNCs/ foreign subsidiaries located in the host country to the host domestic firms.

Indeed, the presence of FDI enterprises has an indirect impact on domestic enterprises increasing competition pressure and forcing these local firms to improve their operational efficiency (Blomström & Persson, 1983). In this way, foreign presence also promotes the process of knowledge diffusion and technology transfer in the host country, thereby increasing the technological capabilities and competitiveness of domestic enterprises (Veugelers & Cassiman, 2004). Also, spillover effects from FDI may occur when an FDI enterprise has

difficulties in protecting its intellectual assets through the leak from training and labor turnover (Blomström & Persson, 1983; Caves, 1974). Furthermore, FDI enterprises can also actively or intentionally share information as well as transfer technology and managerial skills to domestic enterprises in their upstream and downstream linkage chain (Görg & Greenaway, 2004).

Spillover effects are defined as foreign influences derived from intentional or unintentional interactions between economic entities over time (David & Rosenbloom, 1990). In this way, the FDI spillover effect is a very popular term in the field of international economics describing the effects of MNCs' economic activities on domestic host firms' business activities and performances even though these two business activities are not related and integrated (Blomstrom & Kokko, 1998). *FDI spillover effect can be understood as the intentional or unintentional externalities on the local firms or the host economy created by the foreign equity presence in the host country* (Caves, 1974). In other words, the FDI spillover effect occurs when MNCs' activity has side effects that exceed the initial prediction. For example, when MNCs invest in a certain country, they may intentionally or unintentionally help local enterprises in that countries increase their competitiveness by expanding the market, penetrating new resources, acquiring modern technology, and producing more valuable products. However, MNCs' presence may also lead to the exits of low-efficient domestic firms that fail to compete with the giants in the intra-industry.

The two established forms of FDI spillovers include productivity spillover and market access spillover (Blomstrom & Kokko, 1998). Productivity spillover associated with FDI as this important phenomenon offers the best opportunities for domestic firms in the host country observe, imitate and upgrade their existing technology and inherit the advanced business practices to improve their firm's productivity at a lower cost (Aitken & Harrison, 1999; Aitken et al., 1997).

2.7 Channels of FDI spillovers

To analyze and measure FDI enterprises' externalities on domestic enterprises, spillover effects can be classified according to different delivery channels and integration direction in production supply chains (Blomstrom & Kokko, 1998; Blomström & Sjöholm, 1999; Damijan, Rojec, Majcen, & Knell, 2013b).

2.7.1 Transmission mechanisms of FDI spillovers

FDI may spill over through four primary channels including imitation/ demonstration, labor turnover, competition and inter-linkage relationships with foreign subsidiaries.

2.7.1.1 Imitation/ Demonstration

Imitation or demonstration is considered the most obvious spillover channel. When a country that receives a new technology without previous usage experiences and knowledge transfer will incur huge costs and face greater risks in using such technology (Damijan et al., 2013a). If the technology has been successfully applied by an MNC, domestic companies will be more accessible to and use the technology more efficiently (Hamida & Gugler, 2009). Through FDI, these MNCs will bring advanced technology into the host country by the establishment of subsidiaries or branches. Besides, the appearance of FDI enterprises will encourage domestic enterprises to innovate technology through establishing joint ventures with foreign partners or through technology transfer from FDI enterprises (Blomström & Sjöholm, 1999; Iršová & Havránek, 2013). However, the level of efficient use of technology also depends on the absorption capacity of domestic firms (Sourafel Girma, 2005; Jacobs et al., 2017; Marin & Sasidharan, 2010).

2.7.1.2 Labor turnover

The second spillover channel occurs when domestic firms hire workers who have worked at MNCs (Blomstrom & Kokko, 1998; Fosfuri, Motta, & Rønde, 2001). It is obvious

that these workers are knowledgeable about technology and can apply to domestic enterprises. More important, the spillover effect will even be stronger if these qualified workers use their accumulated knowledge from MNCs in their own business/ startups (Damijan et al., 2013a). However, it is difficult to assess the impact of these workers on the productivity of domestic companies. A good example is when these highly qualified workers from these MNCs have no conditions to maximize their capabilities. In addition, based on the FDI theory of industrial organization discussed by Moosa (2002), labor productivity of an enterprise can be determined by many firms and industry-specific characteristics such as market size, capital intensity, financial development, and industry concentration. Therefore, the impact of labor mobility on firm productivity or efficiency is still questioning (Bellak, 2004; Gorodnichenko et al., 2014a; Peri & Urban, 2006).

2.7.1.3 Competition

The third spillover channel occurs through competition pressure from foreign presence in the same industry. To survive in the fierce competition market, domestic enterprises are required to operate more efficiently by using available resources, applying new technology and improving their productivity (Blomström & Sjöholm, 1999; Malik, Rehman, Ashraf, & Abbas, 2011). However, the competitive process can also lead to negative impacts on domestic enterprises. For example, FDI enterprises bring into the domestic market a new technology and create new products to replace existing products produced by domestic enterprises. Undeniably, this action may affect the existence of domestic enterprises, depending on the substitution level of this new product. Or another case, FDI enterprises' penetration of market shares also reduce the production efficiency of domestic enterprises (Hamida & Gugler, 2009; Hamida, 2013).

Regarding competition, Salim & Bloch (2009) used firm-level panel data of 568 Indonesian chemical and pharmaceutical firms from 1988 to 2000 surveyed by the Central

Board of statistics to explore the relationship productivity growth and spillover using FEM and REM method. Productivity growth is estimated by the maximum likelihood method of stochastic production frontier and Malmquist index. The study found evidence for horizontal spillover. Another finding indicates that competition, R&D are important determinants for horizontal productivity spillovers. To further complicate the issue, Fatima (2016) attempted to enrich the analysis on a deeper understanding of the relationship between local firms' productivity growth and FDI spillovers on different quantiles of productivity growth. The quantile regression is estimated using panel data of Turkish manufacturing enterprises across 37 industries from 2003 to 2010. In this approach, TFP growth is distributed into five quantiles: 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}. In addition, absorptive capacity measured by distance from firm productivity to industry best practice (frontier) is added as a moderator. The findings indicate that local firms in different quantiles are affected in different ways from horizontal and forward spillovers. Firms in higher quantile tend to less suffer from the competition (horizontal spillovers from MNCs) and receive more from forwarding spillover.

2.7.1.4 Inter-linkage relationships with foreign subsidiaries

The FDI theory on the product life cycle emphasizes the gradual movement of home-country production to production in advantageous locations across different countries in the world (Vernon, 1960; Moosa, 2002). In the third stage and fourth (final) stage of the product life cycle, MNCs attempt to take host countries' specific advantages to increase production scale and expand the export of their innovative product launched at the first stage to other countries. In this way, MNCs' export activities in a host country are always associated with the establishment of local production facilities, distribution networks, transportation infrastructure or taste adaptation of foreign markets (Kokko, 1994; Wang, 2010). It is undeniable that MNCs, with their long-term operational experiences and tremendous international influence, are

always better than local businesses in recognizing the factors that help increase export and maximize profits.

Furthermore, the cooperation between FDI enterprises and local businesses in the supply chain can generate externalities (spillover) effects on host countries' local firms. Therefore, another spillover channel recognized is through the linkages between domestic companies and foreign subsidiaries in downstream and upstream sectors of the supply chain (Havranek & Irsova, 2011; Javorcik & Spatareanu, 2008; Khachoo & Sharma, 2016). Downstream (forward) linkages relate to domestic enterprises buying production inputs from FDI enterprises, while upstream (backward) linkages take place when domestic enterprises provide intermediate inputs for FDI enterprises. Through backward linkage, domestic enterprises can expand their production scale and improve products' quality to meet the strict standards of foreign subsidiaries (Blomstrom & Kokko, 1998; Javorcik & Spatareanu, 2011).

Besides, MNCs' supplementary services embedded with their supplied products may generate many opportunities for the diffusion of innovative processes and superior practices from MNCs to domestic firms (Mariotti, Mutinelli, Nicolini, & Piscitello, 2015). However, once the quality of the intermediate inputs is enhanced, the production cost will equivalently increase. Thus, domestic enterprises must prepare themselves ready for absorbing technology and knowledge spillovers from FDI firms by internal capacity building (Jacobs et al., 2017; Mariotti et al., 2015).

As the very first study investigating indirect effects of FDI in Vietnam, Giroud (2007) implemented a semi-structured interview with the target group of MNCs' managers in Vietnam and Malaysia in 1996 and 2002, then used statistical method of frequency and percentage estimation to evaluate. The sample is Vietnamese firms operating in two sub-sectors of the manufacturing industry including electronics/ electrical and textiles & garments. In this way,

the questionnaire is designed on five rating scale and 19 transfer practices (11 items on supplying intermediate inputs to foreign affiliates and 8 items on training activities) of MNCs that may trigger spillovers. As a result, the author found that the effect of backward linkage spillovers to local firms in the host country exists, however, it remains limited to some extent. It is worth to note that Malaysia performs better than Vietnam in terms of absorbing MNCs' management know-how and superior technology backward spillover. Besides, the study implied that vertical linkages in Vietnam are weak and lack of orientation. Thus, Giroud (2007) suggested implications for linkage improvement and capacity building in the host country.

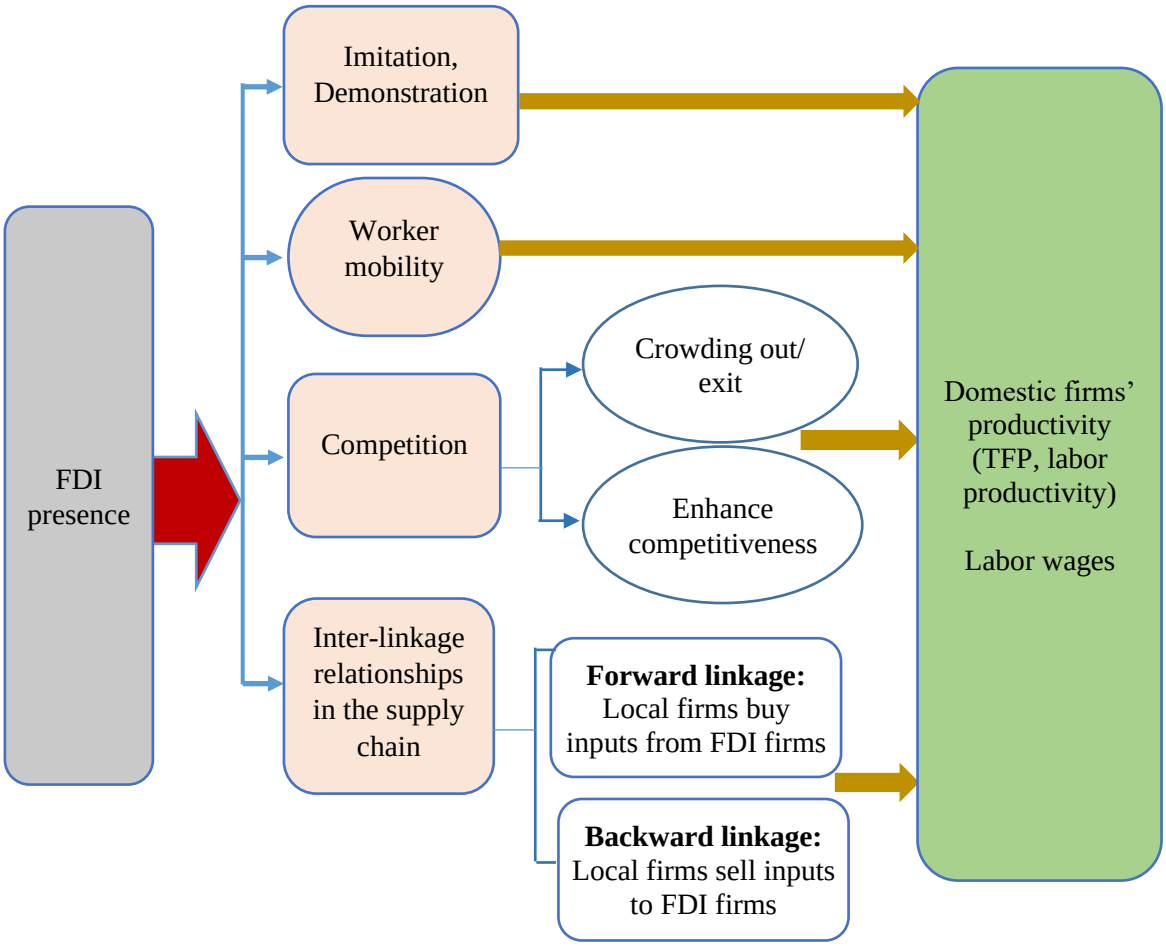

Figure 2-4: Mechanisms of FDI spillovers. *Source: author*

2.7.2 Horizontal and vertical channel of FDI spillovers

In terms of integration direction in the production supply chain, spillover channels may occur through (1) horizontal interactions between FDI enterprises and domestic enterprises in

the same industry; or (2) vertical interactions among upstream and downstream enterprises in the supply chain.

2.7.2.1 Horizontal spillovers

Horizontal spillovers describe the intra-industry externalities generated by MNCs' presence and activities (Iršová & Havránek, 2013; Wang & Blomström, 2002). These externalities take place within the industry where FDI is involved in the domestic market. It is admitted that the horizontal spillover effects from FDI enterprises may occur through foreign technology imitation/ demonstration and labor movement from FDI to domestic enterprises or competition in the same industry (Blomstrom & Kokko, 1998; Carluccio & Fally, 2013; Damijan et al., 2013a; Khachoo & Sharma, 2016). However, it is very difficult to separate those effects. For example, when FDI enterprises participate in the domestic market, increasing competitive pressure in the same industry can help domestic enterprises improve their competitiveness or force them to exit the industry.

2.7.2.2 Vertical spillovers

Vertical spillover effects, on the other hand, occur through inter-linkage interactions in the supply chain (Blomstrom & Kokko, 1998; Caves, 1974; Havranek & Irsova, 2011). Domestic enterprises that supply materials/ inputs are vertically linked to foreign firms in the upstream sector. In contrast, local firms buying intermediate inputs from MNCs are vertically linked to foreign firms in the downstream sector. As well discussed in the previous part about inter-linkage relationships, local firms in the vertically backward (upstream) linkage with MNCs can increase their competitiveness and gain more market share (Damijan et al., 2013b; Javorcik & Spatareanu, 2011). On the other hand, the vertically forward (downstream) linkage allows domestic companies to obtain high-quality inputs from MNCs to enhance their production efficiency and output quality (Giroud & Scott-Kennel, 2009).

2.8 Theoretical framework

The presence of spillover effects from FDI has been well illustrated in thoughtful discussions on FDI effects and relevant FDI theories. The theoretical framework (as in the figure below) attempts to fill the research gap by synthesizing and revealing the direct and indirect effects from FDI to domestic firms in the host country. Because this dissertation aims at exploring the FDI spillover effects at firm level, the framework focuses on describing relevant theories and mechanisms that spillovers may spread from foreign firms to domestic firms.

At the macro-level (country level), neoclassical growth theory developed by Solow and Swan (1956) and extended by Solow (1957) assumes that the shortage of production factors and high labor costs in wealthy countries encourage them to shift their production to poor and labor-intensive countries. This may arise the direct effect of FDI on economic growth through the capital provision and technological advances. There is a wide range of previous literature and empirical evidences on direct relationship between FDI and economic growth in transition economies (Balasubramanyam, Salisu, & Sapsford, 2006; Forte & Moura, 2013; Murthy, 2015; Silajdzic & Mehic, 2016; Temiz & Gokmen, 2014) and in Vietnam (Anwar & Nguyen, 2010).

At the micro-level (firm-level), relevant FDI theories provide relevant concepts and discussions approving the existence of FDI spillovers from foreign firms to domestic firms. These relationships are later clarified by Blomstrom & Kokko (1998) to provide a comprehensive picture of how foreign externalities spread to domestic firms. First of all, **strategic and long-term factor theory** describes a set of strategic and long-term factors explaining foreign presence in other countries. This long-term commitment and presence can trigger spillover effects on domestic firms in the intra-industry and inter-industry by creating more chances for imitation, demonstration as well as the delivery of strategic production inputs from foreign subsidiaries to domestic firms. Secondly, **eclectic theory** is the convergence of

industrial organization theory, internationalization theory and location theory providing three conditions for FDI motivations: (1) the existence of comparative advantage (firm-specific or location advantages); (2) favorable entry mode and (3) the existence of preferential production factors in the host economy. Thirdly, **industrial organization theory** also emphasizes MNCs' ability to relieve the liability of foreignness by collaborating with local enterprises and the transfer of foreign firm's specific factors. Thus, this may a source of spillovers occurred through linkage relationships. Fourthly, **product life cycle theory** figures out 4 stages of the product life cycle with the goals of successive product innovation and promotion. As a result, technology and products are increasingly standardized for untrained low-skill workers, low-cost developing countries to replace exports from developed countries where the products are created and launched. Fifthly, **oligopolistic reactions theory** explains one firm's FDI implementation in an effort for market expansion may be reacted by the competitors in the industry. An increase in intra-industry competition and entry concentration in a host country may generate both negative and positive spillovers on domestic firms. Finally, **Kojima's theory** describes FDI as a source of factor endowments in kind of capital, technology, and skills transfer from home countries to host countries. As a result, this provides another channel for FDI spillover which can enhance trade and labor welfare or vice versa.

These all six theories are initial theories to mention the potential mechanisms of foreign spillover effects on domestic firms' productivity trade flows and employee compensation in terms of wages. These spillover motivations and mechanisms (vertical channels via forward and backward linkages and horizontal channels via imitation/ demonstration, competition, and worker mobility) are profoundly discussed in further critical reviews on FDI theories (Blomstrom & Kokko, 1998; Blomström & Sjöholm, 1999; Calvet, 2014; Caves, 1974; Denisia, 2010; Forte & Moura, 2013; Schaumburg-Müller, 2003; Wang & Blomström, 2002). Last but not least, previous literature and some empirical evidences emphasizes the importance

of absorptive capacity revealed by firm and industry's specific characteristics in determining the direction and the extent of FDI spillovers ((Aitken & Harrison, 1999; Aitken et al., 1997; Blomstrom & Kokko, 1998; Fatima, 2017; Hamida, 2013; Kokko, 1994; Sánchez-Sellers, Rosell-Martínez, & García-Vázquez, 2014a; Wang & Blomström, 2002).

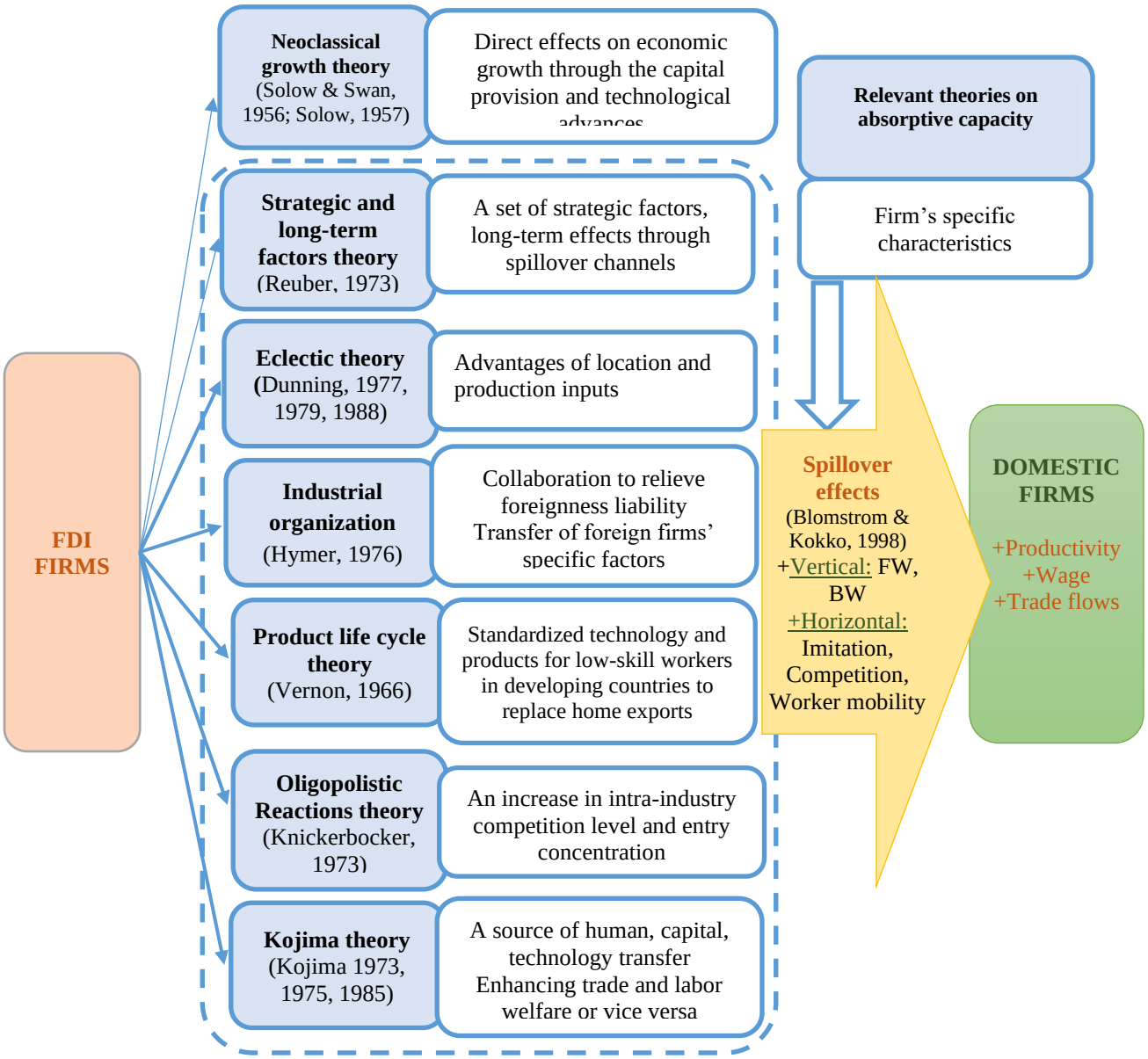

Figure 2-5: A theoretical framework of relevant theories illustrating the presence of FDI spillovers. *Source: author*

2.9 Productivity spillovers from FDI

Productivity spillover describes the phenomenon that the productivity level of local firms in the FDI receiving country is intentionally or unintentionally affected in both positive and negative ways as a result of foreign equity entries and their operations in the host country (Blomstrom & Kokko, 1998). The productivity spillover can be delivered to local receiving firms in several ways. Firstly, it can occur when foreign firms implement the demonstration of their existing technology or training their employees (Hamida & Gugler, 2009). In this way, the local firms in Vietnam can easily imitate or pay higher salaries to attract the workers used to work or training by MNCs (Fosfuri et al., 2001). Secondly, the local firms in a joint venture relationship with foreign partners can gain many advantages in this learning and upgrading process to improve productivity and competitive advantage (Blomström & Sjöholm, 1999). Thirdly, it is undeniable that competition pressure along with foreign presence is another strong motivation for domestic firms to make relentless efforts to increase the productivity by upgrading their technology and reinforcing their human capital stock (Hallin & Holmström Lind, 2012). Finally, productivity can also spillover through vertical business linkages between local firms and foreign firms; for example, be local suppliers for MNCs in the upstream sector or be local customers for MNCs in the downstream sector (Giroud, 2007; Mariotti et al., 2015).

It is worth to note that Blomstrom & Kokko (1998) have expanded previous studies to provide a relatively completed theoretical background and valuable concepts for further researches on FDI externalities in both home country and host country. Most recent studies based on their work to establish their estimation model and further complicate the issue. The authors use case study methodology and the use of some limited empirical evidences at that time on MNCs activities and its spillover effects on local firms to provide a conceptual framework of spillover theories with two branches of productivity spillovers and market access spillovers.

2.9.1 Channels of productivity spillovers from FDI

Many recent authors investigate the productivity spillovers from FDI by two main spillover channels including horizontal FDI spillover and vertical FDI spillover (Damijan et al., 2013a; Fatima, 2016; Iršová & Havránek, 2013; Le & Pomfret, 2011).

2.9.1.1 Horizontally productivity spillovers

According to Aitken & Harrison (1999) and Blomstrom & Kokko (1998), horizontally productivity spillovers is defined as the changes in productivity levels of local competitors when there are the presences of wholly foreign-owned firms or joint venture subsidiaries operating in the same industry or intra-industry (as in figure 1). These changes may come from the positive FDI externalities such as the technology diffusion, superior management and worker turnover from foreign firms to domestic firms; or negative externalities as competition and intellectual protection (Carluccio & Fally, 2013). In this way, higher foreign equity in a particular sector may link to the positive changes the productivity of local competitors if the local ones in the same sector can inherit the existing or advanced technology which is now less expensive and more available.

Besides, the domestic players can also benefit from the movement of labor from the FDI sector to domestic sectors because this labor force has received formal training and experienced an efficient process (Fosfuri et al., 2001; Hübler, 2015). The attraction of these workers can facilitate technology transfer and enhance the absorptive capabilities of the local firms. In contrast, the foreign presence may cause a higher probability of local firms' failure and exit due to fierce competition and crowding-out effect (Javorcik & Spatareanu, 2008). Furthermore, foreign firms tend to closely protect their technology from horizontal competitors. It is not easy to adopt the technology from the foreign sector without a relentless effort and high learning cost. Thus, the local firms lacking resources, technology, management

know-how and slow response to market changes may become the victims of foreign entries (Huynh, Nguyen, Trieu, & Tran, 2019).

On the contrary, there are many challenges that local firms in the host country have to confront to benefit from horizontal FDI spillovers. It is admitted that domestic firms with low competitiveness and absorptive capabilities can't absorb positive externalities from foreign competitors for improving their productivity and performance and become unexpected victims of foreign entries (Jordaan, 2013). It is also important to note that the intra-industry foreign competitors are the experts in retaining and satisfying their good employees (Caves, 1974). Thus, the attraction of high-skilled labor from this sector is quite difficult and requires many resources. As a result, the positive horizontal spillover may be easily outweighed by fierce competition in the same industry in the host market.

2.9.1.2 Vertically productivity spillovers

Vertical spillover, on other hands, is the result of the backward and forward linkage created by domestic firms under the agreement of MNCs which enable local firms to become a stakeholder in the supply or distribution chain with foreign presence firms (Halpern & Muraközy, 2007). Further, such kinds of linkages contribute to build the domestic firm's capabilities and improve productivity in the long run (Iršová & Havránek, 2013). Firstly, the backward linkage occurs when domestic firms are chosen to be the suppliers of local inputs to foreign companies. Admittedly, this is considered as the most important channel as it is believed to generate the positive externalities on the involved native firms; for example, quality control, product and process innovation to compete and meet the requirements of the foreign sector. Secondly, the forward linkage comes from the use of foreign inputs in the production of local firms. These upstream and downstream business activities are no longer strange to emerging economies where the race to cost minimization is happening lively along with many potential opportunities for maintain the competitive advantages and expanding the market

(Merlevede & Purice, 2016). However, these benefits are delivered selectively to firms with high absorptive capacities. It is undeniable that those firms' gains are also compensated by many challenges such as stricter requirements of quality standards, higher operation cost, and fierce competition.

More comprehensively, this dissertation attempts to combine and illustrate the flows of FDI spillover channels from foreign firms to domestic firms in the host country as in the figure below. Within the framework of horizontal spillover, Carluccio & Fally (2013) discussed that technology could spill over horizontally from FDI firms to domestic firms by three means. The first channel mentioned is demonstration/ imitation effects that could improve institutional, managerial, and technological skills, competition effects. The second means for transferring is competition effect that the existence of FDI firms could increase the competitiveness of the market, which pushes domestic firms to update skills to improve their productivity (Blomstrom & Kokko, 1998; Blomström & Sjöholm, 1999). Thirdly, the productivity could spillover via the movement of employees from FDI firms which have higher technology level to domestic firms, or via complementary workers (Fosfuri et al., 2001).

It has also been illustrated that vertically backward spillover occurs in the upstream sector through upstream activities between local suppliers of intermediate goods and foreign subsidiaries while vertically forward spillover occurs in the downstream sector through downstream activities between foreign subsidiaries and local customers (Iršová & Havránek, 2013). Backward spillover refers to the effects of foreign firms' activities on local providers or local suppliers' proactive adaptation to ensure the quality and the standardized process of local inputs supplied (Javorcik & Spatareanu, 2011). In this way, higher foreign standards for product quality and reliable delivery encourage local suppliers to improve their product and process to receive stable orders from foreign firms. Besides, the MNCs also have incentives to transfer their knowledge to local suppliers in the backward linkage chain to control better

their production (Hamida, 2013). More important, as the local supplier is a stakeholder in MNCs' supply chain, its practices can directly influence the performance of foreign subsidiaries. Therefore, in most cases, backward spillover has been considered as the most positively dominant channel of FDI spillover.

Forward linkage, on the other hand, describes the externalities arisen when the outputs of foreign subsidiaries are distributed to the downstream customers in the host country. It is undeniable that the foreign presence makes the foreign inputs with a high content of technology more available and less expensive to local producers (Javorcik & Spatareanu, 2011). Besides, the additional services along with the product is also a potential channel of positive externalities from FDI. Although the foreign sector may have different strategies and incentives in the business relationships with forwarding and backward partners, there is also a place for the existence of forwarding spillover.

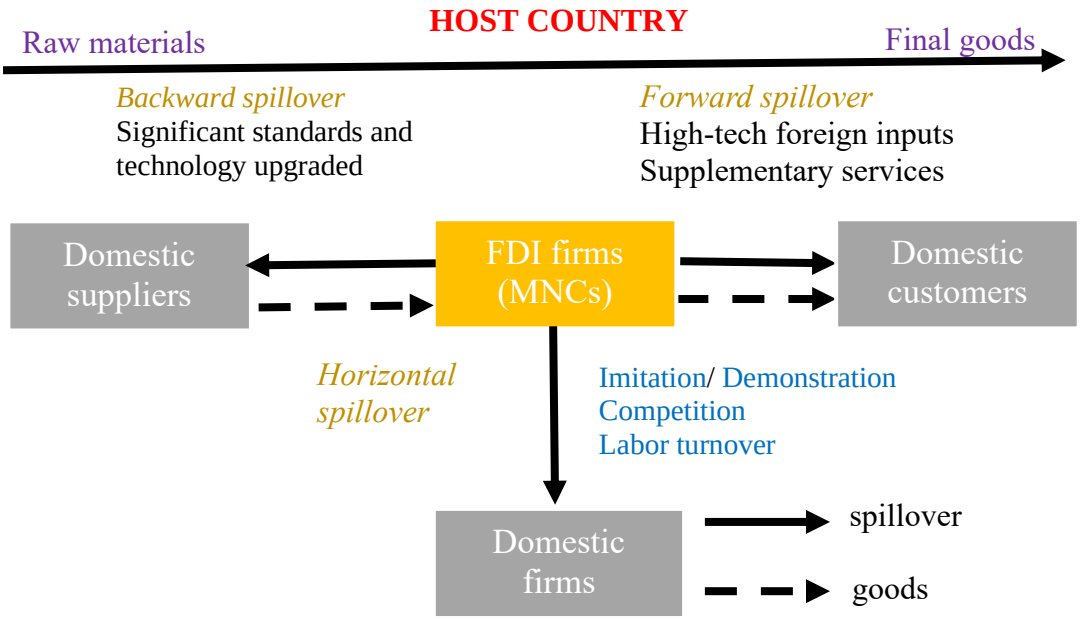

Figure 2-6: FDI horizontal and vertical productivity spillovers from MNCs to domestic firms. *Source: author, adapted from Huynh et al. (2019)*

2.9.2 The effect of absorptive capabilities on productivity spillovers

The initial theoretical reviews indicate domestic host firms' motivations in improving their internal capacities to better absorb positive FDI externalities, especially through backward linkage relationships with foreign subsidiaries (Blomstrom & Kokko, 1998; Caves, 1974). They also recognize the factors determining the absorptive capacity of an indigenous firm in response to foreign presence such as R&D activity and expenditures, internal organization of innovation, external relationships of innovation, quality of human capital, family management, business complexity reflected in different levels of technology and processes and market concentration (Sánchez-Sellers et al., 2014a). However, under the real circumstance of emerging economies, factors reflecting firm's absorptive capabilities are restricted to several existing indicators. Because of the lack of R&D and innovation activities and expenditures devoted to these activities, absorptive capabilities in transition economies can be determined by three primary indicators including human capital, technology gap and financial development (Anwar & Nguyen, 2014; Fatima, 2017; Silajdzic & Mehic, 2016). Regardless of the author's effort in this dissertation to capture the R&D activities and expenditures, it fails to explain the situation due to an insufficient number of observations.

First of all, technology gaps significantly affect domestic firms' ability to adapt to MNEs' valuable intangible assets. The majority of studies have provided strong evidence confirming this relationship. Iršová & Havránek (2013), Javorcik & Spatareanu (2008) and Kokko (1994) agree that the technology gap is an important determinant of FDI spillover. However, a recipient country must have a certain level of technology gap to benefit from spillover; otherwise, there is no gain from technology spillovers. For instance, Hamida (2013) shows that only domestic firms that have invested predominantly in absorptive capacity gain from FDI spillovers. Damijan, Rojec, Majcen, & Knell (2013) find significant and positive horizontal spillover in domestic firms with high and medium absorptive capacity. Girma, Görg,

& Pisu (2008) find that if the difference in technology level between recipient firms and MNEs is too great, spillover is less likely to occur.

Second, human capital is another important channel of spillover absorption as the successful implementation of this transfer requires the involvement of skilled and well-trained labor force (Becker, 1975; Liu, Parker, Vaidya, & Wei, 2001). There is no doubt that firms with experienced managers, experts, qualified technicians, and workers have a better absorptive capacity and are more ready to receive positive foreign externalities. Furthermore, the mobility of foreign-trained employees to domestic firms may contribute to knowledge diffusion and increase the domestic firm's absorptive capabilities (Wang, Deng, Kafouros, & Chen, 2012).

Third, financial development reflects the financial health and absorptive capacity of a firms by the availability of organizational slacks for new ventures (Bourgeois, 1981; Nohria & Gulati, 1996). More important, a stable foundation of financial development provides domestic firms more incentives to invest in capacity building and the advanced technology to imitate and relieve the pressure of foreign penetration in their host country. Besides, the availability of financial resources allows domestic enterprises proactively to reach and get involved in upstream and downstream linkages with foreign subsidiaries. This brings more chances for positively vertical FDI externalities.

2.9.3 Regional spillover effects and the impact of geographical proximity

The concentration of FDI inflows in different parts of the recipient country can determine the magnitude of technology spillover. FDI spillover has regional effects, meaning that firms located near areas of high FDI concentration are most likely to benefit from the spillover (Aitken & Harrison, 2013). According to Wei & Liu (2006), a technology from FDI may transfer to local firms in the same area and then spread to other locations. The magnitude

of this spillover, however, depends on the characteristics of each region, such as the availability of natural resources and labor and the business environment (Perri & Peruffo, 2016; Wang & Wu, 2016). However, it is also argued that a high density of local firms surrounded by foreign affiliates within an industry creates higher competition, which may generate an adverse externality on the host country's production performance. The extension of benefits from technology and knowledge spillover to local firms highly depends on their capacity to compete, maintain their position in the market, and absorb advanced knowledge for application in their own business (Damijan et al., 2013a; Hamida, 2013; Xu & Sheng, 2012). Otherwise, domestic companies may suffer from a loss of market share, which will negatively affect the growth of the whole nation.

Aitken & Harrison (1999) find that there are no FDI externalities at the regional level. On the other hand, in the United Kingdom (UK), Girma, Görg, & Pisu (2008) identify positive spillover for intra-industry firms in the same region but negative spillover for intra-industry firms located in different areas. Similarly, Xu & Sheng (2012) find a significant and positive relationship between spillovers and the productivity of firms in the same sector and region. Exploiting panel data on 10,000 Chinese firms, Wei & Liu (2006) find evidence of positive intra-industry spillover within areas. Aitken & Harrison (1999) argue that, if the benefit of FDI spillover to the local area is too small to compensate for its negative impact on the whole country, then it is reasonable to conclude that FDI hurts the development of the host country. Therefore, more research on the importance of the geographic distribution of FDI spillover is needed to help governments adopt appropriate policies on investment by foreign countries.

2.9.4 Empirical evidence on productivity spillovers from FDI

Regardless of relentless efforts in clarifying the impact of FDI spillovers, the empirical evidence on productivity spillovers from FDI is still ambiguous with controversial arguments. While many authors indicate the importance of inward capital in raising the stock of financial

human capital and improving host country's productivity through vertical and horizontal spillovers (Aitken et al., 1997; Du et al., 2012; Mariotti et al., 2015; Salim, Razavi, & Afshari-Mofrad, 2017), some argued that competition incurred by FDI outweigh the positive spillovers generated by imitation and labor mobility (Decreuse & Maarek, 2015; Hamida, 2013; Javorcik & Spatareanu, 2008; Le & Pomfret, 2011).

To further complicate the matter, recent studies on emerging economies explore the importance of absorptive capabilities in term of human capital, technology gap and financial development (Anwar & Nguyen, 2014; Behera, 2017; Hamida, 2013); distance (Anwar & Sun, 2016; Thang, Pham, & Barnes, 2016); trade orientation (Anwar & Nguyen, 2011b; Ha & Giroud, 2015; Havranek & Irsova, 2011); firm and industry heterogeneities (Carluccio & Fally, 2013; Damijan et al., 2013b; Fatima, 2016) in determining how these variables influencing the direction and extent of the productivity spillovers. In addition, a possible explanation for mixed findings may come from a variety of methodologies and contexts (as in Appendix 1).

Pioneering research by Caves (1974) was conducted on testing the relationship between MNCs' presence, intra-industry competition, and the productivity in the host economy. The study aimed at investigating FDI spillovers using the dataset of Canadian and Australian manufacturing firms across 87 different industries. The author used a simple model to explore the determinants of domestic firms' profit rate on equity (ROE). The explanatory variables include foreign share of industry sales, total assets, the ratio of value-added per worker, foreign ownership share and market concentration. The author found that the presence of MNC's subsidiaries enhances the efficiency of domestic resource allocation and speed up the technology transfer to local ones. However, foreign presence negatively affects the profits of domestic firms. Aitken, Hanson, & Harrison (1997), on the other hand, examined the effects of FDI spillovers on the export orientation of domestic firms using panel data of 2104 Mexican manufacturing firms from 1986 to 1990 to estimate two-stage PROBIT regression. The author

established the proxies for independent variables such as domestic and foreign output price, industry concentration, local export concentration, MNC export, proximity to subsidiaries. This is the first author revealing his concern on whether spillovers are bounded by geographical distance. As a result, the study comes up with the conclusion that the presence of MNC as "catalysts" for local export activity. Besides, domestic firm export is positively correlated to the distance to MNCs and uncorrelated to the concentration of local exporters.

Inheriting the conceptual framework of Blomstrom & Kokko (1998) and the empirical model of Caves (1974), Blomström & Sjöholm (1999) conducted an empirical analysis of the effect of foreign presence on labor productivity. The authors used cross-sectional data of more than 16,000 Indonesian firms from 329 industries surveyed in 1991 by Indonesian Central bureau statistics. The model is estimated using labor productivity function. The explanatory variables include capital intensity, labor skill, capital utilization and scale of operation. The relationship between foreign presence and labor productivity is moderated by foreign ownership shares: a large percentage owned (major) and minor percentage owned. In conclusion, the study found that foreign-owned firms are dominant players achieving high productivity in comparison to local ones. Meanwhile, the degree of foreign ownership doesn't matter for productivity. Thus, the hypothesis that MNCs facilitate positive labor productivity spillover to local firms is not supported.

Concerning the ownership structure of FDI firms, Aitken & Harrison (1999) – one of pioneering researchers used a panel data of 4000 Venezuelan from 1976 to 1989 estimated by Ordinary Least Square (OLS) and Weighted Least Square (WLS) models to investigate the effects of foreign presence on domestic firm productivity (log of firm-level real output). The right-hand side of the equation includes the variables such as skilled labor, unskilled labor, materials, capital, foreign equity participation in the firm (0 to 100%), foreign ownership in the sector. It has been found that foreign share in total equity (joint venture) matters for enhancing

the productivity of domestic firms. Besides, a higher concentration of foreign ownership in the sector triggers negative effects on local firms' productivity as a result of scale dominance and high competitiveness. Nevertheless, there is no signal for technology transfer from foreign firms to local ones.

Since the early analyses, there are many empirical researchers devoted their efforts to replicate or expand the empirical models to measure the productivity spillovers associated with foreign presence across different economies using labor productivity for total factor productivity as a dependent variable. It is undeniable that these researches contribute to further complicate the issue and expand the original empirical works by conducting different methodology and variables. However, the impact of FDI externalities on the economic indicators of domestic firms appears to contextual bounded and even raises more questions than answers.

Taking human capital into account, Liu, Parker, Vaidya, & Wei (2001) used log-linear function to investigate both direct and indirect effect (spillovers) of inward FDI on host economy’s industry productivity which is later expanded to firm-level spillovers by series of researches such as Javorcik (2004b), Damijan et al. (2013b) and Anwar & Nguyen (2014). The authors used cross-sectional data of 47 sub-sectors in the Electronics industry in 1996 and 1997 taken from China's statistical yearbook. For robustness checks, the statistical tests recommend the use of the WLS model, 3SLS and W2SLS instead of OLS and 2SLS. The authors attempted to calculate the dependent variable of labor productivity by each sub-sectors and independent variables including capital intensity, firm size, labor quality (human capital of both local and foreign firms) and foreign presence (the share of foreign capital in total capital in each sub-sector). The findings are quite optimistic that MNCs presence explains the rise in labor productivity. Interestingly, all explanatory variables, especially human capital lead to an improvement in labor productivity in each sub-sector in the host economy.

As regard to absorptive capabilities, Damijan et al. (2013b) used panel data of more than 90,000 firms across 10 transition economies over the period from 1995 to 2005 for model estimation. The authors applied the Heckman two-step procedure initiated by Javorcik (2004b) to calculate TFP (using Olley-Pakes approach), then regress spillover proxies on TFP. The result indicates 4 over 10 transition economies receive positive direct effects of FDI. However, without firm absorptive capabilities, there is no signal of horizontal spillover. It is important to note that the higher the absorptive capacities and productivity level, the higher the probability the firm benefits from productivity spillover. The finding is also supported by many studies (Demena & Murshed, 2018; Sánchez-Sellers, Rosell-Martínez, & García-Vázquez, 2014b; Wang, 2010).

Anwar & Nguyen (2014) once again indicated that productivity spillover varies across regions with different levels of absorptive capacities measured by three main indicators - human capital, technology gap, and financial development. The authors used panel data of Vietnamese manufacturing firms from 23 industries from 2000 to 2005 and the input-output matrix in 2000 to conduct a two-stage estimation. They firstly calculate TFP using the Cobb-Douslag model, then estimate the spillover variables and determinants affecting TFP. The findings emphasize the importance of backward spillovers and absorptive capacity in determining domestic firms' productivity. From a more supportive perspective, Fatima (2017) estimated his quantile regression on Turkish firms and come up with the conclusion that absorptive capacity is a facilitator to enable local firms to become beneficiaries of FDI. Thus, an increase in absorptive capacity should be supported and accumulated for lower TFP quantile firms.

By separating the technological level of local firms, Sena (2004) also attempted to find evidence for productivity spillovers from FDI; however, using a quite different method of Data Envelopment Analysis (DEA) and firm-specific technical change index (Malmquist) to

calculate firm productivity growth. Due to its appropriateness, panel data of 206 Italian manufacturing firms from 1989 to 1994 is once again used to estimate the model. The sample data is classified into high-tech and non-high-tech firms. The independent variables of technical change, investment ratio, the foreign share of equity are added into the model. The results indicate knowledge diffusion from high-tech to low tech Italian manufacturing firms. Besides, endogenous problem between FDI and productivity growth may be avoided by the index as it compares the firm's output/input ratio to the shift of best production possibility.

To further complicate the matter, Le & Pomfret (2011) attempted to differentiate the spillover effects across different levels of technology gap, ownership structure and trade orientations using firm-level panel data of Vietnamese enterprises from 2000 to 2006 surveyed by GSO and 2-digit aggregate IO matrix from VSIC. FEM and REM approaches are conducted to estimate the regression equations. In conclusion, the effect of vertical spillovers (especially through backward linkage) on the local firm's productivity is positive. The firm size and technology gap matter for the effect of backward spillover on labor productivity. Negative horizontal spillovers to labor productivity of domestic firms occur in the firms with one of the following characteristics such as private, domestic-oriented, known R&D and low-tech.

Regarding vertical spillovers, Javorcik (2004b) contributed significantly to the existing literature by initiating a two-stage estimation procedure to explore the effect of foreign capital share on firm total factor productivity (TFP) in the host country. In the first step, the author used a panel firm-level data of Lithuanian manufacturing enterprises from 1996 to 2000 to calculate TFP (Cobb Douglas production function using Olley-Pakes correction). In the second step, the author regressed FDI spillover variables (foreign share, horizontal spillover, backward spillover for partially foreign ownership, backward spillover for wholly foreign ownership, forward spillover). The findings reveal that backward spillover as the dominant channel of productivity spillover from foreign firms to local firms while the assumption for intra-industry

spillover (horizontal spillover) is not supported. Furthermore, partially foreign participation is found to enhance the process of productivity spillovers.

It is worth to note that the study of Javorcik (2004b) is a significant work orienting and influencing the later empirical researches on FDI spillovers, especially in term of methodology (Anwar & Nguyen, 2014; Jacobs et al., 2017; Javorcik, Turco, & Maggioni, 2018). Similar to the findings of Javorcik (2004b), Barrios, Görg, & Strobl (2011)) also found significantly positive backward spillovers from FDI. The authors used firm-level data of Irish enterprises from 1983 to 1998 surveyed by Irish Economy Expenditure and Input-output table to explore the effects of three spillover channels (horizontal, forward, backward) on productivity. First, Levinsohn and Petrin (2003) approach are conducted for productivity estimation. Second, the GMM approach is used to check whether the result is robust. It is interesting to note that the authors attempt to use both home country's input-output matrix and host country's one to separate forward and backward effects generated from these two sources (domestic source and imported source). It is admitted that MNCs have similar behaviors as local firms in sourcing inputs for cost minimization implying the potentials for building backward linkage with local suppliers.

For vertical spillover measurement, Lenaerts & Merlevede (2016) conducted a meta-analysis differentiating the use of aggregated input-output tables versus a detailed input-output table using panel data of Romanian service and manufacturing firms from 1996 to 2005. Similar to Javorcik (2004b), the authors conducted a two-step procedure to calculate TFP and explore the effects of FDI spillovers on TFP. Besides the use of the Olley-Pakes approach, Lenaerts & Merlevede (2016) also used alternatives of TFP calculation (LP, 2003) and replaced the use of Cobb-Douslag production function by Translog production function for robustness check. The findings explain why previous studies result in a dominant horizontal effect. There

is strong evidence toward positive backward spillover using detailed IO while the magnitude horizontal spillover is in favor of aggregated IO table use.

Investigating the existence of intra-industry (horizontal) spillovers, Du et al., (2012) also adopted the methodology of Javorcik (2004b) to estimate the effects of intra-regional and inter-regional FDI spillovers on the productivity of Chinese manufacturing firms from 1998 to 2007. In this way, the foreign share is classified by its origin countries resulting in two regions: (1) Hongkong – Macau – Taiwan and (2) other countries. Under different firm internal capacities, foreign shares by other countries (except HK – Macau – Taiwan) positively affect firm productivity. In addition, while there is no/ weak influence of horizontal spillover on individual firm productivity, backward and forward spillovers positively affect domestic firms' productivity. Different from Du et al. (2012), Liu, Agbola, & Dzator (2016) found a positive effect of horizontal spillover on TFP using panel data of 1328 Chinese firms in the electronics industry from 2003 to 2008. However, the impact of horizontal FDI in the labor-intensive industry on TFP is unexpectedly negative. It is admitted that a lower productivity gap between foreign firms and domestic firms in an economy provides more room for positive spillovers and local ones' productivity improvement.

Regarding geographical distance, Girma & Wakelin (2007) researched a different context using UK firm-level data surveyed by the national statistics office in 1980 and 1992. Firstly, TFP was estimated using Olley – Pake's semiparametric approach. Secondly, the authors estimated productivity spillovers from regional FDI (FEM, GMM). Besides, twice lagged values for spillovers, lagged government subsidy, lagged regional and productivity growth are also added to the model to control endogenous problems. The estimation result shows consistently signs over OLS and Olley-Pakes TFP estimation approach. Importantly, there are evidences for both intra-regional and inter-regional externalities. It is worth to note that distance from local firms to MNCs matters for spillovers. Meanwhile, domestic firms in

less-developed regions lacking MNCs concentration receive lower FDI spillovers. The findings are consistent with Halpern & Muraközy (2007) who also indicate the importance of distance in triggering negative horizontal spillovers and positive vertical spillovers with large magnitude using panel data of Hungarian manufacturing firms from 1996 to 2003.

In contrast to Girma & Wakelin (2007) and Halpern & Muraközy (2007), Mariotti, Mutinelli, Nicolini, & Piscitello (2015) rejected the role of distance as an important facilitator or barrier of the productivity spillovers using panel data of 1999-2005 Italian firms in both services and manufacturing industry. The author estimated TFP by the semi-parametric estimation procedure of Levinsohn and Petrin (2003) to control for the simultaneity problem of input choice, then used GLS regression to capture FDI spillovers. By focusing on the colocation factor, Mariotti et al. (2015) found that local suppliers and downstream customers of foreign subsidiaries in the service sector receive greater productivity spillover compared with those in the manufacturing sector. Besides, distance is not important in determining spillovers, especially for the service sector. A recent study on 1998-2007 Chinese manufacturing firms by Lin & Kwan (2016) used a spatiotemporal autoregressive panel model and system GMM to consider whether spillovers depend on geographical distance. The authors once again support findings of Girma & Wakelin (2007) and Halpern & Muraközy (2007) that FDI presence in surrounding regions of domestic firms' location is an advantage.

Regarding ownership identities and trade orientation, Newman, Rand, Talbot, & Tarp (2015), on the other hand, established the econometric model of productivity spillovers using 4000 Vietnamese manufacturing enterprises from 2009 to 2012 surveyed by Vietnam technology and Competitiveness. The authors also conducted the robustness checks to control for sector-level concentration and Olley-Pakes approach for controlling the input simultaneity problem of TFP estimation. Different from Giroud (2007), Newman et al. (2015) found the strong magnitude of vertical spillovers through both backward and forward channels. This is also

different from Barrios et al. (2011) and Javorcik (2004b) who only approve the existence of backward spillovers. According to Newman et al. (2015), the backward spillovers are significantly positive while the forward spillovers are significantly negative. Also, the finding reveals less negative productivity spillover from 100% of foreign-owned firms to local firms indirect linkages with them. Indeed, this may reflect the inter-industry technology transfer through a production network. Further, the most recent study by Javorcik, Turco, & Maggioni (2018) on Turkish manufacturing firms across 22 industries from 2003 to 2011 found a positive spillover effect on Turkish TFP through both vertical and horizontal channels. It is interesting to note that firms with export orientation benefit more from all kind of spillovers

The other explanation for mixed empirical findings may come from the firm and industry heterogeneity. Gorodnichenko, Svejnar, & Terrell (2014) conducted a meta-analysis using firm-level panel data from 17 countries in Central and Eastern Europe, Turkey and the Commonwealth of Independent States from 2002 to 2005. Cobb-Douslag revenue function and Solow residual model are used to estimate the FDI spillover effect on revenue efficiency controlled by the firm and industry characteristics. There is a wide range of moderating variables tested on the relationship between FDI spillover and revenue efficiencies such as bribes, manager's time spent with officials, ownership identity, FDI source of origin, human capital, distance from the technological frontier and firm-level linkages. Damijan et al. (2013b) also investigated whether firm heterogeneity influences the productivity spillover from FDI using panel data of manufacturing firms across 10 developing economies. Their findings reveal positive backward spillover and insignificant horizontal and forward spillover. It is also concluded that the institutional variables have little effect on efficiency spillover. Meanwhile, human capital, distance from the technological frontier, firm, and industry-specific characteristics can affect productivity spillovers from FDI to some extent (Nguyen & Sun, 2012; Sena, 2004).

2.10 Wages spillovers from FDI

2.10.1 The effect of FDI horizontal spillovers on wages:

FDI horizontal spillover is no longer a novel concept for host developing countries receiving foreign equity from more developed countries. Horizontal spillover from FDI occurs when foreign entries in terms of inward capital, technology, and senior executives operate in the same industry as domestic-owned firms and contributing to the industry's total output (Blomstrom & Kokko, 1998; Caves, 1974). Based on the theoretical literature and empirical evidence, horizontal spillovers can trigger positive externalities by offering local firms more opportunities to adopt new advanced technology and managerial skills through demonstration, imitation, and worker mobility channels (Blomstrom and Kokko, 1998; Dimelis, 2005; Gorodnichenko, Svejnar, and Terrell, 2014).

However, at the horizontal level, the positive spillovers from foreign presence may be compensated by fierce intra-industry competition (Hamida, 2013). In countries like Vietnam that are characterized by low-tech sectors and unskilled labor, the risks of foreign presence to local firms and employees are relatively high (Le & Pomfret, 2011). The question of whether horizontal FDI brings benefits to local workers in terms of wages is even more complicated to answer. Javorcik (2015) finds a positive impact of foreign affiliates on both domestic workers' compensation and the country's benefits by creating good jobs and improving productivity. The relevant literature has developed two main streams on how horizontal spillovers from foreign presence affect local wages: (1) competition in the labor market between foreign affiliates and domestic firms and (2) aggregate productivity improvement (Aitken & Harrison, 1999; Driffield, 2004; Pittiglio, Reganati, & Sica, 2015).

First, under labor competition theory in the host market, the status quo of employee mobility demands that foreign-based firms pay higher wages than local companies for highly

skilled and experienced workers (Becker, 1975). Because multinational enterprises (MNEs) require highly qualified and committed workers to operate efficient systems, they generally pay higher wages than local rates to discourage labor turnover of highly skilled workers (Aitken & Harrison, 1999; Driffield, 2004; Meyer, 2003). Foreign companies tend to protect their intangible assets (a sunk cost), and high wages are a means of minimizing trade losses and labor turnover issues (Dunning, 2000; A. Kokko, 2004).

Moreover, new entries into a developing market are always accompanied by foreign liabilities that require the foreign affiliates to confront a shortage of skilled workers and the difficulties of recruiting and retaining this kind of labor (Fukase, 2014). Recruiting a majority of skilled workers and assimilating these employees are essential to not only maintain but also promote productivity in the long run and ensure the efficient operation of MNCs (Chew & Teo, 2002). Besides, high payments can function as a marketing strategy highlighting the company's capital, revenue and high adaptability to the new environment.

Furthermore, although local firms' business practices and wage policies in host developing countries are very familiar to local workers, highly qualified workers will gradually realize that their dream jobs are available with greater compensation at foreign firms. This recognition supports their bargaining power for the wage they expect to receive for a particular job. Under this labor competition, domestic firms are forced to pay higher wages to attract qualified workers, leading to an increase in the wage equilibrium (Fukase, 2014; Onaran & Stockhammer, 2008). Regardless of an MNC's generous wage policy, the labor demand, capital intensity, firm size, skill intensity requirement, and wage minimum and premium levels in the host country influence the effect of FDI on salary (Nelson, 2010; Ni et al., 2017).

Second, previous studies have argued that FDI firms bring substantial benefits to the host country, including advanced technology, management know-how, and productive capital.

From the perspective of aggregate productivity improvement, local businesses can absorb knowledge spillovers from foreign presence through observation, imitation, and demonstration activities to enhance their labor productivity and produce at more efficient marginal costs (Hamida & Gugler, 2009; Blomstrom & Kokko, 1998; Caves, 1974). The absorptive capacity of labor is extremely important for domestic firms to receive positive productivity spillover from FDI (Huynh et al., 2019). Labor productivity is significantly greater in foreign companies than in local firms; as a result, the observed wage for foreign companies is also higher than that of local companies. Due to favorable conditions and a sense of opportunity, the nature of the horizontal spillover will boost the productivity of local firms and push up the wage equilibrium of local workers (Aitken et al., 1997). The positive and dramatic effects of horizontal spillover on the wages of domestic workers are also topics in the literature on skill development and expansion of knowledge (Blomström & Persson, 1983; Blomström & Sjöholm, 1999; Globerman, 1979; Liu, 2002).

However, FDI also increases wage inequality in developing countries. The management skills, market information, technology, know-how, and knowledge development that FDI brings to developing countries can accelerate technological change, a skill-driven process, and thus increase income inequality in developing countries (Figini & Görg, 2011; Javorcik, 2015; Zulfiu-Alili, 2014). First, the importance of spillovers can be most valuable to the industry because of the implications of high technology for production. Because MNEs tend to employ higher-skilled labor, they need to enhance production skills in developing countries (Feenstra & Hanson, 1997). Second, due to the fierce competition with MNEs, domestic firms are encouraged to adopt new technologies and enhance their research and development (Wood, 1995). Third, these technological changes could skew skills and increase the relative wages of skilled workers in developing countries (Figini & Görg, 2011). Thus, by allowing capital appreciation and technological change, FDI not only promotes economic growth by increasing

capital accumulation and productivity but also enhances income inequality in developing countries.

Onaran and Stockhammer (2008) investigate whether foreign presence and trade openness in terms of export and import orientations affect the average wage in five European countries using cross-country manufacturing panel data from 2000 to 2004. A wage bargaining model is estimated with real wage as the dependent variable and a wide range of independent variables such as labor productivity, unemployment rate, intensity of foreign equity, export and import ratio to total output. Notably, Onaran and Stockhammer (2008) contribute to the literature by exploring the effects of both FDI penetration and trade on wages. The authors find a significantly positive impact of FDI on wages in the short run but a negative impact in the medium run accounting for skill and capital intensity. The findings also reveal that international trade does not influence wages in the short run. Nevertheless, in the medium run, there is a positive relationship between exports and wages, whereas a negative relationship is observed between imports and wages. Although the effect of FDI on wages may vary across time, Javorcik (2015) finds an overall positive impact of foreign presence on national aggregate productivity and employees' salaries by creating good jobs and providing user training.

2.10.2 The relationship between trade openness and wages

Traditional trade theories recognize an effect of trade openness on a country's welfare, as the production of each country is based on its comparative advantages using its abundant resources. However, skilled workers' benefits may be negatively affected by a lower relative wage premium if developing countries specialize in producing unskilled labor-intensive products (Arbache, Dickerson, & Green, 2004). It is undeniable that trade openness is often accompanied by knowledge spillovers in terms of technological upgrades and inward capital, leading to higher demand for qualified workers (Marjit, Beladi, & Chakrabarti, 2004). Compared with industrialized countries, the impact of trade liberalization from the perspective

of developing countries is quite different. The premises of international economics emphasize the effect of international trade on intra-industry and inter-industry wage dispersion and the change in relative wages due to unbalanced worker mobility, such as increasing demand for skilled labor in export-intensive industries and a shock to labor demand in import industries (Martins & Opromolla, 2009; Onaran & Stockhammer, 2008).

The recent literature has reviewed how firm-level trade openness may affect wages in the formal employment sector in the host country. While trade openness negatively affects the real wages of both skilled and unskilled workers in the short run, it appears to generate well-paid jobs for unskilled labor and a decline in wages for skilled labor in developing countries (Onaran & Stockhammer, 2008). Economists argue that the effect of trade on wages may take time and is strictly linked to country and firm heterogeneities (Arbache et al., 2004). Therefore, the effects of trade on wages, in the long run, are better determined by cost efficiency and productivity improvement than temporary labor demand (Monte, 2011). Furthermore, the effects of exports and imports on wages should be analyzed separately (Onaran & Stockhammer, 2008).

Importing high-quality intermediate goods can benefit firms via efficiency and productivity improvements and generate positive externalities to workers by distributing higher wages (Martins & Opromolla, 2009). However, increasing imports of new machinery and technologies will temporarily trigger negative impacts on real output under the initially imperfect allocation of skilled labor in the short run. In other words, such imports may favor skill- or capital-biased industries and result in job losses for unqualified individuals (Arbache et al., 2004). Indeed, this shift will temporarily increase relative wages in favor of skilled workers. However, after this transition stage is over, the initial reduction in unskilled workers' wages may be offset as this labor force begins learning and adapting to the new technology. Therefore, increasing imports may lead to a decline in wages by intensifying the competitive

pressure on domestic firms and increasing wage inequality between industries and ownership sectors (Onaran & Stockhammer, 2008).

Exporters in developing countries, on the other hand, are often characterized by high-capital-intensity industries and rely on skilled labor. Consequently, workers employed in these industries have the strong bargaining power to demand their expected wages (Martins & Opromolla, 2009; Wood et al., 2014). When firms want to go global and sell their products to other countries, they need to adapt their products to international standards. The higher compensation associated with exporters is one way to motivate the workers to strive relentlessly to achieve common goals.

In practice, the measurement of the extent and frequency of FDI spillovers through the channels of competition, imitation/demonstration, worker mobility, and inter-linkage cooperation are not possible. Besides lacking information and indicators, these channels' level of appearance is very different and inconsistent across businesses and economies. That is the reason why previous researchers in Vietnam and around the world have measured the extent of FDI spillovers to domestic firms by horizontal (intra-industry) spillover and vertical (inter-industry) spillover. Therefore, this kind of classification and measurement is used by this thesis to measure and analyze the spillover effects of FDI on Vietnamese enterprises.

2.10.3 Firm heterogeneity and wage spillovers

Although compensation in foreign subsidiaries and large corporations may be higher in the early stage of expansion to recruit qualified workers with high absorptive capacity, the average wages may soon stabilize at a floor labor price that is equal to or slightly higher than that of local competitors and smaller firms (Decreuse & Maarek, 2015). There is no doubt that these firms have strong motivations to invest in emerging countries to acquire cheap labor (Chen, Ku, & Liu, 2018; Kojima, 1973). For example, China, known as the world’s factory and home

to many offshoring activities, has an extremely high demand for blue-collar workers, who often receive low wages (Zhihong Chen, Ge, Lai, & Wan, 2013; Nelson, 2010). Emerging economies such as Brazil and Indonesia have witnessed similar trends of the size-wage effect in which foreign presence is positive for skilled labor and negative for unskilled labor (Hijzen, Martins, Schank, & Upward, 2013). Therefore, under the common circumstances of developing countries, an increase in firm size may lead to a fall in the average wage, especially for low-skill labor.

The gender ratio (GR) is essential for assessing whether enterprises with higher rates of female workers earning the average wage have lower (mainly primary workers) total employment (Nguyen, 2015). Female workers may be considered more likely to be less skilled due to differentiated training and education levels (this perspective has been influential since ancient times in Vietnam). Further impacts may occur when skilled female workers acquire new views on workplace discrimination, particularly in a male-dominated society such as Vietnam (Fukase, 2014). However, there are other explanations for the divergent effects on wages for women and men. Difficulties faced by women during and after pregnancy may also explain the lagging and decreasing wages of women. Many young mothers decide to sacrifice and change careers when they have children. In particular, women tend to find flexible jobs that allow them to earn extra income while caring for their children. As a result, women have fewer job opportunities and may also be less likely than men to work for a company long-term. Therefore, in this study, the interaction term between gender ratio and horizontal spillover is expected to explain whether the share of female workers influences the horizontal effect of FDI on wages.

Empirical evidence has revealed that encouraging female employment in foreign subsidiaries and export-oriented firms lead to a reduction of the gender wage gap. However, foreign presence fails to enhance wage equality in the private sector as a result of gender

discrimination against women in developing countries (Chen et al., 2013). Although FDI inflows and export orientation narrow the gender wage gap, the diverse effects of these phenomena on wages can be traced to the gender productivity gap and differentiated employability skills (Chen et al., 2013; Chiu & Chuang, 2016). Research on the inter-industry gender wage gap also finds that women have several advantages and earn higher relative wages approaching those of men in non-production industries such as finance and services (H. L. Chuang, Lin, and Chiu, 2018).

Importantly, the empirical evidence has emphasized the moderating effect of ownership types such as partially foreign-invested firms, domestic private firms, joint ventures, SOEs, and wholly foreign-invested firms on the relationship between horizontal spillover and wages (Earle, 2017; Nguyen, 2015; Nguyen & Ramstetter, 2017). The inherent characteristics of each ownership type will determine how firms design their wage patterns, respond to competition in the labor market and adapt to wage policies and government regulations in the host country. Indeed, wholly foreign-owned firms and joint ventures with foreign affiliates tend to pay higher wages than SOEs and domestic private firms to employ and retain qualified labor as well as to prevent the movement of their intangible assets to the domestic sector (Blomstrom & Kokko, 1998; Driffield, 2004).

On the other hand, domestic private, joint-stock and state-owned firms appear to pay lower wages because they are very familiar with the local labor market and often have a high demand for unskilled labor. Moreover, foreign entry may restructure the host labor market such that all types of ownership are on the labor demand side and all kinds of labor are on the labor supply side (Nelson, 2010). Because the demand for labor differs among skilled and unskilled labor, wages may be driven by the market to a new wage equilibrium. In this thesis, due to data availability, ownership identity has been divided into five categories: wholly foreign-invested

firms, joint-stock companies, domestic private firms, SOEs and joint ventures with foreign partners.

Finally, Bhaduri & Marglin (1990) explain that the real wage represents an endogenous variable because machinery creates favorable conditions for generating demand along with output, which determines the real wage of the workers. Bhaduri & Marglin also note that it is difficult to rationalize the extent of the effect of output on wages. However, wages and productivity simultaneously move in the same direction; this is the indecisive factor that directly targets wages. Thus, this study explores again how real output predicts the average wage. Second, capital-intensive production requires an abundant source of human capital and assumes that efficient wages are paid for human capital. Indeed, companies requiring capital intensity seek to employ skilled workers, leading to a high correlation between capital intensity and wages (Nguyen & Ramstetter, 2017). Third, among competitors and spearheads of the industry, wages go hand in hand with transformed motivations in the Vietnamese economy. Furthermore, an indispensable concept is that companies with a significant market share will have the advantage of dominating the market. Loss of market share is accompanied by reduced competitive advantage, reduced profits, higher costs, and a threat to the market. According to Nguyen (2015), a higher market share leads to a greater reputation and higher wages.

2.10.4 Ownership structure and FDI spillover:

The level of foreign ownership of affiliates located in the host country is a determinant of FDI spillover (Buckley, Wang, & Clegg, 2007). Foreign shares can confer benefits to the recipient firms through technology and knowledge diffusion. In particular, foreign ownership is considered one of the most important channels of horizontal FDI spillover (Iršová & Havránek, 2013; Lin, Liu, & Zhang, 2009). During the cooperation, some of the knowledge-based intangible assets of foreign enterprises may spill over to local companies (Blomström & Sjöholm, 1999; Javorcik & Spatareanu, 2008). To maintain a competitive advantage, MNEs

may try to prevent leakage by investing in only fully-owned foreign projects to ensure greater control of employee behavior and firm policies (Javorcik & Spatareanu, 2008).

As emphasized by Javorcik (2004) and Javorcik & Spatareanu (2008), MNEs may transfer advanced technology that may be too complex for domestic firms to learn to wholly-owned affiliates. In this case, spillover is less likely to happen. In addition, Aitken & Harrison (1999) and Javorcik & Spatareanu (2008) find strong evidence supporting positive spillover for joint ventures but negative spillover for wholly-owned affiliates. On the contrary, Blomström & Sjöholm (1999) analyze cross-sectional data and find that the type of ownership does not affect firms' productivity nor generate spillover effects.

2.10.5 Empirical evidence on wage spillovers from FDI

Compared to a rich body of empirical studies investigating productivity spillovers, the researches related to FDI spillover effect on wages are relatively limited and lacking persuasive evidence. Therefore, this dissertation aims at providing more evidence and implications on the existence of wage spillovers in emerging countries receiving inward foreign capital.

Regarding worker mobility, Hijzen, Martins, Schank, & Upward (2013) explored which extent foreign takeovers and domestic takeovers affect the average wages of domestic workers. The authors used firm-level data across five countries (two developed and three developing)[1]. The approach of propensity-score matching (PSM) and difference-in-differences are implemented for model estimation. In their study, the average wage is measured by the logarithm of average worker wage or the logarithm of total wages divided by total employees. The explanatory variables include foreign ownership, total employees, individual wage, worker

[1] Brazil (firm-level data from 1994 to 2005), Germany (establishments data in 1994 and 2004), Portugal (firm-level from 1997 to 2004), UK (firm-level 1997 1997-2005), Indonesia (establishment 1997-2005)

turnover, sex, age skill, foreign takeovers (t=1, t=2, t=3)[2], domestic takeovers (t=1, t=2, t=3)[1], region and industry dummies. The findings indicate that employees working in foreign firms or after a foreign takeover receive higher average wages. The result is also supported by Stoyanov & Zubanov (2014). Moreover, as a result of the cherry-picking process, the effect of foreign takeovers on average wages depends on the skill level of workers which is in favor of high-skill workers and negatively affects low-skill workers (Hollanders & Weel, 2002; Nelson, 2010). However, there is a tradeoff between positive wage effect and job insecurity under MNCs' presence (Shropshire & Kadlec, 2012).

Concerning local workers' benefit under foreign presence, Pittiglio et al. (2015) used firm-level panel data of Italian manufacturing firms and input-output tables from 2002 to 2007 to examine the effect of foreign presence in terms of horizontal and vertical spillovers on domestically – owned firms' average wage. The authors conducted the fixed effect model (FEM) moderated by the technology gap which is measured by the difference between the firm's TFP and intra-industry average foreign firms' TFP. The results show that without controlling for the technology gap, wage spillover doesn't exist. The technology gap is an important determinant of both productivity spillovers and wage spillovers from FDI (Jacobs et al., 2017; Kounetas, 2015). In this case, domestic firms with large technology gap receive positive horizontal spillovers and negative vertical spillovers on wage. In contrast, there is a positive backward spillover effect on wages in the case of domestic firms with medium technology gap. Moreover, the impact of foreign presence on wage varies significantly across industries.

[2] Note: t=0: < 12 months after the change in ownership status, t=1: 1-2 years after the change in ownership status, t=3: 2-3 years after the change in ownership status

Nguyen (2015) contributes to the empirical literature by conducting the Breusch-Pagan LM test for investigating intra-industry wage differentials using 2000 – 2009 panel data of Vietnamese non-household manufacturing firms. The model used average real wage measured by the logarithm of firm average wage rates as dependent variable. The explanatory variables such as output, capital intensity, industry concentration, export-oriented, gender ratio, ownership types[3], industry classifications[4] and regions[5] are added into the right-hand side of the regression equation. The results are consistent with the findings of Hijzen et al. (2013) and Javorcik (2015) which also indicate that wage premium in foreign firms is greater than that in domestic firms. Besides, wage differentials between foreign firms and domestic firms vary across industries and sectors (Pittiglio et al., 2015). It is worth to note that the average wage in the capital-intensive industry and import-oriented industries are higher than those in labor-intensive and export-oriented industries. For ownership types, the wage differential is highest in a joint venture between foreign firms and state-owned enterprises.

To further explore the moderating effect of ownership structure, Nguyen & Ramstetter (2017) used firm-level cross-sectional data of Vietnamese large and medium enterprises in 2009 to examine the relationship between foreign presence and real average wage across different ownership types. The estimation model is controlled by firm-specific characteristics such as real output, female ratio, asset-labor ratio, percentage of highly educated employees, percentage of moderately educated employees, percentage of high paid employees, capital intensity, size, and ownership types. They also conducted the robustness check using similar data in 2007. Similar to Nguyen (2015), the authors found that firm-level wage premiums in

[3] Five categories of ownership: SOEs, domestic private firms, foreign JV with state enterprises, foreign JV with private firms, fully foreign-owned
[4] Industry classification: resource-based, capital-intensive, labor-intensive, traditional-labor intensive, electronics
[5] Red River Delta and its surroundings; Mekong River Delta and its surroundings

wholly foreign-invested enterprises, joint venture (JV) and state-owned enterprises (SOEs) are greater than that in domestic private firms. Besides, positive wage differentials are stable for JV and wholly foreign-owned firms for most sectors, but insignificant for SOEs.

About workers' characteristics, Earle (2017) investigate the effects of MNC's presence on average wage using firm-level panel data of Hungarian firms from 1992 to 2008 using Statistical Yearbooks of Hungary. The propensity score matching and linear probability model (LPM) is used to test the main hypotheses. By separating the effects of FDI across different worker's characteristics, the author recognizes that the differentials of productivity and wage are clear with the existence of skill bias as what is found in Monte (2011) and Yunus, Said, & Azman-Saini (2015). Regardless of worker's characteristics, no one suffers from wage reduction under FDI presence.

2.11 Research model and hypotheses

2.11.1 Firm productivity spillover under FDI presence

Based on the work of Blomstrom & Kokko (1998) and empirical findings by (Anwar & Nguyen, 2014; Damijan et al., 2013b; Havranek & Irsova, 2011; Javorcik et al., 2018; Mariotti et al., 2015), productivity spillover occurs when there is local firms' productivity/ efficiency improvement as a result of foreign presence, may come from: (1) The movement of some extent of advanced technology and knowledge diffusion from MNCs' origin country to developing host countries to sustain their competitiveness and (2) Market penetration threatening local firms' market share and profits and forcing them to change. However, they also admitted that the evidence for such kind of FDI spillover effects on the host country in both inter and intra-industry are not strong enough due to limited empirical analysis. To sum up, the authors emphasize that foreign presence improves "allocative efficiency" and "technical efficiency" in the host country, thereby enhancing the productivity of domestic host firms.

More important, spillovers are positively related to the host country's internal capacity and competitiveness.

There are a wide range of MNCs' activities or consequences associated with inward FDI such as remove or trigger high monopolistic industry in response to the power of local competitors; transfer of management know-how through training/demonstration activity and worker turnover; develop backward and forward linkage relationship between subsidiaries and upstream local suppliers/ subcontractors or downstream customers (techniques transferred: inventory, standards, quality control, etc…); adaptive management and marketing strategies and knowledge by local firms in response to a more dynamic and competitive environment (Blomstrom & Kokko, 1998). Regarding measurable indicators, productivity spillovers occur through three channels including horizontal spillover, vertically backward spillover and vertically forward spillover. Therefore, the proposed hypotheses are as follows:

Hypothesis H1: The productivity of Vietnamese domestic companies is negatively associated with the *horizontal* technology spillovers from FDI firms.

Hypothesis H2a: The productivity of Vietnamese domestic companies is positively associated with the vertical *backward* spillover from FDI firms.

Hypothesis H2b: The productivity of Vietnamese domestic companies is positively associated with the vertical *forward* spillover from FDI firms.

2.11.2 The importance of absorptive capabilities

As the foreign firms increase their presence in the host market, a well-trained labor force with high absorptive capacity can enable the local firms to receive the positive spillovers from FDI more effectively (Ahmed, 2012). On the contrary, low level of human capital development can trigger a true obstacle that the domestic firms may realize about it; however, they miss out and let positive externalities run away. Thus, the acquisition of human capital and the

availability of high-skilled labor in local firms are considered as the main key to unlock the positive FDI spillover and help domestic firms reach a higher level of productivity (Anwar & Nguyen, 2014). It is interesting to note that the labor turnover from the foreign subsidiaries to local firms has generated one of the most important FDI spillover channels in many countries (Demena, 2015; Havranek & Irsova, 2011). Hence, the proposed hypothesis is as follows:

Hypothesis H3: The relationship between FDI spillovers and productivity of domestic firms is improved with a higher level of human capital.

Studies on technology gap have recognized a role for technological gap between foreign firms and local firms as a facilitator or sometimes a barrier for technology transfer and productivity spillovers (Carluccio & Fally, 2013; Sourafel Girma & Wakelin, 2007; Jacobs et al., 2017; Tsekouras, Chatzistamoulou, Kounetas, & Broadstock, 2015). They demonstrate that the technology gap is inversely proportional to the successful level of technology transfer. Indeed, technology upgrade is considered as the most important source of productivity increase. More comprehensively, Girma & Wakelin (2007) propose three subgroups of technology gap: the top 20^{th} percentile, the second 20^{th} -80^{th} percentile and the bottom 20^{th} percentile. Further, if the gap is too small, there is less motivation for local firms to imitate. On the contrary, the large gap is very difficult for low-technological-frontier firms to reach (Kounetas, 2015). He indicates that the middle one is the most appropriate gap for technology transfer and local firms' adoption. The proposed hypotheses are as below:

Hypothesis H4a: The relationship between FDI spillovers and productivity of domestic firms is lower at the top 25^{th} and bottom 25^{th} percentile of the technology gap.

Hypothesis H4b: The relationship between FDI spillovers and productivity of domestic firms is enhanced at the middle 25^{th}-75^{th} percentile of the technology gap.

Although financial development does not attract much attention from previous empirical studies, it is an essential indicator implying the financial health of a firm. The surplus of financial resources in term of organizational slacks encourage firms to start their new ventures, deal with uncertainties or get involved in rapid changes by maintaining their competitiveness, upgrading their technology or investing in human capital accumulation (Lin & Liu, 2012; Zhang, Yang, & Zhang, 2018). Moreover, the local firms with sufficient financial development have more capabilities to absorb knowledge diffusion and technology spillovers from FDI. Therefore, the proposed hypothesis is as below:

> **Hypothesis H5:** The relationship between FDI spillovers and productivity of domestic firms is improved with a higher level of financial development.

2.11.3 The effect of regional effects and geographical distance on productivity spillovers

The geographic distribution of FDI also has a significant influence on the magnitude of FDI spillover. Foreign investors select sites of investment based on an assessment of the advantages and disadvantages of different areas. Specifically, domestic firms that are located in an export processing zone or industrial zones where foreign investment-preferential policies are available to have greater potential to receive technology spillover. According to Chen, Poncet, & Xiong (2017), local firms located near MNEs may benefit from export spillover since MNEs are likely to have more experience in export activity (Ekholm, Forslid, & Markusen, 2007; Girma, Görg, & Pisu, 2008; Harding & Javorcik, 2012; Jenkins & Arce, 2015). Dang (2013) suggests that foreign investments tend to be located in highly developed areas of the recipient country in which a productive workforce and relatively low energy costs are available. The effects of flows on institutional development or quality have also been explored (Demir, 2016; Krammer, 2015; Long, Yang, & Zhang, 2015; Ran, Voon, & Li, 2007). Hence, the study obtains the hypotheses as follows:

Hypothesis H6a: FDI spillover effect on domestic firm productivity vary significantly across geographical regions and higher in more FDI-intensive regions.

Hypothesis H6b: FDI spillover effect on domestic firm productivity vary significantly across economic regions and higher in more FDI-intensive regions.

There is strong evidence for the negative influences of geographical distance between foreign firms and local firms on the possible productivity spillover (Halpern & Muraközy, 2007; Thang et al., 2016). On the other words, the distance is inversely proportional to the spillover effects from foreign affiliates to local ones (Mariotti et al., 2015; Merlevede & Purice, 2016). It is worth that the local firms nearby or surroundings by MNCs have more chances to observe, imitate the foreign competitors/ partners, hence improve its productivity and performance (Sourafel Girma & Wakelin, 2007). Furthermore, those firms are more exposed to the technology and management know-how currently used by foreign ones (Havranek & Irsova, 2011). This facilitates the process of technology transfer and creates a springboard for productivity improvement in the long term. Because the data on physical distances between foreign firms and domestic firms in Vietnam is unavailable, this study attempt to fill the gap by measuring the provincial distance (within 100km^2) from the province that the domestic firms located to the eight cities/ provinces (Ha Noi, Bac Giang, Hai Phong, Thanh Hoa, Binh Duong, Dong Nai, Ba Ria – Vung Tau and Ho Chi Minh) with highest concentration of accumulated FDI capital. Thus, the proposed hypothesis is:

Hypothesis H7: Local firms in provinces located within 100 sq. km. of the most FDI-intensive provinces/cities receive greater spillover effects than those located in provinces outside 100 sq. km of these areas.

2.11.4 The effect of horizontal spillovers on the average wage

Despite a huge body of researches on productivity spillovers and export spillovers, there is less evidence on the effects of FDI spillovers on the average wage of local workers. Previous studies indicate a positive wage differential between foreign firms and domestic firms which appears to be higher for joint venture ownership (Nguyen, 2015; Nguyen & Ramstetter, 2017). According to Earle (2017), the effect of intra-industry FDI spillovers on local average wages can be explained by higher labor productivity under foreign presence, thereby leading to an increase in wage equilibrium. This is supported by studies on the wage gap and gain distribution between foreign-employed workers and domestic-hired workers (Huang & Zhang, 2017; Stoyanov & Zubanov, 2014). It is admitted that FDI firms have the motivation to pay higher wages to retain their labor to sustain their intangible assets and knowledge. As a result, local firms surrounded by foreign firms have to follow this wage trend to compete for high-skilled workers in the host market (Driffield, 2004). Therefore, the proposed hypothesis is as follows:

> **Hypothesis H8:** Horizontal FDI spillovers under foreign presence positively affect the average wage of local firms in the same industry with foreign firms.

In addition, it is undeniable that the wage patterns and adaptation toward inward FDI may be determined by ownership types categorized by SOEs, private firms, FDI firms (both wholly invested and joint venture), joint-stock companies and other types. As a result of skill bias, there are strong evidences for higher wages paid by wholly foreign-owned firms or joint ventures between MNCs and SOEs (Hollanders & Weel, 2002; Pittiglio et al., 2015). In contrast, the private sector is often characterized by lower compensation due to their low working requirements and cultural familiarities (Nguyen & Ramstetter, 2017). However, it is believed that foreign presence may generate both direct and indirect influences on restructuring the labor market in the host country. Thus, the proposed hypothesis is as follows:

Hypothesis H9: The effects of horizontal FDI spillover on average wages vary across ownership types.

The main hypotheses have been well illustrated in the figure below.

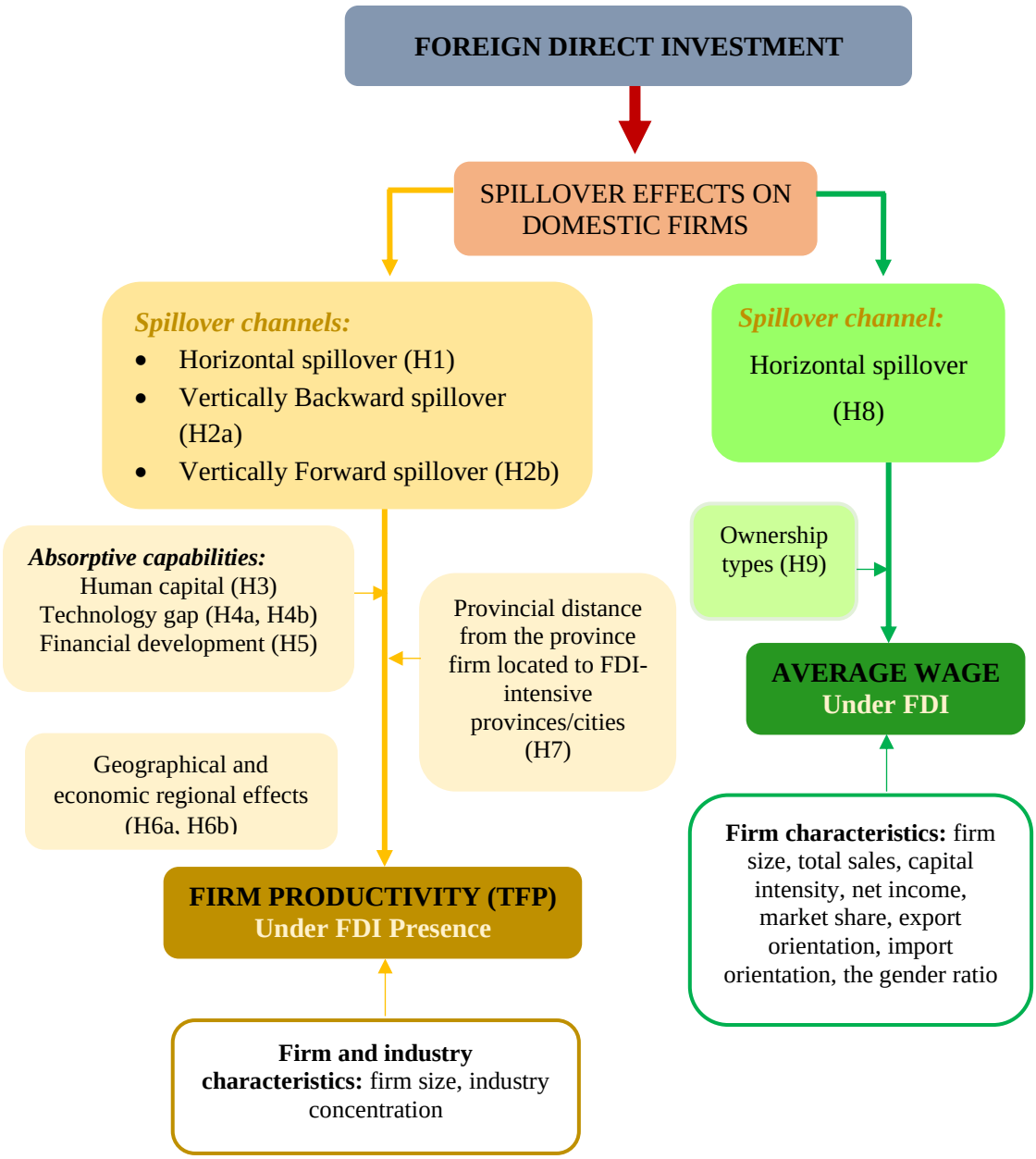

Figure 2-7: Research model. *Source: author*

CHAPTER 3. **METHODOLOGY**

Chapter 3 presents the quantitative methodology for estimating the proposed hypotheses. The chapter includes data description, model specifications for TFP calculation and key proxies for FDI spillover estimations to further establish estimation models of productivity spillovers and wage spillovers. Besides, this chapter also discusses the selection of measurements and justification of the method uses. The figure below shows how the thesis is conducted.

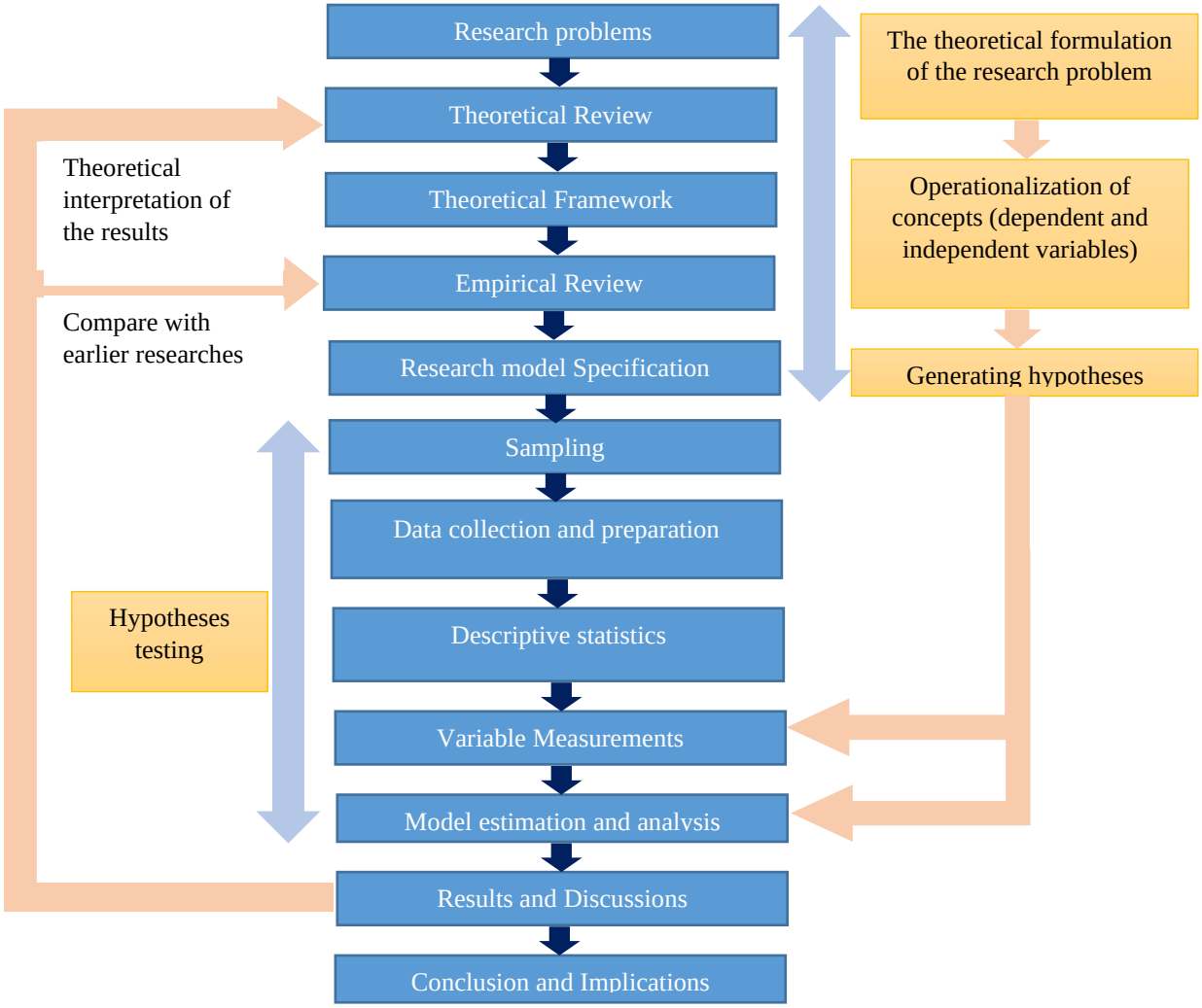

Figure 3-1 The process of implementing research

3.1 Econometric model specifications and estimations

Besides the major contribution of labor and capital inputs, it is found that there are always unobserved input factors determining the total output. These factors may belong to the application of scientific and technological advances, modern management knowledge, etc. In other words, three components contribute to the production of goods and services, namely (1) labor, (2) capital and (3) other factors such as education, training, science, and technology, etc. The productivity gains which are not due to an increase in capital and labor is called "total factor productivity". Therefore, to investigate the productivity spillovers associated with FDI, the author first estimates firm-level productivity in terms of total factor productivity by estimating the residual of production function.

The study then regresses the TFP on proxies for FDI spillovers. Also, their interactive terms associated with other control variables are included in the equation to avoid the problem of omitted variable bias and explain the movement of the dependent variable more accurately. This two-stage procedure is widely used to estimate productivity spillovers from FDI (Anwar & Nguyen, 2014; Lin & Kwan, 2016).

3.1.1 Total Factor Productivity Estimation

There are several functions for TFP estimation such as Cobb-Douslag production function, translog production function, constant elasticity of substitution (CES) utility function and other more complicated production functions. Depending on the purpose of FDI spillover estimation, the Cobb-Douslag production function is widely used as it can reflect the technological relationship among the inputs and outputs produced which are the most important concern of productivity improvement under foreign presence (Gorodnichenko et al., 2014a). In this way, the production function at Cobb-Douslag type is conducted by many recent studies on FDI spillovers such as (Anwar & Nguyen, 2014; Gorodnichenko et al., 2014a; Lenaerts & Merlevede, 2016; Newman et al., 2015) to estimate TFP.

First, assume that the production function of Vietnamese manufacturing firms is at Cobb Douslag type, we have:

$$\ln (Y_{ijt}) = \ln (A_{ijt} L_{ijt}^{\beta_l} K_{ijt}^{\beta_k}) \quad (1)$$

Based on the first equation, the total factor productivity can be estimated as in equation (2)

$$\ln(A_{ijt}) = \ln(Y_{ijt}) - \beta_l(L_{ijt}) + \beta_k(K_{ijt}) + \omega_{\mathrm{Iit}} + \varepsilon_{it} \quad (2)$$

where *Y, L,* and *K* are the logarithm of output, labor, and capital inputs, respectively, ω stands for the firm's input demand that researchers do not know, ε represents the stochastic disturbance of productivity, and *i, j,* and *t* denote the firm, industry, and time, respectively.

One of the estimation concerns is to avoid the problem of simultaneous input choices which lead to the correlation between TFP and covariance (Demena, 2015). As a result, calculating TFP using the OLS approach is more likely to be biased due to the endogenous problem. Thus, the study uses the Olley-Pakes method (OP) which allows firm-specific productivity gap to reveal idiosyncratic changes over time.

The study applies the syntax *"opreg*" in Stata 14 with an option method developed by Yasar, Raciborski, and Poi (2008) to estimate TFP, which is considered the residual of the gross output function contributed by labor and capital input. Labor input is represented by the natural logarithm of the number of employees at each firm. The natural logarithm of fixed assets is used to estimate capital input. The natural logarithm of the change in debt is used to estimate investment. Following Olley and Pakes (1992), to overcome endogeneity, this study use investment level to proxy for an unobserved time-varying productivity shock (as in Appendix 3). The approach of Olley and Pakes is also recommended as a very appropriate econometric approach for TFP calculation (Rojec & Knell, 2017).

3.1.2 Establishing key proxies for FDI spillovers

3.1.2.1 Horizontal FDI spillovers

Horizontal spillover is estimated by taking the ratio of foreign capital share in industry j to the share of firm i's output in that industry. It has been revealed in previous studies that horizontal FDI is very limited to some extent of spillover as it negatively or insignificantly affects the domestic firms' productivity (Gorodnichenko et al., 2014a; Halpern & Muraközy, 2007). Few studies support a positive relationship between horizontal FDI and TFP (Behera, 2017; Iršová & Havránek, 2013). Hamida (2013) suggests a higher probability of negatively horizontal spillover for low-tech firms. Thus, in the case of Vietnamese manufacturing firms, horizontal FDI is supposed to be negatively associated with TFP.

$$H\_FDI_{jt} = \left[\frac{\sum_{i\ for\ all\ i\in j} Foreign\ Share_{it} \times Y_{it}}{\sum_{i\ for\ all\in j} Y_{it}}\right]$$

where *i, j,* and *t* denote the firm, a four-digit industry, and time, respectively.

3.1.2.2 Vertical FDI spillovers

Vertically backward spillover is considered as an important channel of positive externalities from FDI in many researches (Anwar & Nguyen, 2014; Anwar & Phi, 2011; Gorodnichenko et al., 2014a; Thang et al., 2016). Thus, backward spillover is expected to positively influence the TFP; as a result of greater inputs supplied by the domestic sector to an industry in the foreign sector (Anwar & Nguyen, 2014). It is calculated in the formulas below:

$$B\_FDI_{it} = \sum_{\forall k\neq i} \propto_{ki} H\_FDI_{ki}$$

where $\propto_{ki}$ is taken from the input-output matrix (in 2012 and 2015) (GSO). This proportion stands for the industry *i*'s output share and is used as inputs in industry *k*. The input supplied derived from the input-output table in intra-industry is often omitted in the previous

estimation model as it is argued that intermediate input use that already captured by the horizontal spillover (Javorcik, 2004b).

3.1.2.3 Vertically forward spillover

Vertically forward spillover represents the externalities that come from the establishment of forward linkage with the foreign presence sector. In other words, the intermediate goods supplied by foreign firms are the inputs of a specific industry in local firms. Thus, it is assumed to negatively or insignificantly affect the TFP because it may lead to the strong dependence on foreign inputs and foreign sector would always control the degree of forward linkage (Gorodnichenko, Svejnar, & Terrell, 2014b; Havranek & Irsova, 2011; Javorcik et al., 2018; Javorcik & Spatareanu, 2011; Khachoo & Sharma, 2016).

$$F\_FDI_{it} = \sum_{\forall k \neq i} \beta_{ki} H\_FDI_{ki}$$

where β_{ki} comes from the input-output matrix (in 2012 and 2015) (GSO). This proportion stands for industry *k*'s output share and is used as inputs in industry *i*.

Due to data unavailability, most empirical studies calculate vertical spillovers at the industry-level to reflect the vertical integration between firms (Lenaerts & Merlevede, 2016). In this study, vertically backward and vertically forward spillovers are also estimated at the two-digit industry.

3.1.3 Estimating productivity spillovers from FDI

3.1.3.1 Research model

We obtain the TFP regression model as follows:

$$\ln(TFP_{ijt}) = \beta_0 + \beta_1 H\_FDI_{jt} + \beta_2 B_{FDI\,jt} + \beta_3 F\_FDI_{jt} + \beta_4 HC_{ijt} + \beta_5 FN_{ijt} + \beta_6 TG_{ijt} + D_j + D_t + \mu_{ijt} \quad (3)$$

where $\ln(TFP_{ijt})$ is the log of firm *i*'s TFP in industry *j* at time *t*; H_FDI_{jt} stands for the horizontal technology spillover in industry *j* at time *t*; B_FDI_{jt} stands for the vertical backward spillover in industry *j* at time *t*; F_FDI_{jt} stands for the vertical forward spillover in industry *j* at time *t*; HC_{ijt} stands for firm *i*'s human capital accumulated in industry *j* at time *t*; FN_{ijt} stands for firm *i*'s financial development; TG_{ijt} stands for firm *i*'s technology gap with the maximum technology level in industry *j* at time *t*; D_j and D_t are industry dummies and time dummies added to absorb the unobserved effect and disturbance across different industries and time, and μ_{it} denotes the idiosyncratic error.

3.1.3.2 The proxies for different transmission channels of FDI spillover effect

The measures for FDI spillovers in the model are empirically adopted from many previous studies (Du, Harrison, and Jefferson 2012; Gorodnichenko, Svejnar, and Terrell 2014; Anwar & Nguyen, 2014). These measures are accepted and widely used, because they are well defined and can capture the externalities from FDI effectively.

Horizontal spillover in four-digit industry *j* at time *t* is calculated as the proportion of foreign equity presence in industry *j*, weighted by the proportion of firm *i*'s output in that industry. Previous studies show that the extent of spillover from horizontal FDI is limited, as it negatively or insignificantly affects domestic firms' productivity (Gorodnichenko, Svejnar, and Terrell 2014; Halpern and Muraközy 2007). Few studies support a positive relationship between horizontal FDI and TFP. The findings suggest a higher probability of negative horizontal spillover at low-tech firms (Gorodnichenko et al., 2014a). Thus, at Vietnamese manufacturing firms, horizontal FDI is assumed to be negatively associated with TFP.

$$H\_FDI_{jt} = \left[\frac{\sum_{i\ for\ all\ i\ \epsilon j} Foreign\ Share_{it} \times Y_{it}}{\sum_{i\ for\ all\ \epsilon j} Y_{it}}\right]$$

where *i, j,* and *t* denote the firm, a four-digit industry, and time, respectively;

FDI spillovers in backward and forward linkages between domestic firms and foreign firms are calculated as follows: Vertical backward spillover is considered an important channel of positive externalities from FDI, as in many previous studies. Thus, backward spillover is expected to positively influence TFP; as a result of greater inputs from the domestic sector to an industry in the foreign sector (Anwar & Nguyen, 2014; Lenaerts & Merlevede, 2016).

$$B\_FDI_{it} = \sum_{\forall k \neq i} \propto_{ki} H\_FDI_{ki}$$

where $\propto_{ki}$ is taken from the input-output matrix (in 2012 and 2015) (GSO). This proportion stands for the industry *i*'s output share and is used as inputs in industry *k*.

Vertical forward spillover represents the externalities from the establishment of forward linkage with the foreign sector. In other words, the intermediate goods supplied by foreign firms are inputs for local firms in a specific industry. Thus, it is assumed to negatively or insignificantly affect TFP because it may lead to strong dependence on foreign inputs, and the foreign sector always controls the degree of forward linkage (Anwar & Nguyen, 2014; Lenaerts & Merlevede, 2016).

$$F\_FDI_{it} = \sum_{\forall k \neq i} \beta_{ki} H\_FDI_{ki}$$

where β_{ki} comes from the input-output matrix (in 2012 and 2015) (GSO). This proportion stands for industry *k*'s output share and is used as inputs in industry *i*.

3.1.3.3 Human capital as a moderating variable

It is admitted that absorptive capacity in terms of human capital can't be immediately achieved by abundant financial investment; but it is a consequence of long-term accumulation of knowledge, skill, and experiences through a wide range of activities such as learning, training, routine practices, and teamwork. Therefore, human capital is an extremely important factor of production directly affecting the firm's absorptive capacity to relieve external

pressures and gain from FDI spillovers (Sampson, 2013). Human capital is calculated as the natural logarithm of the ratio of firm *i*'s average wage to industry *j*'s average wage at time *t*. Human capital is expected to enhance the productivity level as well as the relationship between FDI spillover channels and TFP (Anwar & Nguyen, 2014; Damijan et al., 2013a; Gorodnichenko et al., 2014a).

$$HC = ln\left(\frac{wage_i}{wage_{meanj}}\right)$$

3.1.3.4 Technology gap as a moderating variable

According to Dimelis (2005), this mixed evidence is related to the catch-up and absorptive capacity hypotheses. The catch-up hypothesis states that the larger the gap, the higher the potential to learn new knowledge since domestic firms can catch up with advanced technology and knowledge in the long run. The results of several studies confirm that a larger gap provides more room for FDI spillovers due to the potential catch-up effect (Blalock & Gertler, 2009; Wang & Blomström, 2002). By contrast, the absorptive capacity hypothesis suggests that a lower gap is needed. In other words, if the gap is too large, domestic firms may not have enough skilled workforce or physical capital to gain from horizontal spillover.

The study follows Anwar and Nguyen (2014) in computing the level of the technology gap, which is measured by the difference in the average productivity of domestic and foreign firms in percentage terms in the same industry. Then, it is divided into three main sub-groups: the top 25th percentile, the second 25th -75th percentile and the bottom 25th percentile (Sourafel Girma & Wakelin, 2007). While Girma (2007) divides the technology gap into three main subgroups—high gap, medium gap, and low gap—to see how TFP responds to different levels of technology gaps, Carluccio and Fally (2013) found that a high technology gap will make it difficult for domestic firms to keep pace with foreign firms in the adoption of more advanced technology. In this thesis, we assume that the gap small gap (bottom 25th percentile) or the large

gap (top 25th percentile) between the firms' technological edge and the industry's technological frontier may restrict the positive influence of FDI spillovers on TFP growth. Meanwhile, the middle technology gap (25th to 75th percentile) is assumed to be in favor of domestic firms' spillover absorption.

3.1.3.5 Financial development as a moderating variable

This effective accumulation and allocation of the financial resources enable firms to implement their absorptive strategies more effectively to achieve their long-term and short-term targets (Lin & Liu, 2012). Under the penetration of foreign firms in the host market, the financial development helps sustain high-liquidity funds for local firms in absorbing foreign knowledge and technology diffusion to sustain their competitiveness and productivity growth (Baloc, Sha, & Panhwar, 2014).

Financial development is a common indicator to demonstrate the financial health and the readiness to absorb spillovers in each enterprise. In addition, financial development is also used as a control variable as it reflects the financial health of a company and whether the firms have enough slack resources to upgrade its existing technology and successfully benefit from FDI spillover. It is calculated by the ratio of the firm's working capital to total assets as adopted in (Anwar & Nguyen, 2014). Thus, we assume that it positively affects TFP growth.

$$FN = \frac{Working\ capital_{ijt}}{Total\ assets_{ijt}}$$

3.1.3.6 The moderating effect of regional and provincial proximity

FDI spillover effect is supposed to be local in scale if the effects are received by nearby firms only or national in scale if the impact spreads further to other parts of the country. In other words, firms that are located close to MNEs tend to benefit more from spillover via imitation and labor turnover compared with firms in more distant areas. The longer the distance, the

higher the cost of technology and knowledge diffusion (Aitken & Harrison, 2013; Görg & Greenaway, 2004).

In short, the possibility of spillover is higher in developed areas than in remote areas since the advanced technology and knowledge of foreign enterprises are easier to absorb if the technology gap between MNEs and local firms is not too large (Jeon, Il, & Ghauri, 2013; Tanaka & Hashiguchi, 2015; Xu & Sheng, 2012). The regional channel is quite important in the case of Vietnam because FDI is mostly concentrated in highly developed regions, while remote areas are unable to attract foreign investors. These disparities can affect the magnitudes of spillover that may occur in different regions (Anwar & Nguyen, 2010; Mao & Yang, 2016).

To investigate how productivity spillovers from FDI vary across different regions, this study aims at testing whether firm distribution matters or there is any significant differential among the effects of inward FDI on domestic firm productivity across Vietnamese geographical and economic regions. Based on the classification of General Statistics Office, geographical regions in Vietnam include six regions: Red river delta, North East & North West, North & South Central Coast, Highland, Southeast and Mekong river delta. In terms of economic development, Vietnam is divided into four economic regions such as North (including Red river delta, North East and North West), Central (North Central Coast, South Central Coast, and Highland), South (Southeast) and Mekong River Delta.

Concerning geographical distance, many prior studies indicate that positive productivity externalities diminish with increases in distance between MNCs and local firms, especially in the manufacturing sector (Barrios et al., 2011; Halpern & Muraközy, 2007; Mariotti et al., 2015). However, due to the shortage of data on the exact physical distance between foreign firms and domestic firms; the study follows Halpern and Muraközy (2007) measuring provincial proximity by using two distance scopes: within 100 sq. km from socioeconomic centers with high FDI concentration of Hungary to the province where local

firms are located and outside 100 sq. km of that. In this study, firms' locations are divided into nine sub-areas (see the table below), including "within 100 sq. km. of Ha Noi", "within 100 sq. km. of Bac Ninh", "within 100 sq. km. of Hai Phong", "within Thanh Hoa 100 sq. km", "within 100 sq. km. of Binh Duong", "within 100 sq. km. of Dong Nai", "within 100 sq. km. of Ba Ria Vung Tau", "within 100 sq. km. of Ho Chi Minh" and "outside" these regions, using distance data from the Ministry of Natural Resources and Environment in 2017. These cities/ provinces have received the highest amount of inward FDI equity and are leading provinces in terms of FDI firms' concentration as well as worker mobilization and human capital accumulation. Besides, the duplicates for firms located in provinces surrounded within 100 sq. km of two or more FDI-intensive provinces are also filtered to eliminate the estimation bias.

Table 3-1: Accumulated FDI until 2017 in cities/ provinces with the highest FDI concentration

Provincial code	Cities/ Provinces	No of FDI projects	Accumulated registered FDI (USD Mil)	FDI share of the entire country (%)
	Entire country	24803	319,613	
01	Ha Noi	4500	27,638	**8.65**
27	Bac Ninh	1138	16,178	**5.06**
31	Hai Phong	606	15,209	**4.76**
	Thanh Hoa	102	13,891	**4.32**
74	Binh Duong	3305	30,339	**9.49**
75	Dong Nai	1472	27,350	**8.56**
77	Ba Ria Vung Tau	363	26,838	**8.40**
79	Ho Chi Minh	7333	43,879	**13.73**

3.1.3.7 Control variables – firm heterogeneity

Firm size is expected to positively associate with productivity growth as greater firm size reflects greater internal capabilities in terms of financial and human resources and the ability to suffer the external pressures (Hamida, 2013; Nguyen & Sun, 2012). Like many previous studies, firm size is measured by the natural logarithm of the firm's sale. Industry concentration (HHI index), on the other hand, is believed to negatively affect firm productivity under foreign

presence due to higher intra-industry competition and smaller market share (Choi & Pyun, 2017). HHI is calculated by the sum of squared market shares of all firms in the industry. Furthermore, market share is calculated as a proportion of a firm's total sales in a four-digit industry. Imports are measured by the natural logarithm of the value of a firm's imports. Labor intensity is estimated by the ratio of total labor to a firm's fixed assets.

3.1.4 Estimating wage spillovers from FDI

3.1.4.1 Research model

The research model is specified as follows:

$$AW_{it} = \beta_0 + \beta_1 * SIZE_{it} + \beta_2 * RQ_{it} + \beta_3 * KL_{it} + \beta_4 * GR_{it} + \beta_5 * NI_{it} + \beta_6 * MS_{it} + \beta_7 * HOR\_SP_{jt}$$

$$+ \beta_9 * EX\_DUM_{it} + \beta_{10} * IM\_DUM_{it} + \beta_{11} * GR_{it}\_SP_{jt} + \varepsilon_{it} + \varepsilon \qquad (1)$$

where i, j, and t are index firms, industries, and years, respectively; AW_{it} is the average wage of firm i at time t; $SIZE_{it}$ is the size of firm i at time t; RQ_{it} is the total sales of firm i at time t; KL_{it} is the capital intensity of firm i at time t; GR_{it} is the gender ratio of firm i at time t; NI_{it} is the net income of firm i at time t; MS_{it} is the market share of firm i at time t; HOR_SP_{jt} determines horizontal spillover within industry j at time t; EX_DUM_{it} and IM_DUM_{it} indicate the export and import orientation of firm i at time t; ε_{it} is "unobserved effects" and captures time-invariant firm features; and ε is a stochastic error term.

3.1.4.2 Dependent variable

The dependent variable is the average wage of each employee of an enterprise (Le & Pomfret, 2011; Nguyen, 2015). The average wage represents the workers' prospective annual income as well as the payment ability of each enterprise.

3.1.4.3 Explanatory variables

To determine the FDI spillover effect on average wage of local workers, we add the horizontal spillover variable (HOR_SP) to the model. HOR_SP is defined as the sum of foreign output over industry output (Blomström & Sjöholm, 1999; Keller & Yeaple, 2009). The other explanatory variables include firm size, output, capital intensity, gender ratio, firm net income, market share and trade orientation. First, firm size reflects the scale of a firm and is quantified by firm equity, which is measured by subtracting the total liabilities from the total assets. Following the studies of Wood et al. (2014), the SIZE variable must be included in this model because firm size is linked to wage fluctuation. Thus, a positive impact of SIZE on average wages is anticipated. Second, the output of firms (RQ) is included because, as explained by Bhaduri & Marglin (1990), the marginal product frequently moves at a specific level associated with wages at which the firm has the highest return. This argument also explains why output always parallels real wages. Third, capital intensity (KL) is constructed to focus on fixed assets, that is, "property, plant, and equipment". This variable measures the scale of firms possessing advanced technology and equipment assets. Krueger & Summers (2012) argue that a high-capital-intensity source is more willing to pay an efficient wage than other sources because wages occupy a part of production costs. Fourth, gender ratio (GR) is included as a variable in this model to assess the potential impact of changes in the views of skilled female workers on workplace discrimination, particularly in a society like Vietnam where males hold the primary and predominant power. Therefore, the construct of wage level incorporates the gender ratio in the firm. Fifth, firm net income (IN) represents the profitability of firms. Enterprises operate to create value for society; the flow of money going back to the enterprise is divided among employees via salaries, owners via dividends, and the operating activities of the firm. The relationship between firm income and the average wage could provide insights into the management of firms. Sixth, market share (MS) indicates the impact of the interaction of

competitors and leaders in the industry on wages. Companies that have a significant market share will have the advantage of dominating the market. In pioneering research, Nguyen (2015) highlights the market share factor as well as its specific change (increase or decrease) as critical factors affecting the average wage. Finally, there is another channel for foreign knowledge spillover via trading activities (Huang & Zhang, 2017). For this reason, we also consider the impact of the export or import orientation of the firm on the average wage.

3.1.4.4 The moderating effect of ownership type

The level of spillover may depend on the type of ownership (Wang & Wu, 2016). MNEs tend to transfer technology and knowledge to partially-owned affiliates to enhance efficiency and product quality. In a joint venture, domestic shareholders also facilitate spillovers. For instance, local employees may be in charge of key activities or have access to expertise or special techniques, which may lead to knowledge leakage if these employees leave the company (Iršová & Havránek, 2013; Javorcik, 2004b; Javorcik & Spatareanu, 2008).

In Vietnam, there are four main types of ownership: SOEs, private firms, joint-stock companies, and foreign direct investment (FDI) firms (see Appendix 5). Each form of ownership has distinct management styles that impact the average wage and the relationship of the average wage with other factors. SOEs operate in a governmental-supportive environment, whereas private firms and joint-stock companies are managed in contrasting ways determined by the benefits to managers and owners. Following Nguyen & Ramstetter (2017), the presence of foreign firms is closely related to the average wage. Differences in qualifications and the ability to absorb knowledge demanded by foreign employers explain the wage imbalance between mainly foreign and domestic enterprises (Friedman, 2004).

Table 3-2: Summary of variables according to ownership type

PRIVATE	JOINT STOCK	FDI	SOEs

	N = 494,443	P = 71.27%	N = 130,013	P = 18.74%	N = 20,040	P = 2.89%	N = 13,820	P = 1.99%
Variab	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
AW	**3.506**	**0.786**	**3.640**	**0.979**	**4.272**	**0.918**	**4.014**	**0.769**
FS	7.827	1.264	8.718	1.587	10.310	1.866	10.729	1.968
RQ	7.945	1.922	8.686	2.210	11.038	1.918	11.300	1.988
KL	4.345	1.269	4.395	1.376	4.572	1.794	4.801	1.647
GR	0.721	1.401	0.683	1.483	2.118	5.147	0.674	1.422
NI	3.550	1.960	4.194	2.463	6.988	2.948	7.241	2.661
MS	0.002	0.017	0.005	0.033	0.026	0.083	0.037	0.104
H_FDI	0.099	0.160	0.112	0.157	0.416	0.266	0.114	0.174
EX	0.008	0.092	0.011	0.105	0.116	0.321	0.026	0.160
IM	0.828	0.377	0.813	0.390	0.882	0.322	0.932	0.252

3.1.5 Summary of Variable measurements

Table 3-3: Variable measurements

Variables	**Measures**
The first estimation model on productivity spillovers from FDI	
DV: Total factor productivity	The residual of the Cobb-Douglas production function (TFP) (Anwar & Nguyen, 2014; Damijan et al., 2013a; Sourafel Girma & Wakelin, 2007)
Horizontal FDI spillover	The proportion of foreign equity presence in industry j, weighted by the proportion of firm i's output accounted in that industry. $H\_FDI_{jt} = \left[\frac{\sum_{i\ for\ all\ i\ \epsilon j} Foreign\ Share_{it} \times Y_{it}}{\sum_{i\ for\ all\ \epsilon j} Y_{it}}\right]$
Forward FDI spillover (2-digit industry)	The ratio of foreign equity to total firm equity, weighted by the share of sector k's output used as an intermediate input by sector j - *using input-output matrix 2012 and 2015* (Gorodnichenko et al., 2014a; Havranek & Irsova, 2011). $F\_FDI_{it} = \sum_{\forall k \neq i} \beta_{ki} H\_FDI_{ki}$
Backward FDI spillover (2-digit industry)	The ratio of foreign equity to total firm equity, weighted by the proportion of intermediate inputs provided by industry j to industry k - *using input-output matrix 2012 and 2015* (Anwar & Nguyen, 2014) $B\_FDI_{it} = \sum_{\forall k \neq i} \propto_{ki} H\_FDI_{ki}$
Technology gap	The difference in the average productivity of domestic and foreign firms in percentage terms in the same industry (Carluccio & Fally, 2013)
Human capital	The natural logarithm of the ratio of firm i's average wage to industry j's average wage at time t. (Anwar & Nguyen, 2014; Damijan et al., 2013a; Gorodnichenko et al., 2014a) $H = ln\left(\frac{wage_i}{wage_{mean\,j}}\right)$
Financial development	The ratio of firm i's working capital to its total assets in industry j at time t. $F = \frac{Working\ capital_{ijt}}{Total\ asset_{ijt}}$

Regional classifications	Six geographical regions: Red river delta, North East & North West, North & South Central Coast, Highland, Southeast and Mekong river delta. Four economic regions: North (including Red river delta, North East and North West), Central (North Central Coast, South Central Coast, and Highland), South (Southeast) and Mekong River Delta.
Provincial proximity	Local firms in provinces located within 100 square kilometers (sq. km.) of the most FDI-intensive provinces/cities as Ha Noi, Ho Chi Minh, Bac Ninh, Hai Phong, Thanh Hoa, Binh Duong, Dong Nai, Ba Ria Vung Tau.
Industry concentration	The Herfindahl (HHI) index, which is calculated as the sum squared of the firm sales as a proportion of total sales in the four-digit industry.
Firm size	The natural logarithm of the total sale
The second model on wage spillovers from FDI	
Average wage	The natural logarithm of total wages to the number of labor ratio
Horizontal spillover	The ratio of the foreign share of sales to four-digit industry sales
Firm size	The natural logarithm of total equity
Capital Intensity	The natural logarithm of fixed assets to number of labor ratio
Ownership types	Dummy variables for ownership identities such as private, joint-stock, FDI and SOEs
Total sales	The natural logarithm of total revenue
Firm income	The natural logarithm of net income
Market share	The ratio of firm sale to four-digit industry sale
Export orientation	= 1 if exporting; = 0 for other
Import orientation	= 1 if importing; = 0 for other
Gender ratio	The number of female divided by the number of males

3.2 Data

3.2.1 The use of panel data

Recent meta-analyses on FDI spillovers have figured out the lack of firm-level panel analyses in existing researches to better examine and provide more accurate evidence for the presence of FDI externalities (Jacobs et al., 2017; Rojec & Knell, 2017). The use of panel data is recommended for estimating FDI spillovers as the most appropriate approach because of its superior characteristics and the unexpected overstatement of cross-sectional analysis (Rojec &

Knell, 2017). Panel data is a combination of cross-data and time-series data. The combination of two types of data has many advantages, especially when the author would like to observe and analyze the fluctuations of the target groups after the events or overtime as well as analyze the differences between the study groups (Stoker, Berndt, Ellerman, & Schennach, 2005). In this study, the author attempts to fill this gap of modeling methods and estimation procedures by using the secondary panel data at the enterprise level for the period from 2007 to 2015 surveyed by GSO.

It is admitted that panel data has several advantages in comparison with cross-sectional data or time-series data (Holtz-Eakin, Newey, & Rosen, 2006; Rojec & Knell, 2017). First, because panel data relates to indicators for individuals, businesses, states, countries, etc. over time, there is certainly heterogeneity in these indicators' units. It is worth to note that estimation techniques based on panel data can account for the heterogeneity by including individual-specific variables. This characteristic is quite valuable in this dissertation. Second, by combining the time series of cross-sectional observations, panel data contains more useful information and has more variability, less multicollinearity between variables, more degrees of freedom, thereby increasing estimation efficiency. Third, by studying repeated observations of cross-sectional units, panel data is more suitable for studying the dynamics of time-varying variables. Thus, the effects of FDI spillovers are better studied by using panel data. Fourth, panel data can better detect and measure impacts that cannot be observed in pure time-series or cross-sectional data. Fifth, panel data makes it possible to study more complex behavior patterns, for example, the technological changes.

Besides simple pooled OLS, the most outstanding techniques for estimating panel data include the fixed effects model (FEM), the random-effects model (REM) and the Generalized Method of Moments (GMM) approaches. In FEM, the Y-intercept in the regression model is allowed to differ among individuals by recognizing the fact that each individual unit may have

some special characteristics of its own. To take into account the different Y-intercepts, dummy variables can be used. FEM is suitable in situations that Y-intercepts across individuals can correlate with one or more independent variables. An alternative model for FEM is REM. In REM, it is assumed that the Y-intercept of an individual is randomly extracted from a larger population, with a constant mean. After that, the individual's Y-intercept is shown as a deviation from this constant mean. REM is appropriate in situations that the (random) Y-intercept of each individual is not correlated with independent variables. The selection of FEM or REM is determined by the Hausman test.

However, an inaccurate estimation may incur as a result of inappropriate estimation model, endogenous problem or omission of important variables. In this case, generalized method of moments (GMM) approach could help. GMM is a general method of many popular estimation methods such as OLS, GLS, MLE, etc. To estimate the coefficient vector β, the GMM method will use a set of instrument variables (also known as Moment conditions) and the number of instrument variables must not be less than the number of variables in the model. A variable selected as an instrumental variable is that it is not correlated with the residuals. Even when violating endogenous assumptions, the GMM method still provides stable and reliable estimates as a result of standardized and efficient distribution.

Therefore, in this study, the hypotheses are tested by FEM and REM, then checked the robustness of the model estimation by using the GMM approach. The concern of unbalanced panel data in this thesis may not be a problem because the estimation software - STATA (version 14.0) can well handle both balanced and unbalanced panel data. Besides, the syntax "xtreg" with "fe" or "re" specification and syntax "xtabond2" are recommended in STATA instructions to deal with a large N, small T panel dataset.

3.2.2 Data description

The paper uses the latest unbalanced panel data of firm-level surveys in Vietnam from 2007 to 2015. The dataset surveyed annually by General Statistics Office (GSO) includes the useful financial and internal indicators at firm-level such as firm's general information, ownership type, capital structure, balance sheet, income statement, etc... for all industries. This secondary data is quite powerful and used popularly for most recent studies in Vietnam related to FDI and firm productivity/ performance (Anwar & Nguyen, 2014; Anwar & Phi, 2011; Le & Pomfret, 2011). Firstly, the firms operating in manufacturing industries at two-digit and four-digit industry codes are filtered from the whole population. Then, the duplicates and outliers are removed from the data. The remaining observations in kind of un-balanced panel data are used for further estimation. Besides, to calculate the vertically backward and vertically forward spillover, the study uses the input-output matrices in 2012 and 2015 collected by GSO to know the flows of input and output within the two-digit industry. Because the input-output matrix is surveyed every three years by GSO, it is impossible to collect input-output matrices for the whole period 2011-2015 for better matching. However, as discussed by (Lenaerts & Merlevede, 2016), aggregate input-output matrix at industry level at a certain time are often used to reflect vertical linkages between firms for the not-far-away period due to data unavailability.

Most of the empirical researchers conduct their studies using panel data and the sample of manufacturing firms (see Appendix 4). This can be explained by the dominant share of FDI equity in manufacturing sectors. More importantly, the manufacturing sector is characterized by complicated arrangements and adoption of technology, machinery, and equipment which create rooms for technology and knowledge transfer. It is important to note that the manufacturing and production industries have been accounted for the largest share at around 70 percent of inward FDI equity in 2017 (GSO). This proportion is far higher than FDI

investment in remaining industries such as services, real estate, retail, and construction. That is the reason why this study attempts to explore FDI spillovers from foreign firms to domestic ones in the manufacturing sector. It is undeniable that high exposures and integration to foreign subsidiaries may contribute to promote technology transfer and gradually improve the level of domestic production technology.

Some data description has been shown in the following tables.

Table 3-4: Foreign share of total equity in two-digit manufacturing industries in Vietnam from 2007 to 2015

Percentage of FDI equity in two-digit manufacturing industries	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apparel Garments	54.5%	56.3%	52.9%	58.0%	51.3%	53.9%	51.1%	45.0%	62.1%
Beverage and Drinks	23.7%	30.9%	29.6%	30.6%	35.8%	34.6%	39.8%	38.9%	45.7%
Food processing and production	37.6%	36.1%	35.6%	37.3%	34.9%	34.9%	37.0%	28.5%	40.3%
Manufacturing automobiles and other motor vehicles	68.0%	68.2%	67.3%	68.3%	64.5%	74.8%	75.5%	62.3%	80.2%
Manufacturing chemicals and chemical products	54.0%	40.4%	39.6%	44.5%	46.1%	41.2%	44.0%	38.6%	53.5%
Manufacturing electronic products, computers and optical products	83.3%	88.5%	88.8%	93.5%	95.4%	94.6%	96.7%	97.0%	98.2%
Manufacturing products from prefabricated metals (except machinery and equipment)	50.6%	48.6%	51.2%	57.6%	41.6%	44.6%	51.3%	35.1%	61.5%
Metal production	25.0%	20.0%	28.8%	26.5%	26.8%	34.5%	50.3%	20.6%	36.7%
Other processing and manufacturing industries	79.1%	81.2%	73.1%	89.2%	82.9%	79.5%	81.8%	67.5%	85.5%
Print and copy all types of records	5.9%	9.4%	10.4%	10.3%	9.5%	9.5%	13.0%	14.5%	26.8%
Processing wood and related products (except beds, cabinets, tables, chairs)	21.2%	15.9%	14.1%	10.2%	20.2%	14.3%	14.5%	12.3%	20.6%
Producing coke, refined petroleum products	74.3%	72.0%	4.6%	7.3%	2.9%	5.9%	6.5%	4.3%	7.3%
Producing other non-metallic mineral products	34.2%	37.7%	41.4%	34.9%	21.8%	35.3%	32.3%	13.6%	41.5%
Producing paper and paper products	24.0%	25.9%	35.9%	41.4%	35.5%	36.5%	36.7%	28.5%	52.2%
Producing products from rubber and plastic	44.3%	47.7%	44.3%	47.1%	43.1%	44.6%	44.0%	42.5%	59.0%
Producing tobacco products	11.6%	19.6%	19.6%	19.5%	15.9%	17.6%	16.8%	10.8%	14.4%
Production and distribution of electricity, gas, hot water, steam and air conditioning	8.0%	6.4%	3.2%	4.7%	0.0%	3.0%	2.7%	1.6%	5.8%
Production of beds, wardrobes, tables and chairs	47.4%	36.2%	34.9%	41.4%	48.8%	41.2%	41.8%	32.3%	55.1%
Production of electrical equipment	48.5%	53.3%	48.6%	52.1%	55.8%	58.7%	63.3%	54.3%	70.5%
Production of leather and related products	70.7%	51.6%	73.3%	74.3%	76.2%	77.3%	76.3%	70.6%	82.3%
Production of machinery and equipment not yet classified	40.2%	49.6%	58.6%	65.6%	62.3%	64.0%	63.0%	60.1%	73.4%
Production of medicines, pharmaceutical chemicals and pharmaceutical materials	19.7%	22.5%	22.6%	23.8%	27.3%	24.6%	25.0%	21.8%	31.7%
Production of other means of transport	72.6%	69.5%	66.8%	76.0%	59.7%	78.9%	80.2%	53.6%	81.0%
Repair, maintenance and installation of machinery and equipment	7.2%	9.0%	15.6%	27.5%	3.1%	9.9%	11.8%	10.1%	26.2%
Textiles	64.5%	66.2%	68.2%	75.5%	61.3%	70.9%	69.9%	53.1%	77.4%

Source: synthesized by author

Table 3-5: Number of total labor employed by two-digit manufacturing industries in Vietnam from 2007 to 2015

Workers employed by two-digit manufacturing industries (thousand workers)	2007	2008	2009	2010	2011	2012	2013	2014	2015
Apparel Garments	664	709	685	698	665	894	990	1,184	942
Beverage and Drinks	32	34	37	35	33	42	42	40	31
Food processing and production	394	424	453	426	305	465	470	482	365
Manufacturing automobiles and other motor vehicles	44	45	58	51	57	85	92	102	83
Manufacturing chemicals and chemical products	69	77	85	71	62	96	99	99	79
Manufacturing electronic products, computers and optical products	82	88	105	140	168	269	311	381	434
Manufacturing products from prefabricated metals (except machinery and equipment)	173	188	204	170	132	237	242	252	171
Metal production	51	58	61	62	45	64	68	72	46
Other processing and manufacturing industries	75	77	89	85	67	104	120	143	115
Print and copy all types of records	43	48	51	35	30	62	59	59	32
Processing wood and related products (except beds, cabinets, tables, chairs)	112	114	110	98	41	115	118	111	67
Producing coke, refined petroleum products	1	1	3	3	4	5	5	5	3
Producing other non-metallic mineral products	227	239	271	255	156	271	260	241	175
Producing paper and paper products	73	75	81	76	53	95	100	97	72
Producing products from rubber and plastic	143	154	167	167	144	202	215	236	195
Producing tobacco products	14	14	14	13	11	13	13	12	11
Production and distribution of electricity, gas, hot water, steam and air conditioning	103	112	225	130	113	145	140	136	119
Production of beds, wardrobes, tables and chairs	270	261	249	241	156	264	276	304	278
Production of electrical equipment	118	118	123	126	105	139	143	153	143
Production of leather and related products	576	601	561	629	557	773	858	1,001	880
Production of machinery and equipment not yet classified	46	48	50	46	43	57	60	62	54
Production of medicines, pharmaceutical chemicals and pharmaceutical materials	30	33	35	33	29	39	41	44	38
Production of other means of transport	116	116	120	96	76	90	89	96	80
Repair, maintenance and installation of machinery and equipment	21	22	24	15	14	29	31	31	22

Textiles	163	152	171	153	108	173	190	204	174

Table 3-6: Capital to labor ratio across two-digit manufacturing industries in Vietnam from 2007 to 2015

Capital to labor ratio (Mil VND)	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Apparel Garments	28	34	37	42	119	50	55	100	62
Beverage and Drinks	666	544	651	744	1,820	942	1,043	1,392	1,688
Food processing and production	157	178	209	258	873	359	391	808	494
Manufacturing automobiles and other motor vehicles	324	395	356	469	1,091	404	430	670	546
Manufacturing chemicals and chemical products	251	343	428	591	1,561	678	753	1,433	970
Manufacturing electronic products, computers and optical products	213	223	243	230	798	354	488	817	628
Manufacturing products from prefabricated metals (except machinery and equipment)	139	180	214	267	1,017	364	345	737	440
Metal production	341	370	605	631	2,042	687	907	1,832	962
Other processing and manufacturing industries	73	84	121	142	364	201	202	267	223
Print and copy all types of records	169	176	195	255	488	230	252	353	376
Processing wood and related products (except beds, cabinets, tables, chairs)	67	74	108	198	591	220	231	518	281
Producing coke, refined petroleum products	593	764	10,240	6,726	22,426	5,630	6,963	9,945	10,018
Producing other non-metallic mineral products	199	201	314	278	1,314	360	424	714	568
Producing paper and paper products	161	199	233	261	899	358	372	703	531
Producing products from rubber and plastic	153	186	231	247	715	319	355	572	422
Producing tobacco products	402	483	552	577	1,529	780	900	1,845	1,320
Production and distribution of electricity, gas, hot water, steam and air conditioning	755	830	1,011	1,377	2,794	2,085	2,655	3,115	1,691
Production of beds, wardrobes, tables and chairs	55	89	105	108	323	126	136	349	136
Production of electrical equipment	195	208	254	260	787	298	324	601	357
Production of leather and related products	29	49	42	43	119	50	52	95	63
Production of machinery and equipment not yet classified	222	271	300	370	836	413	454	795	549
Production of medicines, pharmaceutical chemicals and pharmaceutical materials	245	266	307	363	838	454	479	803	694
Production of other means of transport	211	240	257	403	1,374	584	711	1,182	836
Repair, maintenance and installation of machinery and equipment	77	85	154	131	1,169	193	212	547	231
Textiles	144	190	210	281	658	335	347	509	447

Source: synthesized by author

Table 3-7: Revenue generated by two-digit manufacturing industries in Vietnam from 2007 to 2015

Revenue generated by two-digit manufacturing industries in Vietnam (VND Trillion)	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Apparel Garments	50	62	65	83	110	142	173	217	197

Beverage and Drinks	26	33	40	58	69	81	95	101	100
Food processing and production	228	316	360	437	453	714	746	854	697
Manufacturing automobiles and other motor vehicles	41	55	74	80	97	113	132	177	177
Manufacturing chemicals and chemical products	65	92	108	124	132	191	209	226	202
Manufacturing electronic products, computers and optical products	61	73	83	128	263	473	770	899	1,180
Manufacturing products from prefabricated metals (except machinery and equipment)	64	93	106	137	136	208	235	258	224
Metal production	74	120	114	170	124	198	200	221	150
Other processing and manufacturing industries	12	15	21	25	27	38	43	54	49
Print and copy all types of records	12	15	17	16	17	27	30	33	23
Processing wood and related products (except beds, cabinets, tables, chairs)	18	22	25	32	24	60	70	70	55
Producing coke, refined petroleum products	3	4	18	75	136	144	174	144	104
Producing other non-metallic mineral products	64	82	124	133	127	185	196	204	195
Producing paper and paper products	25	35	37	48	48	81	87	99	84
Producing products from rubber and plastic	54	72	80	107	129	164	179	212	189
Producing tobacco products	19	21	27	32	32	40	45	39	37
Production and distribution of electricity, gas, hot water, steam and air conditioning	81	120	334	332	209	389	468	404	407
Production of beds, wardrobes, tables and chairs	44	51	53	66	56	92	106	126	127
Production of electrical equipment	62	71	80	106	111	145	162	188	186
Production of leather and related products	50	59	62	80	89	128	160	203	211
Production of machinery and equipment not yet classified	17	21	22	29	34	48	54	59	64
Production of medicines, pharmaceutical chemicals and pharmaceutical materials	15	19	22	27	26	38	43	46	48
Production of other means of transport	74	83	97	116	142	167	170	179	183
Repair, maintenance and installation of machinery and equipment	6	4	10	13	17	21	16	14	11
Textiles	53	58	73	94	81	149	170	188	174

Source: synthesized by author

To estimate productivity spillovers from FDI, this study draws on unbalanced panel data on 385,976 observations at 129,375 unlisted Vietnam manufacturing enterprises over the period 2011-2015 surveyed annually. In this dissertation, the various manufacturing industries and their subsets are classified with two-digit and four-digit codes, respectively. Furthermore, the observations with no clues on identification code, negative capital stock, negative sales, negative outputs, outliers, duplicates, and other unreliable values or missing key variables are excluded to ensure the validity and reliability of the sample (Sourafel Girma, Gong, Gorg, & Lancheros, 2015).

Table 3-8: Correlation matrix

	LN_TFP	H_FDI	F_FDI	B_FDI	IM	MS	HC	LI	FN	TG

LN_TFP	1									
H_FDI	0.0370*	1								
F_FDI	-0.0307*	0.3767*	1							
B_FDI	-0.1019*	0.1780*	-0.1341*	1						
IM	0.0250*	0.0711*	0.0140*	-0.1879*	1					
MS	0.7328*	0.1742*	0.1386*	-0.0409*	-0.0447*	1				
HC	-0.1251*	0.0031*	0.0045*	-0.0097*	0.0672*	0.1219*	1			
LI	-0.0692*	-0.0195*	-0.0386*	0.0791*	0.0349*	0.0145*	-0.1238*	1		
FN	0.0138*	-0.1170*	-0.0516*	-0.0076*	-0.1337*	-0.1217*	-0.1514*	0.3777*	1	
TG	-0.2404*	-0.0460*	0.0123*	0.1972*	-0.0269*	-0.1123*	0.0633*	0.0239*	-0.1628*	1

To estimate the effect if horizontal spillover on the average wage, the study uses annual enterprise firm-level data from the period 2007 to 2015 for 693,720 observations.

Table 3-9: Summary of variables

			TOTAL			
Period time: 2007 – 2015			N = 693,720		P = 100%	
Variable	**Measurement**	**Variable Name**	**Mean**	**Std. Dev.**	**Min**	**Max**
Average wage	ln(WAGES BUDGET/No. LABOR)	AW	3.522	0.874	0.000	12.679
Firm size	ln(EQUITY)	SIZE	8.088	1.529	0.000	19.803
Total output	ln(REVENUE)	RQ	8.181	2.119	-1.609	20.054
Capital intensive	ln(FIXED ASSET/No. LABOR)	KL	4.349	1.322	0.000	14.200
Gender ratio	No. FEMALE/ No. MALE	GR	0.743	1.708	0.000	279.000
Firm Income	ln(NET INCOME)	LN_NI	3.848	2.243	-2.303	17.900
Market share	FIRM SALES / INDUSTRY SALES	MS	0.004	0.029	0.000	1.000
Horizontal Spillover	FOREIGN SALES / INDUSTRY SALES	HOR_SP	0.109	0.170	0.000	1.000
Export orientation	= 1 if exporting; = 0 for other	EX_DUM	0.012	0.109	0.000	1.000
Import orientation	= 1 if importing; = 0 for other	IM_DUM	0.835	0.371	0.000	1.000
Ownership type	Dummies for private (1), joint-stock (2), FDI (3) and state-owned enterprises(4)	PRIVATE	0.713	0.452	0.000	1.000
		JOINT-STOCK	0.187	0.390	0.000	1.000
		FDI	0.289	0.167	0.000	1.000
		STATE_OWN	0.199	0.139	0.000	1.000

CHAPTER 4. EMPIRICAL FINDINGS AND DISCUSSIONS

By briefly reminding the research objectives and proposed hypotheses, this chapter provides empirical findings and relevant discussions for two branches of this dissertation: (1) the effect of inward FDI spillovers on domestic manufacturing firms' productivity (on other words, productivity spillovers from FDI) and (2) the effect of inward FDI spillovers on labor's average wage in the host economy (on other words, wage spillovers from FDI).

4.1 The effects of inward FDI spillovers on the productivity of Vietnamese manufacturing firms

Although the government offers foreign investors special incentives, including tax holidays, tariff reductions or exemptions, and subsidies for infrastructure, the empirical evidence on productivity spillovers from foreign firms to domestic firms is still ambiguous. Most studies on Vietnam focus on the direct effect of FDI on economic growth or technology spillovers from FDI before 2010 and lack of evidence for both vertical and horizontal spillovers from FDI (Anwar and Nguyen 2014; Anwar and Sun 2012; Le and Pomfret 2011; Thang, Pham, and Barnes 2016). Thus, this part attempts to find evidence for the following research objectives and hypotheses (as proposed in Chapter 3 – Empirical Literature Review) using a large unbalanced panel of data on 332,887 Vietnamese manufacturing firms from 2011 to 2015:

First, the author investigates the effects of FDI spillovers through vertical and horizontal channels to domestic firms' productivity (Hypotheses H1, H2a, H2b); secondly explore the moderating effects of absorptive capabilities in term of human capital, technology gap and financial development on productivity spillovers from foreign firms to Vietnamese manufacturing firms. (Hypotheses H3, H4a, H4b, H5); thirdly examine whether productivity spillovers through vertical and horizontal channels are associated with regional effects

(hypothesis H6a, H6b) and finally examine whether local firms in provinces located within 100 square kilometers (sq. km.) of eight cities/ provinces with highest FDI concentration receive greater FDI spillovers than those located outside 100 sq. km of these areas (hypothesis H7).

4.1.1 FDI spillover effect through vertical and horizontal channels on domestic manufacturing firm productivity

The table below reveals the findings of productivity spillovers from FDI in Vietnam from 2011 to 2015 using a large unbalanced panel data of 129,375 manufacturing firms (385,976 observations). At this stage, the Hausman test rejects the null hypothesis that the difference in coefficients is not systemic. Thus, it suggests a fixed-effects model should be a more appropriate option. Further, the problem of heteroskedasticity and autocorrelation are under control. It has been well illustrated in the table below that the coefficients for FDI spillover variables are significantly associated with TFP in both fixed effect and random effect model. In addition, the directions of these spillover indicators are consistent across models. Concerning the random effect model, the findings are robust with less negative horizontal and forward FDI spillovers and a larger magnitude of backward spillovers.

Concerning the fixed-effect model, the result indicates a significantly negative impact of horizontal spillover from MNCs' presence in the recipient country to domestic firms' TFP (β= -2.156***). It is worth to note that the adverse magnitude of horizontal spillover is quite large and appears to overwhelm two remaining channels of spillovers. This interesting finding is supported by the theoretical review of (Blomstrom & Kokko, 1998) and empirical evidences by (Carluccio & Fally, 2013; Damijan et al., 2013b; Javorcik & Spatareanu, 2008) implying the existence of dominant horizontal spillovers in challenging the survival of domestic firms through more fierce competition and stricter intellectual protection. It undeniable that Vietnamese manufacturing firms haven’t prepared themselves ready for the fighting against FDI penetration. That is the reason why the opportunities for absorbing positive horizontal

spillovers through imitation, demonstration and worker mobility is still limited to some extent. Thus, the **first hypothesis (H1)** referring to a negative impact of horizontal FDI spillover on the domestic firm's productivity is supported.

Regarding backward spillovers, Vietnam witnessed a reverse trend that the greater the effect of backward spillover is, the higher the productivity local firms can reach (β= 0.611***). Despite strong evidence for dominant effects of positive backward spillovers, it can't offset the negative outcome generated by horizontal spillovers. It is optimistic that the nature of backward spillover allows local firms with a certain level of absorptive capacity to benefit from the presence of foreign subsidiaries in the host market (Havranek & Irsova, 2011). When MNCs enter into a host economy, their first attempt is to relieve the foreignness liability by establishing their linkage relationship with local partners. Thus, they have many motivations to transfer their knowledge and premium processes to local suppliers in the backward linkage chain to control better their production (Hamida, 2013). On the other hand, local suppliers have to learn and adapt to higher foreign requirements. This creates chances and rooms for upgrading new technology and innovative process; as a result, improve the overall productivity (Javorcik et al., 2018). Therefore, **the hypothesis H2a** implying positive backward spillover is supported.

Besides, forward FDI spillover is found as an unfavorable determinant as it negatively affects domestic firms' TFP growth (β= -1.085***). The finding is different from the common perspective of positive externalities generated by forward FDI spillover. The previous studies discuss that MNCs' presence may benefit local firms' productivity in the downstream sector by less expensive and more accessible foreign inputs and premium supplementary services (Blomstrom & Kokko, 1998; Javorcik & Spatareanu, 2011). However, the foreign sector may implement its market penetration strategy aiming at increasing the dependencies on their intermediate products and services and weakening the embedded industries in the domestic host country (Newman et al., 2015; Thang et al., 2016). In this case, the finding **fails to support**

the hypothesis H2b implying positive forward FDI spillovers. Furthermore, while human capital, financial development, and firm size are positively associated with domestic firm's productivity, the technology gap incurs a significantly negative effect on that. The effects of these firm-specific characteristics will be discussed deeper in later parts.

Table 4-1: Productivity spillovers from FDI using fixed effect and random effect model

	(Fixed effect) LN_TFP	(Random effect) LN_TFP
Horizontal_FDI	-2.156*** (0.354)	-1.770*** (0.086)
Backward_FDI	0.611*** (0.115)	0.845*** (0.101)
Forward_FDI	-1.085*** (0.275)	-0.816*** (0.152)
Financial_Development	0.018** (0.052)	0.013*** (0.037)
Human_Capital	0.000* (0.000)	0.000*** (0.000)
Technology_Gap	-3.359*** (0.776)	-3.534*** (0.562)
Concentration	-8.423 (5.953)	-3.080 (2.561)
Firm_Size	0.247*** (0.070)	0.203*** (0.051)
_cons	2.777** (1.145)	3.215*** (0.845)
N	385976	385976
Firms	129375	129375
R^2	0.581	

Standard errors in parentheses
* p<.10, ** p<.05, *** p<0.01

4.1.2 The moderating effect of human capital

The table below reveals how FDI spillovers affect a firm's TFP across different levels

of human capital. In this dissertation, human capital is measured as natural logarithm of the ratio of firm i's average wage to industry j's average wage at time t (Anwar & Nguyen, 2014; Damijan et al., 2013). Besides, the degree of human capital is divided into two segments: less than 50^{th} percentile and equal or greater than 50^{th} percentile to better evaluate its role. It is worth to note that the number of manufacturing firms in the top 50^{th} human capital segment has only accounted for 32 percent of total firms investigated. The result indicates that human capital is a facilitator for productivity spillovers from foreign firms to domestic firms. Specifically, less negative horizontal (from β= -3.010*** to β= -2.100***) and forward spillover (from β= -1.073** to β= -0.993***) are associated with higher level of human capital (equal or greater than 50^{th} percentile). More important, positive backward spillover is also improved with a higher degree of human capital (from β= 0.541*** to β= 0.613***). It can be explained that higher quality of human capital results in better absorptive capacity and enables the successful knowledge and technology transfer from foreign firms to local firms in backward and forward linkage chain (Becker, 1975; Liu et al., 2001; Wang et al., 2012).

Besides, MNCs often offer their employed workers training and premium practices. As a consequence, the movement of these labor from foreign affiliates to domestic ones unavoidably provides many chances for knowledge diffusion contributing to improving indigenous firms' absorptive capacity and labor productivity (Demena, 2015; Havranek & Irsova, 2011; Wang et al., 2012). In this way, the acquisition of human capital in local firms is a facilitator to benefit from FDI spillovers and help domestic firms reach a higher level of productivity (Anwar & Nguyen, 2014). Thus, **hypothesis H3** referring to positive moderating effects of human capital on the FDI spillover-productivity relationship is supported.

Table 4-2: The moderating effect of human capital on productivity spillovers from FDI

	(FEM)	**(FEM)**
	Human capital	Human capital

	<50 percentile LN_TFP	>=50 percentile LN_TFP
Horizontal_FDI	-3.010***	-2.100***
	(0.764)	(0.441)
Backward_FDI	0.541***	0.613***
	(0.156)	(0.175)
Forward_FDI	-1.073**	-0.993***
	(0.537)	(0.237)
Financial_Development	0.057***	0.010**
	(0.097)	(0.026)
Technology_Gap	-3.280***	-3.393***
	(1.139)	(0.679)
Concentration	0.103	-13.110**
	(5.055)	(6.607)
Firm_Size	0.234**	0.279***
	(0.103)	(0.061)
_cons	2.795*	2.634***
	(1.696)	(0.994)
N	236084	149892
Firms	88694	40691
R^2	0.572	0.581

Standard errors in parentheses
* p<.10, ** p<.05, *** p<0.01 - (FEM): fixed effect model

4.1.3 The moderating effect of the technology gap

Concerning technological incompatibility, the table below shows interesting findings toward the moderating effect of the technology gap on the relationship between three channels of FDI spillovers and firm productivity. In this dissertation, the level of the technology gap between foreign firms and domestic firms is then classified into three main segmentations including technology gap at bottom 25th percentile, technology gap from 25th to 75th percentile and technology gap at top 25th percentile, as adopted from (Sourafel Girma & Wakelin, 2007). The results indicate that negative horizontal FDI spillover on a firm's TFP is impressively improved with the movement of technology gap from the bottom 25th percentile to the middle 25th -75th percentile (from β= -1.594*** to β= -0.818***). At the upper percentile, there is no

signal for the moderating effect of the technology gap. Productivity associated with forward FDI spillovers also witnesses the similar trend (from β= -0.845*** at bottom 25th to β= -0.244*** at the middle one, and insignificant coefficient at the top 25th).

On the other hand, the relationship between backward FDI spillover and firm productivity is diminished when the technology gap turns from the bottom 25th segment to the middle one. Besides, an insignificant backward spillover is also found at the top 25th percentile. Although the technology gap provides more chances for local firms to upgrade their technology to achieve aggressive productivity growth, its effects on productivity spillover appear to be a little complicated. While the small gap generates less motivation for local firms to imitate, the large gap prevents low-technological-frontier firms from reaching more advanced technology (Sourafel Girma & Wakelin, 2007; Jacobs et al., 2017; Kounetas, 2015). Thus, many previous studies appreciate the catch-up (middle) technology gap that is in favor of technology transfer and matches the domestic firm's absorptive capacity. This contributes to explain the improvement in horizontal and forward externalities in the middle 25th -75th gap. However, as discussed above, local firms, especially firms in forward and backward linkage with foreign subsidiaries have to prepare themselves ready for successful technology transfer and enhance their absorptive capacity to benefit from FDI externalities (Dimelis *, 2005; Jordaan, 2013). Therefore, the findings support **hypothesis H4a and H4b** in the case of horizontal and forward FDI spillovers. Meanwhile, for backward FDI spillover, these hypotheses are partially supported.

Table 4-3: The moderating effect of technology gap on productivity spillovers

	(FEM)	**(FEM)**	**(FEM)**

	Technology gap at bottom 25th percentile LN_TFP	Technology gap from 25th to 75th percentile LN_TFP	Technology gap at top 25th percentile LN_TFP
Horizontal_FDI	-1.594***	-0.818***	-0.053
	(0.358)	(0.168)	(0.285)
Backward_FDI	0.419***	0.132**	-0.028
	(0.103)	(0.053)	(0.101)
Forward_FDI	-0.854***	-0.244**	-0.248
	(0.219)	(0.115)	(0.213)
Financial_Development	0.175***	0.140***	0.143***
	(0.032)	(0.008)	(0.034)
Human_Capital	0.000***	0.000	0.000
	(0.000)	(0.000)	(0.000)
Concentration	-2.219***	-5.947*	7.362**
	(0.536)	(3.310)	(3.512)
Firm_Size	0.232***	0.038***	0.029
	(0.017)	(0.003)	(0.033)
_cons	3.472***	6.418***	4.124***
	(0.241)	(0.028)	(1.059)
N	96738	188711	100527
Firms	33485	65903	29987
R^2	0.444	0.739	0.650

Standard errors in parentheses
* p<.10, ** p<.05, *** p<0.01 - (FEM): fixed effect model

4.1.4 The moderating effect of financial development

The table below indicates the moderating effect of three different levels of financial development on productivity spillovers from FDI. It is worth to note that FDI spillovers in both vertical and horizontal channels do not occur at the bottom 25th percentile of financial development. Concerning backward FDI spillover, its effect on firm productivity is significantly enhanced with a higher level of financial development (from β= 0.298*** at the middle 25th – 75th to β= 0.737*** at the upper one). In the contrast, horizontal FDI spillover witnesses a reverse trend when its effect on a firm's TFP is more negative at the upper level of

financial development (from β= -1.273*** to β= -2.015*** at the upper one). Meanwhile, forward FDI spillover only occurs in the middle 25th to 75th segment of financial development (β= -1.093***).

The insignificant FDI spillovers at the bottom segment of financial development may come from the fact that domestic firm's spillover absorption requires a certain level of financial slacks. This kind of slack resources reflects the high-liquidity financial surplus to invest in new chances or relieve external pressures (Bourgeois, 1981; Nohria & Gulati, 1996). It is also admitted that the more efficient the financial accumulation and allocation are, the more effective the firms implement their strategies (Lin & Liu, 2012). In this way, the financial development empowers domestic enterprises to launch the technology transfer programs and better absorb knowledge diffusion from foreign presence. Thus, **hypothesis H5** implying a positive moderating effect of financial development is in favor of backward FDI spillovers. Meanwhile, the findings fail to support the hypothesis H5 in the case of horizontal and forward spillover.

Table 4-4: The moderating effect of financial development on productivity spillovers

	(FEM) Financial development at bottom 25th percentile LN_TFP	**(FEM)** Financial development from 25th to 75th percentile LN_TFP	**(FEM)** Financial development at top 25th percentile LN_TFP
Horizontal_FDI	-0.444	-1.273***	-2.015***
	(0.587)	(0.244)	(0.533)
Backward_FDI	0.112	0.298***	0.737***
	(0.172)	(0.085)	(0.227)
Forward_FDI	-0.302	-1.093***	-0.159
	(0.383)	(0.209)	(0.311)
Human_Capital	0.000	0.000***	0.000
	(0.000)	(0.000)	(0.000)
Technology_Gap	-1.840	-5.440***	-3.032***
	(1.149)	(0.190)	(0.654)

Concentration	-0.341	-4.690***	-27.610**
	(2.509)	(0.955)	(11.355)
Firm_Size	0.407***	0.049***	0.299***
	(0.093)	(0.018)	(0.064)
_cons	0.222	5.987***	2.193**
	(1.613)	(0.294)	(1.003)
N	98737	173407	113832
Firms	34952	59920	34503
R^2	0.358	0.854	0.554

- (FEM): fixed effect model

4.1.5 Productivity spillovers from FDI firms to domestic manufacturing firms across six geographical regions and four economic regions in Vietnam from 2010 to 2015

The high R^2 values across six geographical regions indicate that the independent variables added can explain 46.5 percent to 82.7 percent of the movement of the dependent variable (*LN_TFP*). It has been revealed that firms' productivity improvements under foreign presence vary significantly across regions in Vietnam and are contributed by backward linkages between local firms and foreign affiliates. This is consistent with what was found in the study of Anwar & Nguyen (2014). Specifically, the relationship between horizontal spillover and TFP from 2011 to 2015 is significantly negative across six geographical regions with robust large magnitudes, except for North East & North West and Mekong River Delta. This outcome is predictable, as it is supported by fresh evidence from similar economies (Gorodnichenko, Svejnar, and Terrell 2014; Javorcik and Spatareanu 2008; Zanello et al. 2016). The significantly negative magnitudes of forward spillover in Red River Delta (β=-0,956***), South East (β=-1,359***) and Mekong River Delta (β=-0.801***) have proven its existence as an important channel of FDI spillovers in Vietnam. The finding is in contrast to observations by Anwar and Phi (2011) and Anwar and Nguyen (2014), who investigate the insignificant forward effect in 2000-2005 when inward foreign equity is limited to some extent. This difference may come from foreign subsidiaries' significant improvements in seeking downstream customers in the host market by better infrastructure, higher exposure to foreign

intermediate inputs (Iršová and Havránek 2013). However, the low accumulation of human capital and insufficient financial development in most Vietnamese manufacturing firms may trigger a true barrier for local firms to absorb favorable FDI externalities.

Remarkably, the study finds the significant positive effects of vertically backward spillover on promoting firms' productivity in the host country across all six regions, except for North East & North West. The backward FDI spillover is unexpectedly highest at Highlands (β= 0.913**) where the region receives the lowest share of inward FDI. It is followed by the most FDI-intensive region - South East (β= 0.628***). This is a little bit different from Anwar and Nguyen (2014) who found the existence of positive FDI externalities in Red river delta, South Central Coast, South East, and Mekong river delta. It is worth to note that these regions are still characterized by better absorptive capacity in terms of infrastructure, human capital, and technological capacity. However, the findings indicate that despite the existence of positive backward FDI spillover, it is still small to offset unfavorable horizontal and forward FDI spillover. Many previous studies emphasize the importance of backward spillover as a significant channel of positive productivity externalities where domestic firms are strongly motivated to learn and absorb the knowledge diffusion from their foreign partners to maintain their position as local suppliers (Anwar and Sun 2012; Barrios, Görg, and Strobl 2011). Concerning absorptive capabilities, human capital has an overall positive effect on TFP growth in the entire country as well as in the Red River Delta (β= 0.000***) and South East (β= 0.001***). The findings are similar to what was found in Anwar and Nguyen (2014). Nevertheless, the impact of human capital is quite dim and insignificant in most geographical regions. The technology gap is consistently negative across the six regions, which builds on the rich evidence in Havranek and Irsova (2011). On the other hand, a significantly positive impact of financial development on TFP is found in the South East region. The robustness checks for TFP of six geographical regions in Vietnam, 2011-2015 are conducted. The results

of the robustness check are consistent with those in the fixed-effects model. The results support the **hypothesis H6a** partly implying the spillover variation across geographical regions is supported. However, the findings fail to support the remaining hypothesis statement mentioning larger spillover magnitude associated with high FDI concentration.

Table 4-5: Productivity spillovers from FDI across six geographical regions

	(FEM) Red River Delta	**(FEM)** Northeast & Northwest	**(FEM)** N&S Central Coast	**(FEM)** Highland	**(FEM)** Southeast	**(FEM)** Mekong River Delta	**(FEM)** Entire country
	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP
Horizontal_FDI	-2.138***	-0.669	-2.522***	-2.542*	-1.974***	-0.506	-2.156***
	(0.447)	(0.628)	(0.871)	(1.313)	(0.323)	(0.463)	(0.354)
Backward_FDI	0.435***	0.323	0.446*	0.913**	0.628***	0.311**	0.611***
	(0.135)	(0.201)	(0.262)	(0.397)	(0.146)	(0.121)	(0.115)
Forward_FDI	-0.956***	0.154	0.516	-0.870	-1.359***	-0.801**	-1.085***
	(0.353)	(0.428)	(0.541)	(0.860)	(0.294)	(0.346)	(0.275)
Financial_Development	-0.017	0.033	0.049	0.082	0.054**	0.034	0.018
	(0.075)	(0.062)	(0.052)	(0.037)	(0.023)	(0.054)	(0.052)
Human_Capital	0.000***	0.000	0.000	0.003	0.001***	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)
Technology_Gap	-2.622**	-4.048***	-3.061***	-5.254***	-4.813***	-4.685***	-3.359***
	(1.303)	(0.577)	(0.681)	(0.187)	(0.294)	(0.413)	(0.776)
Industry concentration	1.033	-1.995	-31.663**	-9.400***	-6.824	-22.454	-8.423
	(2.241)	(2.487)	(14.627)	(2.905)	(9.014)	(21.899)	(5.953)
Firm_Size	0.283***	0.193***	0.274***	0.091***	0.115***	0.145***	0.247***
	(0.105)	(0.042)	(0.064)	(0.021)	(0.030)	(0.041)	(0.070)
A year and 4-digit industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
_cons	1.758	3.419***	2.159**	5.244***	5.136***	4.596***	2.777**
	(1.890)	(0.800)	(1.037)	(0.305)	(0.445)	(0.625)	(1.145)
N	116213	29137	61998	11186	123650	43790	385976
Firms	35737	10754	19460	4728	45276	13420	129375
R^2	0.465	0.673	0.551	0.827	0.782	0.772	0.581

Standard errors in parentheses
* p<.10, ** p<.05, *** p<0.01 - (FEM): fixed effect model

To further complicate the matter of regional effects, the study investigates the impact of horizontal and vertical spillovers on TFP across four economic regions (North, Central, South and Mekong River Delta) classified by GSO. Despite the lower share of inward FDI

compared to other economic regions, the Central region holds the first position both in receiving the most negative horizontal FDI spillover (β = - 2.553***) and the highest positive backward spillover (β = 0.543**). It is followed by South region (β_H = - 1.974***, β_B = 0.428***, β_F = - 1.359***) and North region (β_H = - 1.948***, β_B = 0.406***, β_F = - 0.761***) which are characterized by highest FDI concentration and human capital accumulation. Mekong River Delta, on the other hand, does not receive any horizontal spillover. Similarly, the finding supports the first half of **the hypothesis H6b** referring to spillover variation across four economic regions. Nevertheless, it fails to support the second half of the hypothesis relating to greater spillover effects on more FDI-intensive regions.

Table 4-6: FDI spillover effect on domestic firm productivity across four economic regions

	(FEM) (North)	**(FEM)** (Central)	**(FEM)** (South)	**(FEM)** (Mekong River Delta)
	LN_TFP	LN_TFP	LN_TFP	LN_TFP
Horizontal_FDI	-1.948***	-2.553***	-1.974***	-0.506
	(0.421)	(0.829)	(0.323)	(0.463)
Backward_FDI	0.406***	0.543**	0.428***	0.311**
	(0.116)	(0.249)	(0.146)	(0.121)
Forward_FDI	-0.761***	0.269	-1.359***	-0.801**
	(0.295)	(0.487)	(0.294)	(0.346)
Financial_Development	0.001	0.037	0.054**	0.034
	(0.075)	(0.049)	(0.023)	(0.054)
Human_Capital	0.001***	0.000	0.003***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Technology_Gap	-2.800**	-3.235***	-4.813***	-4.685***
	(1.219)	(0.673)	(0.294)	(0.413)
Concentration	0.547	-32.080**	-6.824	-22.454
	(2.132)	(14.814)	(9.014)	(21.899)
Firm_Size	0.271***	0.260***	0.115***	0.145***
	(0.097)	(0.063)	(0.030)	(0.041)
_cons	1.955	2.426**	5.136***	4.596***
	(1.754)	(1.020)	(0.445)	(0.625)

N	145352	73184	123650	43790
Firms	46491	24188	45276	13420
R^2	0.491	0.571	0.782	0.772

Standard errors in parentheses
* p<.10, ** p<.05, *** p<0.01 - (FEM): fixed effect model

It is undeniable that FDI spillovers on firm productivity and its magnitude may vary across regions relying on different regional characteristics such as geographical features, the availability of production inputs, infrastructure, institutional quality, business environment and preferential policies (Demir, 2016; Mebratie & van Bergeijk, 2013; Z. Wei & Hao, 2011). Besides, indeed, the firms' productivity and spillover absorption are often determined by common regional characteristics, resources and a wide range of its surrounding firms' activities such as inter-linkages, export, imitation, labor turnover and competition (Zhao Chen et al., 2017; Damijan et al., 2013a; Sourafel Girma et al., 2008; Hamida, 2013). These positive and negative effects are even larger in the case of intra-industry firms located in the same region. In other words, intra-regional firms may suffer similar regional advantages and inherit common advantages determining their performance under foreign presence. This can contribute to explaining spillover variations across regions and the large unfavorable horizontal spillovers in Red River Delta, North & South Central Coast, and South East. It is also argued that geographic distribution does not matter for the effect of FDI externalities on the productivity of firms located in the same region (Takii, 2011). Despite increasing inward capital, FDI in Vietnam is unevenly distributed and mostly concentrated in highly developed regions as Red River Delta and South East. Meanwhile, other regions with high economic potentials are still not an attractive destination for foreign investors. Therefore, this dissertation, by identifying the geographical and economic regions with robust FDI spillovers, can provide practical implications to help governments offer appropriate policies on attracting FDI and relieving regional pressures.

4.1.6 The role of provincial proximity in FDI productivity spillovers

The table below shows the effects of FDI spillovers on firm productivity across provincial distances. The distance is measured from the province that the firm located to the border of most FDI-intensive provinces as Ha Noi, Bac Ninh, Hai Phong, Binh Duong, Dong Nai, Ba Ria Vung Tau and Ho Chi Minh. Although this measure is inadequate to capture the geographical distance, it appears to be an acceptable choice at this time due to the lack of data on physical distance. In this way, provincial distance is classified into nine sub-areas including within 100 sq. km. of Ha Noi, within 100 sq. km. of Bac Ninh, within 100 sq. km. of Hai Phong, within 100 sq. km. of Binh Duong, within 100 sq. km. of Dong Nai, within 100 sq. km. of Ba Ria Vung Tau, within 100 sq. km. of Ho Chi Minh and outside 100 sq. km of these regions. Intuitively, the effect of horizontal FDI spillover on TFP is negatively robust across nine sub-areas, except the insignificant impacts in two sub-areas "Within Ha Noi 100 km^2" and "Within Hai Phong 100 km^2". The most negative horizontal spillover (β = -3.586***) occurs within Thanh Hoa 100 km^2, followed by within Binh Duong 100 km^2 (β = -2.115***) and within BR-VT 100 km^2 (β = -2.050***). The situation is not better for firms located in the provinces outside 100 km^2 of these sub-areas (β = -2.940***). Although greater externalities are believed to be concentrated in the biggest cities/provinces in terms of foreign capital inflows, the magnitude of FDI spillovers, in this case, is unpredictable.

Regarding backward spillover, the positive backward externalities occur in most sub-areas, except "within Bac Giang 100 km^2" and "within Hai Phong 100 km^2". Regardless of the highest negative horizontal spillover, sub-area "within Thanh Hoa 100 km^2" continues to absorb the largest positive backward spillover for enhancing the firm's TFP. It is interesting to note that the outside sub-area (β=0.754***) outperforms than the most FDI-intensive sub-areas such as within Ho Chi Minh 100 km^2, within Ho Chi Minh 100 km^2, within Binh Duong 100 km^2, within Dong Nai 100 km^2, and within Ha Noi 100 km^2 in term of positive backward FDI

absorption. On the other hand, forward FDI spillovers negatively affect firm productivity in most sub-areas with nearby provincial proximity, except within Hai Phong 100 km^2, within Thanh Hoa 100 km^2 and the outside region. Negative forward externalities are more likely to occur in the South economic regions within 100 sq. km of the FDI-intensive provinces as Binh Duong (β = -1.625***), Dong Nai (β = -1.368***) and Ba Ria -Vung Tau (β = -1.631***).

Table 4-7: FDI spillover and geographically provincial proximity

	(FEM) Within Ha Noi 100 km^2	**(FEM)** Within Bac Giang 100 km^2	**(FEM)** Within Hai Phong 100 km^2	**(FEM)** Within Thanh Hoa 100 km^2	**(FEM)** Within Binh Duong 100 km^2	**(FEM)** Within Dong Nai 100 km^2	**(FEM)** Within BR-VT 100 km^2	**(FEM)** Within Ho Chi Minh 100 km^2	**(FEM)** Outside 100 km^2 of these areas
	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP
Horizontal_FDI	-0.669	-1.189***	-0.605	-3.586***	-2.115***	-1.897***	-2.050***	-1.602***	-2.940***
	(0.540)	(0.307)	(0.566)	(1.379)	(0.374)	(0.299)	(0.383)	(0.520)	(0.757)
Backward_FDI	0.418**	0.128	0.043	1.383***	0.692***	0.492***	0.653***	0.646***	0.754***
	(0.207)	(0.098)	(0.222)	(0.420)	(0.175)	(0.110)	(0.179)	(0.191)	(0.206)
Forward_FDI	-0.641*	-0.368**	0.010	-0.607	-1.625***	-1.368***	-1.631***	-0.517*	-0.391
	(0.389)	(0.187)	(0.391)	(1.053)	(0.384)	(0.286)	(0.397)	(0.299)	(0.275)
Financial_Development	0.046*	0.222***	-0.105	0.211**	-0.033	-0.030	-0.010	0.106***	0.187**
	(0.026)	(0.016)	(0.076)	(0.087)	(0.031)	(0.022)	(0.033)	(0.029)	(0.090)
Human_Capital	0.000***	0.000***	0.001***	0.000	0.000	0.000***	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Technology_Gap	-5.447***	-5.373***	-4.156***	-2.488***	-4.761***	-5.019***	-4.718***	-4.629***	-2.356**
	(0.054)	(0.101)	(0.743)	(0.957)	(0.348)	(0.258)	(0.356)	(0.321)	(1.051)
Concentration	-0.416	-4.133***	-3.212	-45.419	-8.820	3.058	-8.727	-15.109	-0.635
	(0.517)	(0.975)	(2.539)	(32.354)	(11.823)	(6.771)	(11.737)	(9.750)	(8.217)
Firm_Size	0.055***	0.063***	0.118***	0.281***	0.115***	0.087***	0.119***	0.155***	0.339***
	(0.010)	(0.010)	(0.042)	(0.069)	(0.037)	(0.027)	(0.038)	(0.032)	(0.094)
_cons	5.689***	5.778***	4.150***	1.461	5.153***	5.532***	5.093***	4.458***	1.135
	(0.108)	(0.150)	(0.928)	(1.331)	(0.535)	(0.392)	(0.550)	(0.475)	(1.558)
N	19816	83712	14252	14837	99384	108432	96198	45230	131869
R^2	0.877	0.841	0.667	0.428	0.774	0.810	0.770	0.761	0.458

Standard errors in parentheses
* p<.10, ** p<.05, *** p<0.01 - (FEM): fixed effect model

Based on the findings above, the **hypothesis H7** is not supported as the provincial proximity from the province local firms located to the province with high FDI concentration matters for productivity spillovers in a more complicated way. This may come better infrastructure, transportation and the existence of inter-regional linkages that allow wider

spillovers across provinces and regions (Aitken & Harrison, 2013). This makes the distance not a decisive determinant any more. Indeed, FDI spillovers may freely be absorbed by the firms in remote regions with the availability of production inputs and strategic assets. However, it is argued that FDI spillovers are bounded with distance and trigger greater impacts on their nearby enterprises by diverse mechanisms (Halpern & Muraközy, 2007; Thang et al., 2016). There is much empirical evidence for the importance of geographical proximity in enabling successful knowledge and technology transfer between foreign firms and domestic firms (Sourafel Girma & Wakelin, 2007; Havranek & Irsova, 2011; Mariotti et al., 2015; Merlevede & Purice, 2016). With provincial proximity, Halpern & Muraközy (2007) also use the scale within 100 sq. km of Hungarian FDI-intensive centers to capture the moderating effect of distance. Nevertheless, their finding indicates positive horizontal spillovers on local firms located close to foreign ones.

4.1.7 Robustness check

The dynamic panel data (DPD) approach was developed to overcome the obstacle in fixed-effect models with datasets that contain a relatively small number of observed periods compared to the number of individual units (small T and large N) (Holtz-Eakin et al., 2006). The issue that the mean of the lagged dependent variables y_{t-1} contains zero values on observations at time *t* because the mean error is subtracted has contemporaneous erroneous values at time *t*. Consequently, the bias in calculating the coefficients of the lagged dependent variable *y* becomes considerable because it is not mitigated when the number of observations increases (Baum 2013.).

This bias is not caused by autocorrelation error, so the lagged dependent variable cannot be independent of the composite error process. The DPD approach improves on the instrumental variables (IVs) approach, which does not exploit all the information available in the sample.

After the generalized methods of moments (GMM) method was introduced by Arellano and Bond (1991), Arellano and Bover (1995), Blundell and Bond (2000), Blundell, Bond, and Windmeijer (2001), and Bond (2002), the DPD model could be estimated more efficiently. We use the syntax xtabond2 to test the robustness of the effects of FDI spillovers on domestic productivity (Stata, 2015). The results of our robustness check are consistent with those in the fixed-effects model (see more in Appendix 4).

Table 4-8: Robustness check for TFP in six regions in Vietnam using DPD approach

	(GMM)	**(GMM)**	**(GMM)**	**(GMM)**	**(GMM)**	**(GMM)**	**(GMM)**
Independent variables	Entire country	Northeast & Northwest	North & South Central Coast	Highland	Southeast	Mekong River Delta	Red River Delta
	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP	LN_TFP
L.LN_TFP	0.058***	0.029**	0.174***	0.091***	-0.074	0.092***	-0.159***
	(0.008)	(0.013)	(0.047)	(0.035)	(0.064)	(0.011)	(0.052)
L2.LN_TFP	-0.017***	-0.025***	0.049*	-0.025	-0.044	0.002	-0.138***
	(0.005)	(0.009)	(0.029)	(0.024)	(0.033)	(0.006)	(0.043)
H_FDI	-0.178*	-0.444**	-0.290	0.185	-0.793	-0.153	-0.357
	(0.097)	(0.201)	(0.407)	(0.240)	(0.928)	(0.122)	(0.373)
F_FDI	-1.216***	-1.079***	0.358	-0.652	-0.402	-1.317***	-0.563
	(0.073)	(0.177)	(0.376)	(0.474)	(0.482)	(0.085)	(0.407)
B_FDI	0.536***	0.423**	1.071***	0.608***	1.072***	0.501***	0.810***
	(0.070)	(0.187)	(0.220)	(0.210)	(0.415)	(0.087)	(0.279)
IM	0.039***	0.046***	0.015**	0.020***	0.030*	0.039***	0.014
	(0.002)	(0.005)	(0.007)	(0.006)	(0.016)	(0.003)	(0.009)
MS	0.652***	0.714***	0.605***	0.619***	0.689***	0.643***	0.663***
	(0.006)	(0.012)	(0.031)	(0.032)	(0.051)	(0.007)	(0.033)
HC	-0.563***	-0.616***	-0.364***	-0.415***	-0.376***	-0.417***	-0.390***
	(0.004)	(0.007)	(0.021)	(0.019)	(0.043)	(0.010)	(0.030)
LI	-0.027***	-0.024***	-0.053***	-0.017**	-0.039**	-0.020***	-0.020
	(0.004)	(0.006)	(0.009)	(0.008)	(0.018)	(0.004)	(0.013)
FN	0.121***	0.158***	0.093***	0.114***	0.134***	0.151***	0.017
	(0.030)	(0.016)	(0.026)	(0.024)	(0.045)	(0.010)	(0.014)
TG	-0.097***	-0.162***	-0.071	-0.041	-0.028	-0.001	-0.050
	(0.023)	(0.049)	(0.068)	(0.066)	(0.133)	(0.032)	(0.072)
_cons	10.592***	11.264***	8.333***	9.810***	10.970***	10.223***	11.841***

	(0.095)	(0.179)	(0.436)	(0.396)	(0.495)	(0.112)	(0.461)
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	163088	48726	7694	15700	2493	80591	7884

Standard errors in parentheses
** p<.10, ** p<.05, *** p<0.01*

4.2 The effect of horizontal spillovers from FDI on average wages

Although FDI firms appear to implement a generous wage policy, the origin of the foreign investor is also essential to determine the investor's labor demand, skill intensity requirement and wage premium level in the host country (Nelson, 2010; Ni et al., 2017). For example, Chinese investors have a high demand for blue-collar workers and tend to lower the equilibrium wages for both unskilled and skilled workers (Nelson, 2010). In Vietnam, domestic firms are characterized by low-skilled intensive production, whereas FDI firms from more developed countries are well-known for technology- and capital-intensive production. This trend creates a competitive market for high-skilled and qualified workers. Moreover, foreign presence may threaten unskilled employees, who may lose their jobs as a result of a domestic firm's exit or acquisition and labor-saving technology (Girma & Greenaway, 2013). Subsequent job losses may lead to abundant labor supply, lower average wages, and wage inequality. The gender ratio is also a factor, as female workers tend to receive lower wages and fewer opportunities in the labor market, with many prejudices against them (Nguyen, 2015). Despite this ambiguous overall effect of FDI on average salary, there is a lack of studies investigating this issue in Vietnam. Therefore, by using 2007-2015 unbalanced panel data of Vietnamese enterprises surveyed by the General Statistics Office of Vietnam (GSO), this study aims to find fresh evidence for the proposed hypotheses (as in Chapter 3 – Empirical Literature Review)

Firstly, the author investigates the effect of horizontal spillover from FDI on the average wage of Vietnamese domestic firms (Hypothesis H8), then explore whether ownership type influences wage spillovers from FDI (Hypothesis H9).

4.2.1 Time trends of the average wage, horizontal spillover, import, and export orientation across different ownership types

As shown in the figures below, the average wage varied among the different types of ownership in the period 2007 to 2015. The average wages of FDI firms and SOEs were highest during the observed period. In contrast to the average wage in SOEs, which steadily increased every year, the average wages in the other sectors fluctuated dramatically in the period 2011 to 2015, with an obvious sudden drop in all sectors except FDI firms in 2014. Although the foreign exchange value of Vietnam increased every year from 2007 to 2015, the ratio of foreign trading orientation among firms did not change notably. In 2007, more than 90 percent of firms were using imported input, whereas few firms exported products. Whereas the ratio of firms involved in exporting activities gradually increased through the period of 2007 to 2015, the ratio of import orientation among firms fluctuated erratically.

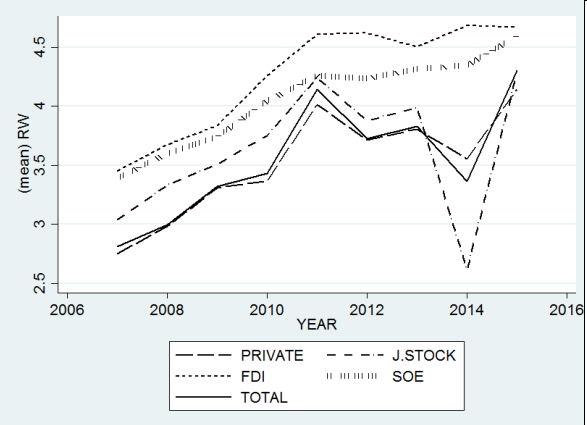

Figure 4-1: Average wage among firms with different types of ownership

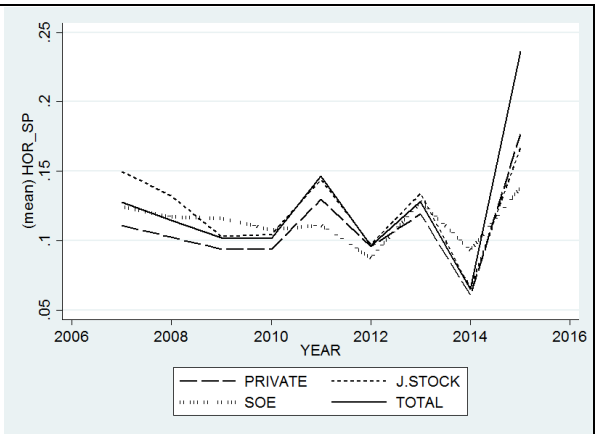

Figure 4-2: Horizontal spillover among firms with different types of ownership

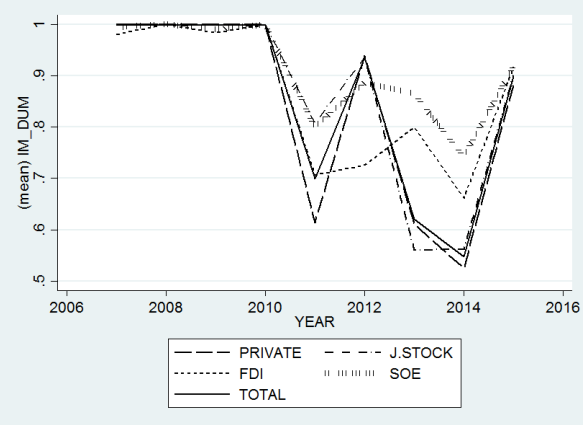

Figure 4-3: Ratio of importing orientation of firms with different types of ownership

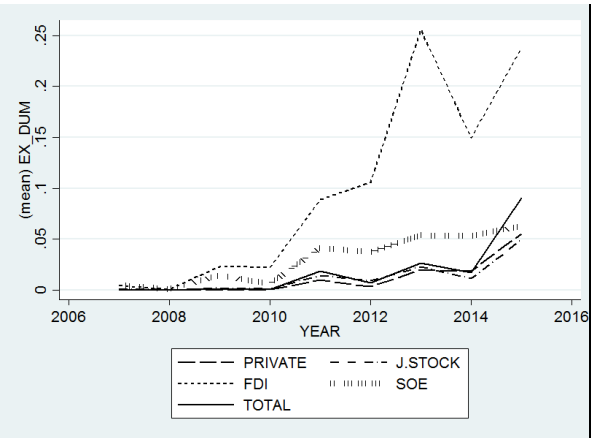

Figure 4-4: Ratio of exporting orientation of firms with different types of ownership

4.2.2 Empirical findings on wage spillovers from FDI

Three estimation methods pooled ordinary least squares (OLS), fixed effects (FE) and random effects (RE), were used to identify the determinants of wage levels. Based on the results of the Hausman test, the FE method was chosen over the RE method to analyze the data. The FE approach was then used to investigate the effect of ownership types on the relationships between the dependent variable and independent variables, clustering by each firm to eliminate the impacts of heteroscedasticity and autocorrelation.

As the measure of firm size (SIZE), firm equity is negatively related to the real wage (β = -0.0927; $p < 0.01$), indicating that small firms are more likely to pay higher wages than large firms; when the firm size becomes more substantial, the average wage is negatively related to firm size. This finding contrasts with those of previous studies showing that firm size and wages parallel each other because of the financial ability of enterprises. The vast equity resources held by large firms typically lead to the payment of high wages to their workers. However, in the context of emerging countries, cheap labor is the goal of most large firms. Larger firms or foreign-owned corporations possessing a good reputation, productive status, and high capital

intensity are always more attractive to local employees (Decreuse & Maarek, 2015). In addition, the average wage may fall as the firm size increases because most employment created by large firms and foreign subsidiaries in an emerging economy is unskilled labor-intensive, with repetitive tasks (Chenet al., 2013; Nelson, 2010). When investigated according to ownership type, a negative relationship is observed only for domestic private firms and joint-stock companies.

The output has a significantly positive effect on the average wage ($\beta = 0.0158$; $p < 0.01$). In terms of labor demand, real output (RQ) demonstrates the need to expend resources in the market through human capital. This conclusion is consistent with the Lewis-Fei-Ranis model, which describes the need for a dynamic labor force in an abundant economy. Conversely, the overall impact of expanded output on wages on the supply side suggests that enterprises are willing to spend part of their assets on wages and even pay higher than the average industrial wage.

The capital intensity (KL) variable appears to have a significantly positive effect on the average wage, and using advanced fixed assets could enhance labor earnings ($\beta = 0.1190$; $p < 0.01$); this result provides extensive empirical evidence of capital-skill complementarity between workers and advanced technology and equipment as well as absorptive capacity. Capital-intense production systems demand human capital with the skill to interact with advanced technology, consistent with the positive correlation between capital intensity and wages.

Table 4-9: The effects of horizontal FDI spillovers on an average wage from 2007 to 2015 across ownership types

Dependent Variable: Average wage	**(FEM)** TOTAL	**(FEM)** STATE	**(FEM)** PRIVATE	**(FEM)** J.STOCK	**(FEM)** FDI
Firm size	-0.0927***	-0.0140	-0.0982***	-0.1108***	0.0073
	(0.0020)	(0.0114)	(0.0023)	(0.0048)	(0.0091)
RQ (Real output)	0.0158***	0.0777***	0.0179***	0.0075*	0.0566***
	(0.0017)	(0.0136)	(0.0018)	(0.0040)	(0.0122)
KL (Capital intensity)	0.1190***	0.0631***	0.1149***	0.1350***	0.0796***
	(0.0015)	(0.0094)	(0.0017)	(0.0036)	(0.0072)
GR (gender ratio)	-0.0020	-0.0001	-0.0054***	0.0046	0.0005
	(0.0014)	(0.0050)	(0.0020)	(0.0038)	(0.0026)
NI (Net income)	0.0319***	0.0213***	0.0306***	0.0334***	-0.0014
	(0.0009)	(0.0038)	(0.0011)	(0.0022)	(0.0032)
MS (Market share)	0.2913***	-0.1690	0.0308	0.9366***	-0.0675
	(0.0539)	(0.1174)	(0.1019)	(0.1256)	(0.0965)
HOR_SP (Horizontal spillover from FDI)	0.0237**	-0.0511	-0.0856***	0.0322	0.0246
	(0.0119)	(0.0554)	(0.0137)	(0.0307)	(0.0366)
EX_DUM (Export orientation)	0.1173***	-0.0937***	0.1421***	0.1807***	0.0142
	(0.0085)	(0.0268)	(0.0119)	(0.0242)	(0.0156)
IM_DUM (Import orientation)	-0.1766***	-0.0159	-0.1882***	-0.1830***	0.1183***
	(0.0050)	(0.0200)	(0.0057)	(0.0108)	(0.0198)
Year Dummy	Yes	Yes	Yes	Yes	Yes
_cons	3.1384***	2.3529***	3.1276***	3.4101***	2.4047***
	(0.0297)	(0.1717)	(0.0206)	(0.0480)	(0.1418)
N	693720	13820	494443	130013	20040
R-sq	0.1937	0.3530	0.1765	0.3384	0.4090

Standard errors in parentheses
* p<.10, ** p<.05, ***p<0.01 - (FEM): fixed effect model

An influence of the gender variable is more common in Eastern countries, especially in developing countries. Despite the Eastern belief of a gender imbalance in wages, we do not have enough evidence to support the impact of gender on wages. The impact of gender on wages remains insignificant for SOEs, joint-stock companies, and FDI companies. By contrast, a significant negative relationship is observed for the group of private firms (β = -0.0054, p <

0.01), which reveals that the higher the ratio of women to men in the labor force of private firms, the lower the average wage. Various studies have suggested that wage levels reflect the lower position of women in mindsets about women and men (Blau & Kahn, 2007; Wood et al., 2014). These authors also find that gender wage inequality negatively impacts earnings in the United States. Using a Mincerian approach, Chuang, Lin, and Chiu (2018) find wage inequality between male and female workers across different industries in Taiwan. The discrepancies among the results could be due to differences in remuneration schemes and working hours. The increase in wages is also a precondition for explaining the gender imbalance in wages. In emerging countries with low social welfare, women face more challenges when entering motherhood. Female workers are less impacted by social welfare when working for a company that provides good maternity benefits. However, in private firms in Vietnam, management and remuneration regimes are underdeveloped compared to those of FDI companies, SOEs, or joint-stock companies, and labor law protections and labor unions cannot eliminate the imbalance in wages between male and female workers. Young mothers may decide to sacrifice and change careers when they have children. They tend to seek flexible jobs to spend more time with family, despite lower opportunities for advancement in their jobs.

A positive and significant effect of net income on wages is observed ($\beta = 0.0319$; $p < 0.01$). This reflects the ability to pay: If the business is profitable, it is possible to pay high salaries. Wages are also one of the motivations for workers to work more efficiently and productively. Many economists expect that rising wages must always go hand in hand with rising productivity. If labor productivity does not increase, businesses have no reason to raise wages. However, increasing new salaries in a sustainable manner are necessary to increase labor productivity. Unless labor productivity increases, raising wages will exceed the capital and production costs of enterprises (Abugri & Soydemir, 2002). When wages rise without an increase in labor productivity, the prices of goods and services will increase faster, causing the

real incomes of workers to increase only nominally. Therefore, addressing the root of the problem requires a specific roadmap that starts with the overall welfare policy and wage reform.

The positive impact of market shares on real wages ($\beta = 0.2913$; $p < 0.01$) indicates that companies focused on surpassing competitors and becoming industry leaders will increase wages with the transformation of motivations in the Vietnamese economy. Furthermore, companies that have a significant market share will have the advantage of dominating the market. Loss of market share is accompanied by reduced competitive advantage, reduced profits, higher costs, and a threat to the market. In this thesis, we emphasize the market share factor as a critical factor affecting the average wage. Therefore, higher market share will lead to a greater reputation and, in turn, higher profit in the form of salaries.

Horizontal spillover appears to have a positive effect on the wages of firms in the Vietnamese economy ($\beta = 0.0237$; $p < 0.05$). Because of the boost to productivity spillover through human capital, foreign enterprises must pay higher wages than domestic enterprises in the host country to avoid labor turnover (Blomström & Sjöholm, 1999; Figini & Görg, 2011; Girma & Greenaway, 2013; Görg et al., 2007; Wood et al., 2014). Access to the advanced technology and equipment of foreign enterprises as well as their specific knowledge in management, production, and operation create horizontal spillover in parallel with wage spillover in the same sector. Spillovers also come from an export orientation, which contributes to increasing the average wage of firms ($\beta = 0.1173$, $p < 0.01$). This relationship may be explained by the fact that exporters in developing countries often operate capital-intensive firms producing global-standard products. Thus, they mainly rely on skilled workers, who therefore have strong bargaining power (Martins & Opromolla, 2009). Moreover, because intrinsically motivated employees are an intangible asset, foreign enterprises cannot decrease the wage level, and domestic firms will attempt to pay higher wages to attract workers (Aitken

& Harrison, 1999; Driffield, 2004). Despite the benefits of knowledge spillovers, the presence of foreign companies generates more pressure on domestic firms in more competitive markets, leading to a negative impact on the average wage of private firms ($\beta = -0.0856$, $p < 0.01$). Indeed, private firms struggling to survive in the fierce competition will take advantage of low labor costs. Based on the findings above, **hypothesis 8 and hypothesis 9** implying the positive effect of horizontal spillovers on average wage and its variation across ownership types are supported.

The import orientation of domestic firms has a negative impact on the average wage ($\beta = -0.1766$, $p < 0.01$), whereas foreign companies with an import orientation pay a higher average wage ($\beta = 0.1183$, $p < 0.01$). These empirical results illustrate that Vietnamese firms still lag behind foreign firms in applying new technologies. Labor cannot benefit from import activities to improve their productivity, as represented by their wages. This result is consistent with the finding of Onaran and Stockhammer (2008) that wages increase temporarily in favor of skilled laborers, followed by a decline in wages for both skilled and unskilled labor in the long run due to competitive pressure on domestic firms and increasing wage inequality.

Foreign-invested enterprises have a positive effect on wages ($\beta = 0.1161$; $p < 0.01$). In Vietnam, in addition to the relationships of net income, horizontal spillover, capital intensity, and firm size with the average wage, foreign-invested enterprises appear to have a strongly positive effect on wages. According to Fukase (2014), due to financial and managerial advantages, foreign-owned enterprises tend to pay a higher wage than local enterprises to attract highly skilled workers.

Table 4-10: Summary of results on hypotheses testing

Hypothesis	Statement	Status
H1	The productivity of Vietnamese domestic companies is negatively associated with *horizontal* technology spillovers from FDI firms.	Supported
H2a	The productivity of Vietnamese domestic companies is positively associated with the vertical *backward* spillover from FDI firms.	Supported
H2b	The productivity of Vietnamese domestic companies is positively associated with the vertical *forward* spillover from FDI firms.	Rejected
H3	The relationship between FDI spillovers and productivity of domestic firms is improved with a higher level of human capital.	Supported
H4a	The relationship between FDI spillovers and productivity of domestic firms is lower at the top 25^{th} and bottom 25^{th} percentile of the technology gap.	Partially supported
H4b	The relationship between FDI spillovers and productivity of domestic firms is enhanced at the middle 25^{th}-75^{th} percentile of the technology gap.	Partially supported
H5	The relationship between FDI spillovers and productivity of domestic firms is improved with a higher level of financial development.	Partially supported
H6a	FDI spillover effect on domestic firm productivity varies significantly across geographical regions and higher in more FDI-intensive regions.	Partially supported
H6b	FDI spillover effect on domestic firm productivity varies significantly across economic regions and higher in more FDI-intensive regions.	Partially supported
H7	Local firms in provinces located within 100 sq. km. of the most FDI-intensive provinces/cities receive greater spillover effects than those located in provinces outside 100 sq. km of these areas.	Partially supported
H8	Horizontal FDI spillovers under foreign presence positively affect the average wage of local firms in the same industry with foreign firms.	Supported
H9	The effects of horizontal FDI spillover on average wages vary across ownership types.	Supported

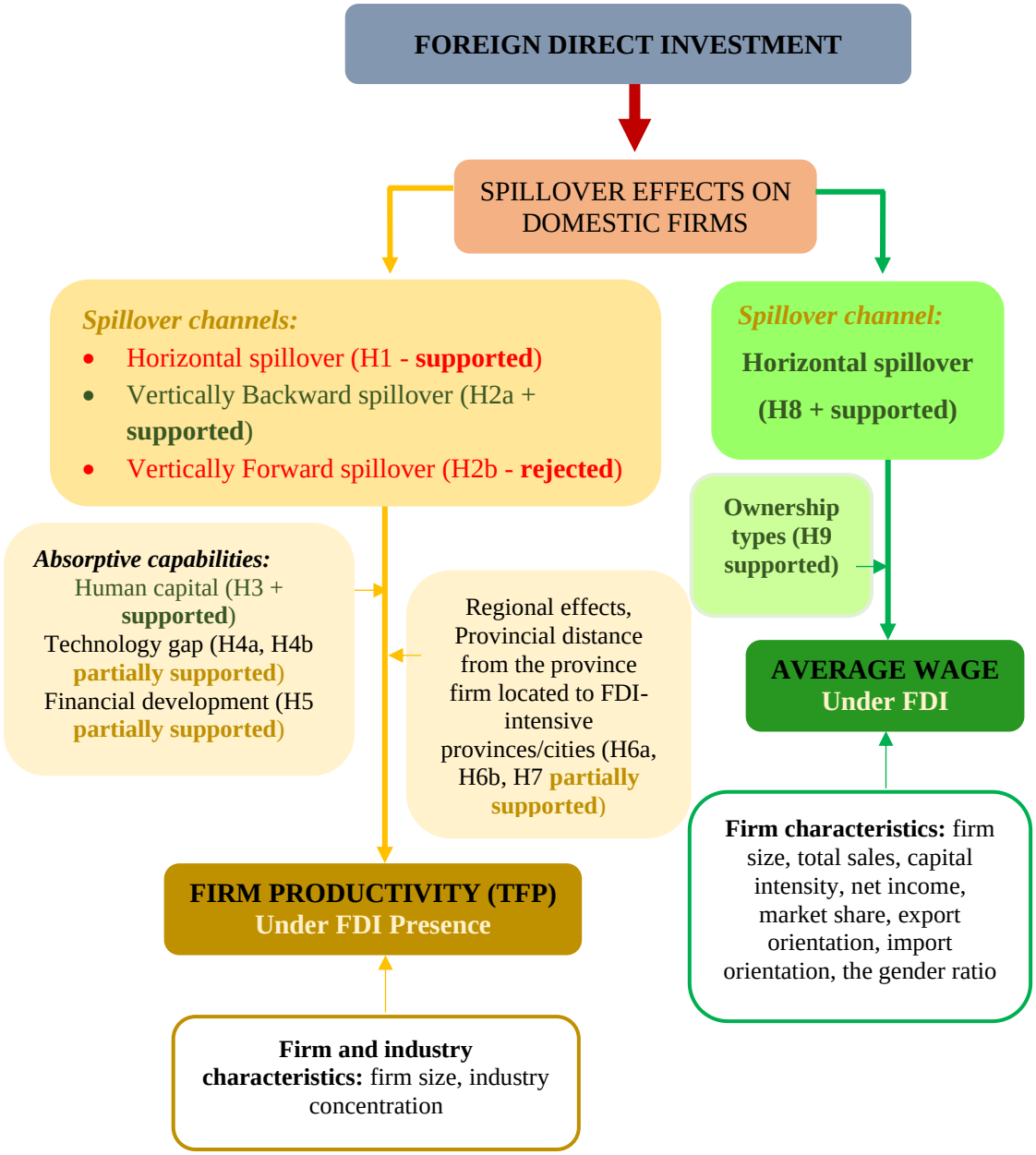

Figure 4-5 Final research model after testing

CHAPTER 5. CONCLUSION AND IMPLICATIONS

5.1 Conclusion

This thesis attempts to investigate the spillover effects of foreign investment (FDI) in Vietnam focusing on productivity spillovers and wage spillovers associated with FDI. FDI spillover effects can be understood as intentional or unintentional interactions among economic entities over time that generates externalities on the local firms or the host economy under the foreign equity presence in the host country. The term "FDI spillovers" implies the ability to leak, disperse and transfer or share information among relevant stakeholders. Under spillover effects, FDI enterprises can indirectly affect the technological capacity and productivity of domestic enterprises as well as the local workers' compensation in terms of the average wage. The externalities generated by foreign subsidiaries may spill over horizontal channels under the effects of worker mobility, competition, imitation/ demonstration or vertical channel under the effects of vertical backward and vertically forward linkages. Further, FDI spillovers do not occur uniformly for all domestic enterprises in intra-industry and inter-industry with MNCs, but it depends on the absorption capacity or specific characteristics of domestic enterprises.

The FDI spillover effects is a relatively new research topic and has received increasing attention in recent times, especially in emerging and developing countries. As FDI inflows have generated unexpected outcomes to the environment and the domestic economy, few researches on technology diffusion have been conducted to clarify its complicated effects. However, by using insufficient and obsolete data set, the evidence for productivity spillovers are still limited. Meanwhile, there are no evidences in Vietnam for wage spillovers from foreign presence although the theories and some empirical findings in different contexts recognize its existence.

In addition, the thesis primarily also focuses on identifying the moderating factors affecting the spillover effects at firm level which have not yet been explored.

After developing the research model and methodology, the dissertation investigates productivity spillovers and wage spillovers from foreign firms to domestically manufacturing firms using a large panel data of Vietnamese manufacturing enterprises. The econometric model on FDI diffusion on firm productivity (period: 2011-2015; 385,976 observations) and wage (period: 2007-2015; 693,720 observations) is estimated by the use of the fixed-effect model (FEM) and random effect model (REM). Hausman test is used to compare and determine the suitability of FEM or REM. The issue relating to biased TFP estimation by the choice of endogenous factor input combinations in the same period is overcome by the use of the Olley-Pakes (OP) methodology. This semi-parameter estimation process allows the firm-specific productivity gap to represent individual changes over time.

Detailed analysis and discussion of empirical research results are presented in Chapter 4. The main findings of the thesis are summarized below:

5.1.1 Productivity spillovers from FDI in Vietnam across different transmission channels

The author examines unbalanced panel data on 385,976 manufacturing firms in Vietnam from 2011 to 2015 to find fresh evidence on FDI productivity spillover effects on Vietnamese manufacturing firms. First, the results indicate that the horizontal and forward spillovers associated with FDI presence in Vietnam have a negative impact on domestic firms' TFP. It is worth to note that the adverse magnitude of horizontal spillover is quite large and overwhelm two remaining channels of spillovers. Regarding backward spillovers, Vietnam witnessed a reverse trend that the greater the effect of backward spillover is, the higher the productivity local firms can reach. Despite strong evidence for dominant effects of positive backward spillovers, it can't offset the negative outcome generated by horizontal spillovers.

5.1.2 Barriers and facilitators of productivity spillovers from FDI in Vietnam

Based on the findings, human capital is found as a facilitator for productivity spillovers from foreign firms to domestic firms. Specifically, less negative horizontal spillover and more positive backward spillover are associated with a higher level of human capital. In other words, the acquisition of more qualified labor in local firms is a facilitator to better absorb FDI spillovers and help domestic firms reach a higher level of productivity.

Another finding reveals that the level of technology gap matters for the productivity spillovers from foreign firms to domestic firms. Specifically, the negative horizontal spillover effect on the domestic firm's TFP is impressively improved with the movement of the technology gap from the bottom 25^{th} percentile to the middle 25^{th} -75^{th} percentile. On the other hand, the relationship between backward FDI spillover and firm productivity is diminished when the technology gap turns from the bottom 25^{th} segment to the middle one. At the upper percentile, there is no signal for the moderating effect of the technology gap.

It is also found that FDI spillovers in both vertical and horizontal channels do not occur at the bottom 25^{th} percentile of financial development. In regard to backward FDI spillover, its effect on firm productivity is significantly enhanced with a higher level of financial development. In contrast, horizontal FDI spillover witnesses a reverse trend when its effect on firm's TFP is more negative at the upper level of financial development. Meanwhile, forward FDI spillover only occurs in the middle 25^{th} to 75^{th} segment.

5.1.3 Productivity spillovers vary significantly across geographic and economic regions

In respect to specific regional effects, the relationship between horizontal spillover and TFP from 2011 to 2015 is significantly negative across six geographical regions with robust large magnitudes, except for North East & North West and Mekong River Delta. The significantly negative magnitudes of forward spillover in Red River Delta, South East, and Mekong River Delta have proven its existence as an important channel of FDI spillovers in

Vietnam. Remarkably, the study finds the significant positive effects of vertically backward spillover on promoting firms' productivity in the host country across all six regions, except for North East & North West. The backward FDI spillover is unexpectedly highest at Highlands where the region receives the lowest share of inward FDI. It is followed by the most FDI-intensive region - South East. However, the findings indicate that despite the existence of positive backward FDI spillover, it is still small to offset unfavorable horizontal and forward FDI spillover. Regarding economic regions, the central region holds the first position both in receiving the most negative horizontal FDI spillover and the highest positive backward spillover. It is followed by the South region and North region which are characterized by the highest FDI concentration and human capital accumulation. Mekong River Delta, on the other hand, does not receive any horizontal spillover.

5.1.4 Productivity spillovers and provincial proximity

The effect of horizontal FDI spillover on TFP is negatively robust across nine sub-areas, except the insignificant impacts in two sub-areas "Within Ha Noi 100 km^2" and "Within Hai Phong 100 km^2". The most negative horizontal spillover occurs within Thanh Hoa 100 km^2, followed by within Binh Duong 100 and BR-VT 100 km^2. The situation is not better for firms located in the provinces outside 100 km^2 of these sub-areas. In regard to backward spillover, the positive backward externalities occur in most sub-areas, except "within Bac Giang 100 km^2" and "within Hai Phong 100 km^2". On the other hand, forward FDI spillovers negatively affect firm productivity in most sub-areas with nearby provincial proximity, except within Hai Phong 100 km^2, within Thanh Hoa 100 km^2 and the outside region.

5.1.5 The effect of horizontal spillovers from FDI on the average wage

This study aims to investigate the effect of horizontal spillover from FDI and trade openness on the average wage in Vietnam using 2007-2015 unbalanced panel data from 693,720 observations. Ownership type is also added to the econometric model as a moderating

variable to examine whether ownership types and their inherent characteristics influence wage spillovers from foreign presence. Finally, independent variables such as firm size, real output, net income, capital intensity, gender ratio, and market share are included as important predictors of the average wage.

The findings indicate that the overall effect of FDI on the average wage in Vietnam is significantly positive, except for domestic private firms. These results are supported by both theoretical and empirical evidence of the two mechanisms of wage spillovers from FDI: labor market competition and productivity improvement. Also, private firms in Vietnam often employ unskilled workers. Thus, wage policies for unskilled workers in this sector may be negatively affected by the foreign presence and government regulations on wages.

5.2 Academic contributions

Regarding theoretical contributions, the theoretical reviews in influential research work by (Aitken et al., 1997; Blomstrom & Kokko, 1998; Caves, 1974; Wang et al., 2012) figure out two main streams of FDI spillover occurring through productivity spillovers and market access spillovers. While productivity spillovers are very important for emerging economies to stimulate economic growth and national better-off, market access spillovers appear to be highly attached to developed or relatively powerful economies. Some authors also argue that market access spillovers; for example, export spillovers may almost be absorbed and revealed in better economies of scale and productivity improvement (Anwar & Sun, 2016; Suyanto, Bloch, & Salim, 2012).

In addition, the term “technological spillovers from FDI” is often misused by many researchers to imply the same phenomenon of productivity spillovers (Rojec & Knell, 2017). Indeed, the positive productivity spillovers associated with FDI is an inevitable consequence of technological advances and market expansion. Therefore, under the context of Vietnam's

economy, this study focuses on productivity spillover associated with FDI as this important phenomenon offers the best opportunities for domestic firms in the host country observe, imitate and upgrade their existing technology and inherit the advanced business practices to improve their firm's productivity at a lower cost. While previous studies in Vietnam, from worker perspectives, try to figure out the wage differentials between foreign sector and domestic sector (Nguyen, 2015; Nguyen & Ramstetter, 2017), this study further complicates the matter and contributes to the current literature by exploring the wage spillovers from FDI as the channel to increase labor compensation and welfare. To provide a more comprehensive picture of the direct and indirect effects of inward FDI on firm productivity and wage, the dissertation has developed a conceptual framework reflecting the relevant theoretical concepts and the relationships among these elements.

Besides, the author also identifies and figures out the other theoretical and empirical research gaps reflecting in some biased findings and insufficient discussions in some previous studies. First, MNCs are not only powerful in sustaining their subsidiaries' comparative advantage in terms of technological advances and intellectual assets but also effective at preventing the spillovers of these advantages to other firms. As a result, FDI spillovers, especially the leakages of sophisticated technology generating outstanding effects on host firm's productivity less likely to occur (Perri & Andersson, 2014; Perri & Peruffo, 2016). This contributes to explain why the negative competition effect often outweighs the sum of imitation, demonstration and worker mobility effects via horizontal spillover channel. Second, the FDI spillover theories have discussed the high probability that domestic firms' productivity will be lower in response to higher competition pressure from superior foreign competitors in the host market (Görg & Greenaway, 2004; Mollisi & Gabriele, 2017). Third, positive externalities may only occur in some subgroups of firms with the convergence of specific characteristics. This has been addressed in the thesis that firm absorptive capacity,

heterogeneity, regional and industrial differences matter for the productivity and wage spillovers from FDI. Fourth, conventional studies on FDI spillovers tend to omit or underestimate FDI spillovers via vertical channels while the thesis findings indicate robust vertical spillovers through both upstream and downstream integration. Finally, FDI spillover presence, as well as its extent and magnitude, are also attached to the host country's macro factors such as institutional quality, well-functioning markets, undistorted FDI and trade, etc. As admitted in the limitation part, the thesis does not capture the effects of these macro determinants. However, this may leave room for further researches exploring more macro indicators from the host country's perspectives.

Concerning methodological contribution, the thesis firstly builds a research model for estimating productivity spillovers and wage spillovers from FDI. Besides, instead of using only one indicator as in most of the previous studies, the thesis further complicates the FDI presence by measuring three dimensions of spillovers. The use of multi-dimensional indicators can help to compare and have a more comprehensive assessment of the FDI spillover effects. Besides, the combination uses of FEM, REM and GMM approaches help reinforce the robustness of research findings. Secondly, the dissertation explores moderating variables related to firm absorptive capacity, heterogeneity and geographical proximity that interact with FDI spillovers to consider whether these variables matter for the different outcomes of productivity spillovers from foreign firms to domestic firms. It has been shown in the research results that productivity and wage diffusion vary significantly across firms and regions with specific characteristics. Finally, the research results from the latest panel data (2007-2015) will provide the up-to-date empirical findings and implications for FDI spillover effects in Vietnam which is useful for managers, policy-makers and further researchers concerning inward FDI spillovers.

5.3 Implications

5.3.1 Implications at policy-maker level

The role of FDI capital, as well as the operation of FDI enterprises in Vietnam, are positively recognized by researchers, policymakers, and managers through a wide range of activities such as interacting, associating, speeding up the process of renovation and boosting Vietnam's economy. However, the process of attracting FDI as well as the activities of these enterprises in Vietnam is posing many challenges.

Based on the findings, the study has come up with some practically economic implications. The findings have provided strong evidence for the important role of backward FDI spillover in enhancing the productivity level of domestically manufacturing firms in Vietnam. However, the positive externalities from backward spillovers have unexpectedly been outweighed by intensively negative horizontal and forward spillovers. It is important to note that FDI inflows incur both unpredictable costs and benefits. The findings have revealed the role of human capital and financial development in facilitating productivity spillover from FDI. Therefore, investing in human capital and financial development is the most important keys to unlock the door to absorb advanced technology and knowledge.

Firstly, instead of the attempts to increase the volume of FDI inflows, the government should have proper policies aiming at enhancing the absorptive capacity of local firms. This may provide an effective tool to protect the new domestically emerging industries in Vietnam from the fierce competition as a result of foreign presence. Moreover, the government should create favorable conditions; for example, a better financial system, effective and transparent administrative services to facilitate local firms' business activities, develop their skills and absorptive capabilities to sustain the competitiveness or the local supply chains with foreign subsidiaries. In this way, the government should have appropriate financial incentives for

technology transfer activities, especially activities related to the transfer of technology in the supporting or embedded industry. Besides, more government expenditures on infrastructure, R&D, education, and training may generate spectacular changes in narrowing down the gap in human capital and technology level between Vietnam and more developed economies. Another challenge and opportunity for Vietnam's economy come from the evolution of Industry 4.0. The speedy development of technological achievements and smart applications in the context of Industry 4.0 is blurring and rapidly weakening the attractiveness from the production factors considered to be "advantages" in emerging labor markets such as "cheap labor force" and "in-kind incentives". In addition, Vietnam needs to take into account the ability to shift investment back to its home country, which is supported by digital transformation, specialization, automation, combined with artificial intelligence that combines increasingly efficient use of labor and machinery.

Secondly, as foreign investors are often motivated by low labor cost and preferential policies and not every MNCs are sources of knowledge spillovers, Vietnam needs to implement procedure reforms to compete for higher quality FDI flows with more potentials for managerial and technological transfer. Thereby, these domestic firms can maintain and attract foreign investors from higher-income economies which possess advanced technology and process. Besides, they are more likely to deliver their knowledge to their partners in the backward and forward linkage chain to upgrade and standardize the local supply for stable production and sustain their consumption market. Although the presence of FDI enterprises has played an important role in helping Vietnam maintain a rapid growth rate in the past few decades, it has also increased the pressure on the environment. Typical negative impacts include water degradation, soil degradation, and erosion, increasing greenhouse gas emissions and air pollution, and putting pressure on biodiversity. Therefore, the most challenging duty is to

maintain an attractive environment for foreign investors associated with harmonious development and environmental protection.

Thirdly, it is necessary to create a truly fair business environment for both domestic and foreign enterprises to compete healthily and cooperate based on a mutually beneficial relationship. To achieve this goal, the government needs to support domestic enterprises to increase their capabilities and their scale to reinforce their readiness to participate in the linkage chain with foreign partners with diversified local advantages in different regions. This may encourage foreign firms to invest in under-developed regions and make positive FDI externalities more accessible. Accordingly, it is necessary to ensure the selection of FDI projects towards high and medium technology industries; promote the connection between FDI enterprises and domestic enterprises; especially support the development and implementation of appropriate priority policies and the orientation of supporting industries toward global and regional production networks and value chains; develop and implement policies to encourage expert advice, technology solutions and human resource training. At the same time, the organization’s openness and desires for innovation may be the drivers for the spread of advanced technologies and knowledge from foreign-invested enterprises to domestic ones.

Fourthly, the impetus for attracting FDI of Vietnam in the coming time will be maintained by Vietnam's efforts to persistently international integration, strong commitment to opening markets, elimination of trade and investment barriers through FTAs such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and the Free Trade Agreement - EU (EVFTA). It is also admitted that trade tensions between the US and China may affect investor sentiment and may accelerate the trend of shifting investment to other potential markets. Vietnam is an attractive destination in that context. Hence, the renovation of Vietnam should continue to be reinforced, aim at reducing many business conditions, improving the transparency of administrative procedures as well as supporting

entrepreneurship and private sector development. On the other hand, Vietnam needs to take into account the risk of becoming an out-of-date technological transfer point of investors, especially with capital inflows from China. The roadmap for implementing China's Made in China 2025 will inevitably lead to the need to replace and renew technology, putting pressure on obsolete technologies to less developed countries, especially neighboring countries like Vietnam. Under these circumstances, Vietnam must consistently promote reform, reduce barriers, eliminate unreasonable business conditions, and create an environment that promotes innovation. In addition to investment in infrastructure development, to maintain attractiveness to investors, it is necessary to increase investment in scientific and technological research to "catch up" with technology trends; at the same time, create a platform to attract and retain talents, create dynamic and attractive competitive forces with high-tech FDI industries.

Finally, wage development is sustainable if it is based on productivity improvement and cost efficiency rather than temporary labor demand. Increasing inward foreign equity and international trade may have different or even strongly negative impacts on wages in the short and long run depending on the movement from labor-intensive production to capital and technology-intensive production. In this context, the abundant resources of unskilled labor in Vietnam are no longer an advantage but a threat to the survival of local firms and worker benefits. Therefore, policymakers need to take advantage of foreign presence and trade to create favorable conditions for preparing and training the existing labor force in Vietnam. In this way, local workers are proactive and ready in absorbing knowledge and productivity spillovers as well as improving their income and bargaining power.

5.3.2 Implications at managerial level

From the managerial perspectives, the study raises some practical implications for local firms' top management in Vietnam. In the context of regional and international expansion, businesses have no other way to invest in technological innovation, improve the quality of the

workforce, build business strategies, brands and gradually accumulate capital to increase production capacity, labor productivity and competitiveness. Especially, firms operating in upstream sectors (input supply) need to improve the quality of their products, standardize their supply chain to meet the requirements of foreign firms, and gradually increase their competitiveness from the local scale to a world scale. In addition, Vietnamese firms in direct competition with foreign subsidiaries can increase the value of their products, brand names, and reputations for market expansion and learn and achieve long-term benefits of inward FDI by investing in absorptive capability.

Furthermore, as Vietnam has been becoming a destination for international investors, changing the orientation and policies to attract FDI will surely bring more MNCs to invest and do business in our country. It is a great opportunity for Vietnamese enterprises to participate in the global product supply chain. However, the ability to turn that opportunity into reality depends on the capacity of the management staff, especially the head of the business. The business leaders should be confident and proactive in approaching large enterprises and MNCs to create cooperation relationships in signing and implementing contracts, gradually creating a foothold in the product supply chain of each corporation. It is worth to note that CEOs must approach management thinking in a modern way, attempt to operate toward both quality and efficiency, build trust with partners and build the reputation of the business, even in terms of paying salaries and income. In the long run, businesses must rely on higher labor productivity and better product quality to raise income for employees.

Last but not least, a professional business association could play an important role in the distribution and cooperation of product supply chains. Many associations such as textiles, footwear, handbags, food, seafood, pepper have gained positive outcomes in developing business strategies, building and promoting brands, finding partners, promoting trade and investment as well as recommending preferential policies to the State. However, the supply

chain linkages still confront technology, quality, price and process issues that need to be addressed. Besides, business associations have a supportive relationship to facilitate business development under foreign presence and provide a wide range of solutions for a better global expansion strategy. Therefore, business executives should be proactive in participating in professional associations to build networking, looking for opportunities, getting solutions and adapting more quickly to the industry and business environment changes.

5.4 Limitations and Future Research

Although the author has made plenty of efforts in the thesis implementation process to achieve the research objectives, this research still has certain limitations. Later studies can inherit and expand this study by overcoming some of the following limitations. Firstly, due to data limitations, the econometric model in this thesis does not control the impact of host macro factors (such as exchange rate, growth, inflation), explore whether the level of these macro factors affecting productivity and wage spillovers from FDI as well as the subsidiaries' heterogeneities and origins of inward FDI volumes. This generates rooms for further researches in addressing the impact of the host country's macro factors and foreign affiliates' characteristics to enrich the literature of FDI spillovers.

Secondly, subsequent studies can access and use longer panel data sets to control late impacts and provide more comprehensive assessments of spillover effects from FDI over time. The study also has several limitations in estimation capacity and access to a larger dataset. Although STATA software and proper data treatment syntaxes can handle large unbalanced datasets with no problem, some proxies cannot be calculated as initial expectations due to insufficient observations. The proxy for absorptive capacity could be improved with the inclusion of R&D expenditures. Furthermore, data on the physical distance between foreign firms' locations and local firms are not available. Thus, the scale "within 100 sq. km." is to some extent inadequate for capturing geographical proximity.

Finally, although the model of FEM with the robustness check by GMM has many advantages in estimating panel data, especially in studying the productivity diffusion from FDI, there are still some limitations in overcoming the endogenous issue. Therefore, subsequent studies may employ additional methods with instrument variables such as 3SLS to more effectively control the possibility of endogenous problems.

LIST OF RELEVANT PUBLICATIONS

ISI Indexed publications

ISI/SSCI: Huynh, T. N. Hien, Nguyen, P. V., Trieu, H. D., & Tran, K. T. (2019). Productivity Spillover from FDI to Domestic Firms across Six Regions in Vietnam. *Emerging Markets Finance and Trade*, 1-17.

Accepted paper (ISI/ESCI): Nguyen V. Phuong, Huynh T. N. Hien, Trieu D. X. Hoa, Khoa T. Tran, Nguyen H. P. Dung (Confirmed: June, 2020). Horizontal spillovers from FDI, trade and average wages: Evidence from Vietnamese enterprises. *Review of Pacific Basin Financial Markets and Policies.*

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Nguyen, P. V., Tran, K. T., Le, H. C. P., Trieu, H. D. X., & Huynh, H. T. N. (2019). Technology spillovers in the electronics and mechanical industries: the roles of ownership structure and wage and training costs in Vietnam. *Journal for Global Business Advancement*, 12(2), 212-231.

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APPENDICES

Appendix 1: The empirical review of previous works relating to productivity and wage spillovers *(refer to section 2.9.4 -Empirical evidences on productivity spillovers from FDI)*

No	Author (year)	Data and method	Dependent variable/ concepts	Explanatory variables/ concepts	Findings
	ORIGINAL/ PIONEERING WORKS				
1	(Caves, 1974)	-Manufacturing firm-level data of Canada and Australia -87 manufacturing industries -The simple model	Profit rate on equity of domestic firms	Share of industry sale, total assets, ratio of value added per worker, foreign ownership share, market concentration.	MNC's subsidiaries enhance the efficiency of resource allocation; speed up the technology transfer to local ones; however negatively affect the profits of domestic firms.
2	(Aitken et al., 1997)	-Panel data of 2104 Mexican manufacturing firms from 1986 to 1990 -Two-stage probit regression	Export orientation (1,0)	Domestic and foreign output price, industry concentration, local export concentration, MNC export, proximity to subsidiaries	The presence of MNC is "catalysts" for local export activity. Domestic firm export is positively correlated to distance to MNCs and uncorrelated to the concentration of local exporters.
3	(Blomstrom & Kokko, 1998)	-Case studies -A conceptual discussion of theories and some limited empirical	*Productivity spillover occur when there is local firms' productivity/ efficiency improvement as	FDI spillovers occur through: -Transfer of management know-how through training/demonstration activity and worker turnover.	-There is evidences for such FDI spillover effects on the host country in both inter and intra industry, however, not

		evidences at that time on MNCs activities and its spillover effects on local firms	a result of foreign presence, may come from: (1) The movement of some extent of advanced technology and process from MNCs' origin country to developing host countries to sustain their competitiveness. (Advantages: new product and process for industry with rapidly changing technologies; marketing and organizational capabilities for matured industry) (2) Market penetration threatening local firms' market share and profits and forcing them to change. *Market access spillover	-may remove or trigger high monopolistic industry in response to the power of local competitors. -The backward and forward linkage relationship between subsidiaries and upstream local suppliers/ subcontractors or downstream customers (techniques transferred: inventory, standards, quality control…) -Adaptive management and marketing strategies and knowledge by local firms in response to a more dynamic and competitive environment.	strong enough due to limited empirical analysis. -Foreign presence improves "allocative efficiency" and technical efficiency. -Spillovers are positively related to host country's internal capacity and competitiveness.
4	(Blomström & Sjöholm, 1999)	cross-sectional data of more than 16,000 Indonesian firms from 329 industries surveyed in 1991 by Indonesian Central bureau statistics	Labor productivity: value added per worker calculated by the ratio of value added to labor	Capital intensity (+) Labor skill (+) Capital utilization (+) Scale of operation (+)	-Foreign owned firms are dominant players achieving high productivity in comparison to local ones.

		-Using labor productivity function		Moderated by foreign ownership shares: large percentage owned (major) and minor percentage owned	- The degree of foreign ownership doesn't matter for productivity. - The hypothesis that MNCs facilitate positive knowledge spillover to local firms is not supported.
5	(Aitken & Harrison, 1999)	-A panel data of 4000 Venezuelan from 1976 to 1989 -Using Ordinary Least Square (OLS) and Weighted Least Square (WLS)	Domestic firm productivity: The log of firm-level real output	Skilled labor Unskilled labor Materials Capital Foreign equity participation in the firm (0 to 100) (+) Foreign ownership in the sector (-)	-Foreign share in total equity (joint venture) really matters for enhancing productivity of domestic firms. -Higher concentration of foreign ownership in the sector triggers negative effects on local firms' productivity as a result of scale dominance and high competitiveness. -There is no signal for technology transfer from foreign firms to local ones.
PRODUCTIVITY SPILLOVERS FROM FDI TO DOMESTIC FIRMS: Expanding papers over the period from 2000 to 2010					
1	(Liu et al., 2001)	-Cross-sectional data of 47 sub-sectors in Electronics industry in 1996 and 1997 taken from China's statistical yearbook	Labor productivity in sub-sectors: value added divided by the number of workers employed in each sub-sector every year	Capital intensity Firm size (+) Labor quality: human capital of both local and foreign firms (+)	-MNCs presence explains the rise in labor productivity. -All explanatory variables, especially human capital lead to an improvement in labor productivity in each

		- Log-linear function captures both direct and indirect effect (spillovers) of inward FDI on host economy's industry productivity. - Statistical tests recommend the use of WLS model, 3SLS and W2SLS instead of OLS and 2SLS		Foreign presence (+): the share of foreign capital in total capital in each sub-sector	sub-sector in the host economy.
2	(Sena, 2004)	-Panel data of 206 Italian manufacturing firms from 1989 to 1994 classified into high-tech and non high-tech firms. -Data Envelopment Analysis (DEA) -Using firm-specific technical change index (Malmquist) to calculate firm productivity growth -	Productivity growth: Total factor productivity growth (TFPG)	Technical change (+) Investment ratio (+) The quadratic term of investment ratio (insignificant) - Endogenous problem between FDI and productivity growth may be avoided by the index as it compares the firm's output/input ratio to the shift of best production possibility.	There are evidences for knowledge diffusion from high-tech to low tech Italian manufacturing firms.
3	(Beata Smarzynska Javorcik, 2004b)	-Panel firm-level data of Lithuanian manufacturing enterprises from 1996 to 2000 - Two-step estimation: + TFP calculation	Firm total factor productivity Cobb Douglas production function using Olley-Pakes correction	Foreign share Horizontal spillover Backward spillover for partially foreign ownership (+) Backward spillover for wholly foreign ownership	-Backward spillover as the dominant channels of productivity spillover from foreign firms to local firms. - Partially foreign participation enhance the

		+ Regression FDI spillover variables on TFP		Forward spillover (-) Demand (+)	process of productivity spillovers. -The assumption for intra-industry spillover (horizontal spillover) is not supported.
4	(Sourafel Girma & Wakelin, 2007)	-UK firm level data surveyed by National statistics office in 1980 and 1992 -Two-step estimation (1) TFP calculation: Olley – Pakes semiparametric approach (2) Estimating productivity spillovers from regional FDI (FEM, GMM)	(1) Total factor productivity estimation (TFP) (2) Productivity	(1) Skilled labor (+) Unskilled labor (+) Capital (+) Materials (+) Consistently signs over OLS, Olley-Pakes (2) share of foreign employment in industry and region (USA, Japan, others) The interaction between distance and intra-industry average FDI outside the region, The interaction between distance and intra-region average FDI outside the industry, Twice lagged values for spillovers, lagged gov subsidy, lagged regional and productivity growth to control endogenous problem	-Evidences for both intra and inter regional externalities. - Distance from local firms to MNCs really matters for spillovers. -Domestic firms in less-developed regions (lacking of MNCs concentration receive lower FDI spillovers

5	(Giroud, 2007)	-Semi-structured interview to the target group of MNCs' managers in Vietnam and Malaysia in 1996 and 2002, then use statistical method of frequency and percentage estimation to evaluate. - These firms operate in two sub-sectors of manufacturing industry including electronics/ electrical and textiles & garments	Local suppliers' improved performance in term of cost, quality, delivery, inventory, lead time, technical skill, design, innovation, safety, business focus, commercial awareness, services, professionalism.	-Product and process: 11 items. -Training: 8 items + Off-the-job training + On-the-job training *Questionnaire – five rating scale on 19 transfer practices (11 items on supplying intermediate inputs to foreign affiliates and 8 items on training activities) of MNCs that may trigger spillovers.	-The effect of backward linkage spillovers to local firms in the host country exists, however remain limited to some extent. - Malaysia performs better than Vietnam in term of absorbing MNCs' management know-how and superior technology backward spillover. -The vertical linkages in Vietnam are weak and lack of orientation. ➔ Implications for linkage improvement and capacity building.
6	(Halpern & Muraközy, 2007)	-Firm-level panel data of Hungarian manufacturing firms from 1996 to 2003 by "Tax office database" including firms' financial and accounting indicators. - Estimating vertical spillovers using input-output tables	Total factor productivity - Two-step procedures: (1) TFP estimation using Levinson-Petrin method, (2) FDI spillover variables as explanatory variables on estimated TFP using FEM	Vertical spillover (+) Horizontal spillover (-) Foreign share Lagged vertical (+) Lagged horizontal Within distance vertical (spillover weighted by distance) Within distance horizontal Outside distance vertical	-The results reveal positive vertical spillover with large magnitude. On contrast, horizontal spillover is on a reversed direction. - The distance matters for horizontal spillovers from FDI.

				Outside distance horizontal (-)	
7	(R. Salim & Bloch, 2009)	-Firm-level panel data of 568 Indonesian chemical and pharmaceutical firms from 1988 to 2000 surveyed by Central board of statistics. -Two-step procedures	-Productivity growth using maximum likelihood estimates od stochastic production frontier and Malmquist index -Productivity growth and spillover (FEM and REM)	Foreign share Spillover Age Industry concentration (HHI) Spillover*HHI R&D Spillover*R&D	Evidences for horizontal spillover. Competition, R&D are important determinants for productivity spillovers.
Expanding papers over the period from 2011 to 2018					
1	(Barrios et al., 2011)	-Panel firm-level data of Irish enterprises from 1983 to 1998 surveyed by Irish Economy Expenditure -Input-output table - Levinsohn and Petrin (2003) approach for productivity estimation -GMM approach for robustness check	Domestic plant productivity (TFP)	Horizontal Forward Backward_IO (measuring the local input used by MNCs and using input-output matrix of the host economy) Backward_HOME (using the input-output tables from the origin (home) country of foreign firms) Backward_NIMP (differ the source of input between domestic source and imported source – NIMP stand for "no imported inputs") Alternative_IO Alternative_HOME Alternative_NIMP Industry growth	Found significantly positive backward spillover using the preferred measures and classification. MNCs have similar behaviors as local firms in sourcing inputs for cost minimization → implies the potential for building backward linkage with local suppliers

2	(Le & Pomfret, 2011)	-Firm-level panel data of Vietnamese enterprises from 2000 to 2006 surveyed by GSO -2-digit input-output classification (aggregate IO matrix) from Vietnam standard industrial classification (VSIC)	Labor productivity of domestic firms (gross output to total employees) *FEM and REM for all regressions *Comprehensive literature on channels of technology spillovers from FDI	Lagged horizontal Lagged backward Provincial horizontal Capital intensity Labor quality Scale Concentration Technology gap *Moderating variables: -Ownership types (state, private, collective) -Firm size (large, small & medium) -Industry types (low-tech, medium-tech, high-tech) -Trade orientation (trade vs domestic) -R&D activity (with R&D, without R&D) -Foreign ownership (full, partial)	-The effect of vertical spillovers (especially through backward linkage) on local firm's productivity is positive. + firm size, labor quality and technology gap really matter for the effect of backward spillover on labor productivity -Negative horizontal spillovers to labor productivity of domestic firms occur in the firms with one of following characteristics such as private, domestic-oriented, non R&D and low-tech.
3	(Havranek & Irsova, 2011)	Enterprise data from 47 countries Multivariate meta-regression + Variety of estimation techniques from the reviewed papers: one-step estimation, Olley-Pakes, OLS, GMM, Random	t-statistic of spillover estimates: to explore structural heterogeneity in backward FDI spillovers.	Host country characteristics: + distance + technology gap + trade openness + financial development + patent rights Foreign characteristics: + 100% equity + joint venture	-While no signal for horizontal spillover is found, there are consistently strong evidences for backward spillovers as an effective channel of knowledge and technology transfer from MNCs so local

		effect, Pooled OLS, Year fixed effect, Sector fixed effect, estimated in difference, Translog, Log-log			suppliers in the inter industry. -Besides, an inconsiderable magnitude of forward spillover to downstream customer is found. -Bias publications against negative spillover estimations.
4	(Du et al., 2012)	-Firm-level unbalanced panel data of Chinese manufacturing firms (including electricity, gas and water) from 1998 to 2007 surveyed by National Bureau of Statistics. - Olley-Pakes approach and the method of (Javorcik, 2004a)	Firm's productivity as adopted from (Javorcik, 2004a)	Intra and inter industry FDI spillovers: Log L (+) Log K (+) Log M (+) Foreign share (by Hongkong - Macau – Taiwan) (+) Foreign share (by other countries) Horizontal spillover Lagged horizontal spillover Backward spillover (+) Lagged backward spillover Forward spillover (+) Lagged forward spillover	-Under different firm internal capacities, foreign shared by other countries (except HK – Macau – Taiwan) positively affect firm productivity. - No/ weak influence of horizontal spillover on individual firm productivity is found. - The existence of positive backward (local suppliers/ sub-contractors of foreign subsidiaries) and forward spillovers (downstream customers of foreign affiliates) from foreign presence to domestically firm productivity.

5	(Damijan et al., 2013a)	-Firm-level panel data of more than 90,000 firms in10 transition economies (Bulgaria, the Czech Republic, Croatia, Estonia, Latvia, Lithuania, Poland, Romania, Slovenia and Ukraine) from 1995 to 2005 -Heckman procedure -Olley-Pakes approach	Firm productivity growth: TFP Direct effect of MNCs on local subsidiaries versus spillover effect (horizontal and vertical) of foreign presence to domestic firms.	Horizontal spillover Vertical spillover Human capital Technology gap Size	4/10 transition economies receive positive direct effects of FDI Without firm absorptive capabilities: no signal of horizontal spillover The higher the absorptive capacities and productivity level, the higher the probability the firm benefits from productivity spillover.
6	(Anwar & Nguyen, 2014)	-Firm-level panel data of Vietnamese manufacturing firms from 23 industries from 2000 to 2005 surveyed by GSO. -Input – output matrix in 2000 -Two stage estimation: (1) Calculate TFP using Cobb-Douslag model (2) Estimating the spillover variables and determinants affecting TFP	(1) Real output of domestic firms (2) Total factor productivity	(1) Capital Labor Elasticities of capital and labor (2)Horizontal spillover: foreign share of output in the industry Backward spillover Forward spillover Industry concentration (Herfindahl index) Scale Human capital Technology gap Financial development	-Again emphasize the importance of backward spillover -Vary across regions with different characteristics of absorptive capacities, human capital and infrastructure.
7	(Gorodnichenko et al., 2014a)	-Meta-analysis	Revenue efficiency	*Explanatory variables Backward	-The positive effect of backward spillover on

		-Firm-level panel data from 17 countries in Central and Eastern Europe, Turkey and the Commonwealth of Independent States from 2002 to 2005. - Input-output tables - Cobb-Douslag revenue function and Solow residual model is used to estimate FDI spillover effect on revenue efficiency.	*Moderating variables on the relationship between FDI spillover and revenue efficiency: -Bribes -Manager's time spent with officials -Ownership identity -FDI source of origin -Human capital -Distance from the technological frontier -Firm level linkages	Forward Horizontal Foreign firms' share of sale Export share Import share National competition level Elasticity of demand (low, medium, high)	revenue efficiency is supported as in many previous studies. - Insignificant horizontal and forward spillover - The institutional variables have little effect on efficiency spillover. - Human capital and distance from technological frontier are the facilitators for efficiency spillovers.
8	(Newman et al., 2015)	-4000 Vietnamese manufacturing enterprises from 2009 to 2012 surveyed by Vietnam technology and Competitiveness -Step 1: Production function estimation -Step 2: Model for FDI spillover -Robustness check: control for sector-level concentration, Olley-Pakes	(1) Value added (2)TFP	(1) Labor Capital Investment (2) -Ownership identities (private, foreign, state) -FDI supplier with technology transfer -FDI supplier with no technology transfer -FDI customer with technology transfer -FDI customer with no technology transfer	- vertical spillovers as the dominant channel + positive backward: local suppliers of intermediate inputs to foreign subsidiaries + negative forward: FDI suppliers of inputs to downstream domestically customers in the host economy. + less negative productivity spillover from 100% foreign owned firms to local firms in

		approach for TFP estimation		-Horizontal -Forward (local) -Forward (joint venture) -Forward 100% -Backward -Backward JV -Backward 100% -Sector concentration -Log export -Log import	direct linkages with them as a result of technology transfer.
9	(Mariotti et al., 2015)	-For Italian MNCs, 1999-2005 panel data - Data on 77,964 Italian domestic firms from 1999 to 2005 surveyed by AIDA Bureau van Dijk - Input-output table - Using the semi-parametric estimation procedure of Levinsohn and Petrin (2003) to estimate TFP as a tool to control for simultaneity problem of input choice. -GLS regression on FDI spillovers	TFP (residual growth of a firm's output)	MNCs_forward MNCs_backward *Foreign presence in utility services MNCs_Utility service_forward MNCs_Utility service_backward *Foreign presence in KIBS (traditional professional services and new technology-based service) MNCs_KIBS_forward MNCs_KIBS_backward *Foreign presence in manufacturing industry MNCs_manufacturing_forward MNCs_manufacturing_backward *Co-location and spatial lags: MNC_LLA_back, MNC_LLA_for MNC_LLAfirst_back MNC_LLAfirst_for	-Local suppliers and downstream customers of foreign subsidiaries in service sector receive greater productivity spillover compared with those in manufacturing sector. -Distance is not important in determining spillovers, especially for service sector. -Well research gap claimed

				MNC_LLAsecond_back MNC_LLAsecond_for MNC_LLArest_back MNC_LLArest_for	
10	(Fatima, 2016)	-Firm-level panel data of Turkish manufacturing enterprises (at least 20 employees) across 37 industries from 2003 to 2010 surveyed by Turkish Statistics Institute - Quantile regression	Firm level productivity *-Quantile regression: enrich the analysis on deeper understanding of the relationship between local firms' productivity growth and FDI spillovers on different quantiles of productivity growth. - TFP growth is distributed into five quantiles: 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}	Horizontal spillovers Backward linkage Forward linkage Lagged export share Lagged import share Size (production share) 2-digit industry concentration <u>Moderator:</u> absorptive capacity (distance from firm productivity to industrial best practice (frontier)	-Local firms in different quantiles are effected in different ways from horizontal and forward spillovers, -Firms in higher quantile tend to less suffered from competition (horizontal spillovers from MNCs) and receive more from forward spillover. -Absorptive capacities as facilitators to enable local firms become beneficiaries from FDI. -An increase in absorptive capacity should be supported and accumulated for lower quantile firms.
11	(Liu et al., 2016)	-Panel data of 1328 Chinese firms in electronic industry from 2003 to 2008	TFP (measured by the residual growth of output in the production function	*Firm-level variables: Foreign equity participation Productivity gap	Foreign capital on TFP → positive

		surveyed by National Bureau of statistics of China - Data on inward capital in 29 provinces in China and human capital and labor skill collected from Chinese electronic industry's yearbook (CEI)	includes Y(output) and X (inputs: labor and capital) *Moderators: productivity gap and provincial foreign equity shares	Fixed assets Management skill Firm market share *Provincial variables: Foreign equity shares in province MNCs' employment proportion in province Science & technology investment share in province Human capital *Firm dummies, regional dummies	FDI-related employment on TFP → negative Lower productivity gap → more rooms for positive spillovers and local firm's productivity improvement.
12	(Lenaerts & Merlevede, 2016)	-Firm-level panel data of Romanian service and manufacturing firms (at least 5 employees) from 1996 to 2005 -Two-step procedure: +Step 1: TFP estimation (Cobb-Douslag production function of labor, capital and materials using Olley-Pakes approach) +Step 2: explore the effects of FDI spillovers on TFP -Robustness check: +Alternatives of TFP calculation (LP (2003),	TFP *Differential vertical spillovers using aggregated input-output table versus detailed input-output table	*Aggregated input-output matrix Horizontal Backward Forward *Detailed input-output matrix Horizontal Backward Forward Time, industry and region dummies	-For aggregated IO-tables: horizontal linkage tends to outweigh vertical ones. -Vertical linkages are more likely occur in the supply chain in the supplier-customer relationship. -Strong evidences for positive backward spillover using detailed IO while the magnitude horizontal spillover is in favor of aggregated IO table use. -Explain why previous studies result in dominant horizontal effect.

		ACF (2008), dynamic panel data (1998), FE) + Replace Cobb-Douslag by translog			
13	(Lin & Kwan, 2016)	-Firm-level panel data of Chinese manufacturing firms from 1998 to 2007 surveyed by National Bureau of Statistics of China -Spatiotemporal autoregressive panel model -System GMM estimation	TFP	SOE presence FDI presence: employment share +Direct spillover +Indirect spillover +Total spillover Foreign presence: sales income share +Direct spillover +Indirect spillover +Total spillover Space–time lagged TFP Spatially lagged SOE presence Spatially lagged FDI presence: employment share Spatially lagged FDI presence: sales income share	(-) intra-regional spillover (-) or (+) inter-regional spillover -FDI presence in surrounding regions of domestic firms' location is an advantage.
14	(Jacobs et al., 2017)	-Firm-level panel data of Slovakia manufacturing and service firms from 2003 to 2012. -Two-step procedure: (1) TFP calculation using Levinsohn and Petrin	(1) Y (output) (2) TFP	Labor Capital Material *FDI spillovers -Spillover (foreign firm's share of output in industry) -Reverse spillover (local firm's share of output in industry)	(+) output spillover for both sectors. (-) squared output spillover → nonlinear effect Insignificant labor spillover and squared labor spillover. (-) capital spillover for both sectors.

		estimation method (L, K, M) (2) First-differenced one step GMM estimation -Endogenous check: avoid reverse causality between change in foreign/local presence and average productivity	*Manufacturing: low-tech vs high-tech *Service: knowledge-intensive vs less knowledge-intensive *Test quadratic terms of spillover to explore the nonlinear relationship.	-L spillover (foreign firm's share of labor in industry) -Reverse L spillover (local firm's share of labor in industry) -K spillover (foreign firm's share of K in industry) -Reverse K spillover (local firm's share of K in industry) *Moderators -Technology gap -Absorptive capacity	
15	(Javorcik et al., 2018)	-39,806 firm level panel data of Turkish manufacturing firms across 22 industries from 2003 to 2011. -2002 input-output table -Model estimation (1) Estimated TFP (2) FEM -Robustness check: general cluster-robust approach as in (Javorcik, 2004b)	TFP_LP and TFP _OP The use of Levinsohn and Petrin (2003) and Olley and Pakes (1996) approaches to avoid simultaneity bias	-Foreign capital share -Export oriented (EX) -Horizontal spillover (HS) *interaction terms of EX and spillover channels -EX × Horizontal Spillover -Backward Spillover -EX × Backward Spillover -Forward Spillover -EX × Forward Spillover -Year dummies	-Positive direct effect of foreign presence on Turkish TFP -Positive spillover effect on Turkish TFP through both vertical and horizontal channels -Firms with export orientation benefits more from all kind of spillovers

THE EFFECT OF FDI ON WAGES OF DOMESTIC FIRMS				
	Author (year)	Data and method	Dependent variable	Independent variables	Findings

1	(Hijzen et al., 2013)	-Firm level data across five countries (two developed and three developing): Brazil (firm-level data from 1994 to 2005), Germany (establishments data in 1994 and 2004), Portugal (firm-level from 1997 to 2004), UK (firm-level 1997 1997-2005), Indonesia (establishment 1997-2005). - Using the approach of propensity-score matching (PSM) and difference-in-differences	Average wages (measured by the logarithm of average worker wage or the logarithm of total wages divided by total employees)	-Foreign ownership -Total employees -Individual wage -Worker turnover -Sex, age, skill -Industry, region *Foreign takeovers t=0 t=1 t=2 *Domestic takeovers t=0 t=1 t=2 *Notes: t=0: < 12 months after the change in ownership status t=1: 1-2 years after the change in ownership status t=2: 2-3 years after the change in ownership status	-Employees working in foreign firms receive higher average wages. -The effect of foreign takeovers on average wages depend on skill level of workers (high-skill (+) and low-skill (-)) -The movement of workers from domestic firms to foreign firms is in favor of emerging countries' employees. (+) wage effect vs (-) job security under MNCs presence
2	(Javorcik, 2015)	Theories and empirical review of previous studies on the effect of FDI on wages under worker perspective and host-country perspective → to	*Worker perspective: Foreign presence and wage, training, job stability *Host-country perspective:	<u>Indicators:</u> TFP Value added per worker Output Employment Average wage	-Better compensation and better jobs in term of training and increase in aggregate productivity from both worker and host-country perspective.

		answer the question "Does FDI bring good jobs to the host countries?" (Javorcik, 2015)	Knowledge transfer Productivity advantages FDI externalities	Intra industry(horizontal) spillover Investment Export share Import input share K-L ratio Skilled labor ratio Capital utilization	-Positive intra-industry spillover on productivity
3	(Pittiglio et al., 2015)	-Firm-level panel data of Italian manufacturing firms from 2002 to 2007 surveyed by AIDA -Input-output tables from 2002 to 2007 by ISTAT -FEM -Robustness check: controlled for technology gap	Domestically – owned firms' average wage	Horizontal spillover Forward Backward Capital (K) Producer price index (P) Age Size *Moderator: technology gap (TG) (difference between firm's TFP and intra-industry average foreign firms' TFP) * Notes: -TFP estimation using LP (2003)	- Without controlling for technology gap, wage spillover doesn't exist. *The moderating effect of technology gap → large TG: positive horizontal spillovers and negative vertical spillovers on domestic wage. → medium TG: positive backward effect on wage -Impact of FDI on wage varies across industries (strongly depending on industrial/sectoral characteristics)
4	(K. T. Nguyen, 2015)	2000 – 2009 panel data of Vietnamese non-household manufacturing firms surveyed by GSO (at least 10 employees).	Average real wage (the logarithm of firm average wage rates)	Output K intensity Industry concentration Export oriented Gender ratio	-Wage premium in foreign firms > wage in domestic firms

		- Breusch-Pagan LM test for intra-industry wage differentials		Ownership types Red River Delta and its surroundings Mekong River Delta and its surroundings <u>Notes:</u> -Five categories of ownership: SOEs, domestic private firms, foreign JV with state enterprises, foreign JV with private firms, fully foreign owned -Industry classification: resource-based, capital-intensive, labor-intensive, traditional-labor intensive, electronics	-Wage differentials between foreign firms and domestic firms by industry/sector: + capital-intensive > labor-intensive + import-oriented > export-oriented -Wage differential is highest in JV of FIE and SOE.
5	(Earle, 2017)	-Firm-level panel data of Hungarian firms from 1992 to 2008 using Statistical Yearbooks of Hungary. -The sample of worker-level data (surveyed by WS) chosen by random method (based on workers' day of birth) → form LEED -Using propensity score matching, linear probability model (LPM)	Firm-level average wage (measured by the ratio of total wages to each year's average number of employees)	Lagged average wage Employment Foreign TFP Foreign labor productivity Foreign average wage Divestment Ownership Lagged employment Capital intensity Female and graduate ratio *Moderated by worker's characteristics	-Regardless to worker's characteristics, no one suffers from wage reduction under FDI presence. -Skill bias exist. -The differentials of productivity and wage are clear.

6	(K. T. Nguyen & Ramstetter, 2017)	Firm-level cross-sectional data of Vietnamese large and medium enterprises in 2009 surveyed by GSO. -Robustness check: similar data in 2007	Firm-level real average wage	*Firm-level indicators: Real output Real fixed asset/ employee % of high educated employees % of moderate educated employees % of high paid employees Female ratio Capital intensity Size Ownership types	Firm level wage premium in 100% FIE, JV and SOEs > that in domestic private firms Positive wage differentials are stable for JV and 100% FIE for most sectors, but insignificant for SOEs.

Appendix 2: Estimating Cobb-Douslag and Translog production function (refer to section 3.1.1-Total Factor Productivity Estimation)

use "C:\Users\hoa\Desktop\Nafosted\Naf 2017\VBER\Data 11-15 new.dta"

prodest LN_REV, free(LN_WAGE) proxy(LN_INVEST LN_INVEST2) state(LN_CAP) method(op)

estimate store cobb

prodest LN_REV, free (LN_WAGE) proxy(LN_INVEST LN_INVEST2) state(LN_CAP) acf method(op) translog

estimate store trl

hausman cobb trl

Results

```
op productivity estimator                       Cobb-Douglas PF

Dependent variable: revenue                     Number of obs      =    104900
Group variable (id): id                         Number of groups   =     89469
Time variable (t): YEAR
                                                Obs per group: min =         1
                                                               avg =       1.2
                                                               max =         4
```

LN_REV	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LN_WAGE	.5803041	.0026572	218.39	0.000	.575096	.5855122
LN_CAP	.0238601	.0081096	2.94	0.003	.0079655	.0397547

op productivity estimator — translog PF
ACF corrected

Dependent variable: revenue	Number of obs	=	104900
Group variable (id): id	Number of groups	=	89469
Time variable (t): YEAR			
	Obs per group: min	=	1
	avg	=	1.2
	max	=	4

LN_REV	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LN_WAGE	.1350374	.0000266	5079.93	0.000	.1349853	.1350895
LN_CAP	.6214193	.0000992	6261.87	0.000	.6212248	.6216138
var_11	.1262945	.0001493	846.04	0.000	.1260019	.1265871
var_12	-.1210696	.0000296	-4095.54	0.000	-.1211275	-.1210117
var_22	.0375795	.0004001	93.92	0.000	.0367953	.0383638

	Coefficients (b) cobb	(B) trl	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LN_WAGE	.5803041	.1350374	.4452667	.0026571
LN_CAP	.0238601	.6214193	-.5975592	.008109

b = consistent under Ho and Ha; obtained from prodest
B = inconsistent under Ha, efficient under Ho; obtained from prodest

Test: Ho: difference in coefficients not systematic

chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 318600.21
Prob>chi2 = 0.0000

L

Appendix 3: TFP Estimation using Olley-Pakes approach (refer to section 3.1.1-Total Factor Productivity Estimation)

lp productivity estimator — Cobb-Douglas PF

Dependent variable: revenue
Group variable (id): id
Time variable (t): YEAR

Number of obs = 537772
Number of groups = 286217

Obs per group: min = 1
avg = 1.9
max = 8

LN_REV	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LN_WAGE	.6067051	.0003684	1646.70	0.000	.605983	.6074273
LN_CAP	.0517784	.0033912	15.27	0.000	.0451318	.058425
LN_INVEST	.0861385	.0012882	66.87	0.000	.0836136	.0886634

Appendix 4: FDI spillovers estimation using GMM approach *(refer to section 4.1.7-Robustness check)*

```
. xtabond2 LN_TFPlp2 l.LN_TFPlp2 H_FDI FWD BWD HERF HC FN TECH_GAP LABOR_SIZE if FF !=1, gmm(l.(LN_TFPlp2
> H_FDI) HERF HC FN TECH_GAP LABOR_SIZE, lag(2 4)) iv(_I*) twostep robust
Favoring space over speed. To switch, type or click on mata: mata set matafavor speed, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step estimation.
  Difference-in-Sargan/Hansen statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: id                              Number of obs      =    124614
Time variable : YEAR                            Number of groups   =     84325
Number of instruments = 165                     Obs per group: min =         1
Wald chi2(9)  =   7648.76                                      avg =      1.48
Prob > chi2   =      0.000                                     max =         7
------------------------------------------------------------------------------
             |              Corrected
   LN_TFPlp2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   LN_TFPlp2 |
         L1. |   .3972678   .0135371    29.35   0.000     .3707356        .4238
             |
        H_FDI |  -1.725676   .2232297    -7.73   0.000    -2.163198   -1.288154
          FWD |  -.2311006   .0271897    -8.50   0.000    -.2843915   -.1778097
          BWD |   .3221033   .0529669     6.08   0.000     .2182901    .4259164
         HERF |   1.223543   .7464982     1.64   0.101    -.2395667    2.686652
           HC |  -.1631587   .0100922   -16.17   0.000     -.182939   -.1433783
           FN |   .1163822   .0164772     7.06   0.000     .0840875     .148677
    TECH_GAP |   -.711237   .0564778   -12.59   0.000    -.8219316   -.6005425
  LABOR_SIZE |   .3985038   .0125878    31.66   0.000     .3738323    .4231754
       _cons |   1.091986   .0716258    15.25   0.000     .9516023    1.232371
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(_IYEAR_2008 _IYEAR_2009 _IYEAR_2010 _IYEAR_2011 _IYEAR_2012 _IYEAR_2013
    _IYEAR_2014 _IYEAR_2015)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/4).(L.LN_TFPlp2 L.H_FDI HERF HC FN TECH_GAP LABOR_SIZE)
Instruments for levels equation
  Standard
    _IYEAR_2008 _IYEAR_2009 _IYEAR_2010 _IYEAR_2011 _IYEAR_2012 _IYEAR_2013
    _IYEAR_2014 _IYEAR_2015
    _cons
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.(L.LN_TFPlp2 L.H_FDI HERF HC FN TECH_GAP LABOR_SIZE)
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z = -10.93  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   1.83  Pr > z =  0.068
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(155)  =5214.46  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(155)  =2268.52  Prob > chi2 =  0.000
  (Robust, but weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(109)  =1106.47  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(46)   =1162.05  Prob > chi2 =  0.000
  iv(_IYEAR_2008 _IYEAR_2009 _IYEAR_2010 _IYEAR_2011 _IYEAR_2012 _IYEAR_2013 _IYEAR_2014 _IYEAR_2015)
    Hansen test excluding group:     chi2(149)  =1321.17  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(6)    = 947.35  Prob > chi2 =  0.000
```

*1. Consistency of the GMM estimator depends on the validity of the instruments.

*2. As suggested by Arellano and Bond (1991), Arellano and Bover(1995), and Blundell and Bond (1998), two specification tests are used: Sargan/Hansen test and serial correlation test (AR(1) & AR(2)).

*3. Sargan/Hansen test of over-identifying restrictions which tests for overall validity of the instruments

*4. the null hypothesis is that all instruments as a group are exogenous. Therefore, higher p-value is better (insignificant

*5. Serial correlation test examines the null hypothesis that error term of the differenced equation is not serially correlated at the first order (AR1) and second order (AR2). So again we need higher p-value here.

*6. By construction, the differenced error term is probably serially correlated at AR (1) even if the original error is not. Differenced error term at AR (1) process is and both have uit-1

*7. AR (2) test is most important since it will detect autocorrelation in levels. AR (2) process is and

*8. While most studies that employ GMM dynamic estimation report the test for first order serial correlation, some do not. (Mahyudin Ahmad Studied Development economics at University of Leicester& Cambridge)

Appendix 5: Distribution of firms according to ownership type by year *(refer to section 3.2.2-Data description)*

	TYPE					
YEAR	**PRIVATE**	**J.STOCK**	**FDI**	**SOEs**	**OTHER**	**Total**
2007	25,776	4,281	1,655	1,316	2,645	35,673
2008	25,148	5,625	1,706	1,232	4,432	38,143
2009	86,961	19,416	2,731	2,482	5,612	117,202
2010	90,375	22,383	2,739	2,223	6,034	123,754
2011	10,404	6,901	1,463	1,092	258	20,118
2012	68,458	18,618	2,090	2,087	5,994	97,247
2013	117,594	31,140	4,251	2,354	7,529	162,868
2014	63,803	17,469	562	283	2,663	84,780

2015	5,924	4,180	2,843	751	237	13,935
Total	**494,443**	**130,013**	**20,040**	**13,820**	**35,404**	**693,720**

Appendix 6: Manufacturing firms' general indicators by year (2007 -2015) and by two-digit industry *(refer to section 3.2.2-Data description)*

YEAR	VSIC2 (2 digit code)	Industrial Name	Labor	Foreign capital share	Equity (Mil VND)	Revenue (Mil VND)	Asset (Mil VND)	Capital per labor
2007	10	Food processing and production	393661	0.3763679	61,700,000	228,000,000	132,000,000	156.73
2008	10	Food processing and production	424487	0.3605575	75,500,000	316,000,000	168,000,000	177.86
2009	10	Food processing and production	453440	0.3561034	94,900,000	360,000,000	218,000,000	209.29
2010	10	Food processing and production	426209	0.372728	110,000,000	437,000,000	264,000,000	258.09
2011	10	Food processing and production	304660	0.3487762	266,000,000	453,000,000	272,000,000	873.10
2012	10	Food processing and production	465204	0.348747	167,000,000	714,000,000	409,000,000	358.98
2013	10	Food processing and production	470227	0.3697422	184,000,000	746,000,000	446,000,000	391.30
2014	10	Food processing and production	482415	0.285088	390,000,000	854,000,000	504,000,000	808.43
2015	10	Food processing and production	364502	0.4032494	180,000,000	697,000,000	410,000,000	493.82
2007	11	Beverage and Drinks	31514	0.2369755	21,000,000	26,400,000	32,000,000	666.37
2008	11	Beverage and Drinks	33622	0.3090121	18,300,000	32,800,000	37,100,000	544.29
2009	11	Beverage and Drinks	37487	0.2955338	24,400,000	40,200,000	48,800,000	650.89
2010	11	Beverage and Drinks	35339	0.305883	26,300,000	57,600,000	57,400,000	744.22
2011	11	Beverage and Drinks	32851	0.3579764	59,800,000	68,500,000	62,700,000	1,820.34
2012	11	Beverage and Drinks	41620	0.3456607	39,200,000	80,600,000	70,500,000	941.85
2013	11	Beverage and Drinks	42274	0.3980366	44,100,000	94,900,000	79,100,000	1,043.19
2014	11	Beverage and Drinks	40293	0.3894199	56,100,000	101,000,000	90,600,000	1,392.30
2015	11	Beverage and Drinks	31049	0.4565188	52,400,000	100,000,000	87,600,000	1,687.65
2007	12	Producing tobacco products	13721	0.116207	5,517,248	19,400,000	9,786,840	402.10
2008	12	Producing tobacco products	13805	0.1963118	6,674,443	21,400,000	11,700,000	483.48
2009	12	Producing tobacco products	13517	0.1957967	7,456,975	26,800,000	16,000,000	551.67

YEAR	VSIC2 (2 digit code)	Industrial Name	Labor	Foreign capital share	Equity (Mil VND)	Revenue (Mil VND)	Asset (Mil VND)	Capital per labor
2010	12	Producing tobacco products	13494	0.1953676	7,779,836	32,200,000	16,700,000	576.54
2011	12	Producing tobacco products	10925	0.1593814	16,700,000	31,700,000	16,900,000	1,528.60
2012	12	Producing tobacco products	13070	0.175748	10,200,000	40,200,000	22,000,000	780.41
2013	12	Producing tobacco products	12777	0.1675639	11,500,000	44,900,000	25,800,000	900.05
2014	12	Producing tobacco products	11602	0.1080112	21,400,000	39,300,000	25,800,000	1,844.51
2015	12	Producing tobacco products	11209	0.1437847	14,800,000	36,800,000	28,600,000	1,320.37
2007	13	Textiles	162999	0.6445754	23,500,000	52,700,000	60,800,000	144.17
2008	13	Textiles	151650	0.662465	28,800,000	58,400,000	73,700,000	189.91
2009	13	Textiles	170769	0.6818757	35,800,000	73,100,000	81,400,000	209.64
2010	13	Textiles	153134	0.75478	43,100,000	94,300,000	96,800,000	281.45
2011	13	Textiles	107637	0.6130869	70,800,000	81,000,000	72,000,000	657.77
2012	13	Textiles	172679	0.709101	57,800,000	149,000,000	132,000,000	334.73
2013	13	Textiles	190273	0.6988925	66,100,000	170,000,000	160,000,000	347.40
2014	13	Textiles	204482	0.5309737	104,000,000	188,000,000	193,000,000	508.60
2015	13	Textiles	174179	0.7740714	77,800,000	174,000,000	191,000,000	446.67
2007	14	Apparel Garments	664229	0.5448561	18,500,000	49,800,000	41,800,000	27.85
2008	14	Apparel Garments	708835	0.5631078	23,800,000	61,800,000	53,900,000	33.58
2009	14	Apparel Garments	685287	0.5289707	25,600,000	65,100,000	57,500,000	37.36
2010	14	Apparel Garments	698377	0.579693	29,400,000	82,600,000	69,400,000	42.10
2011	14	Apparel Garments	664963	0.5126758	79,100,000	110,000,000	81,200,000	118.95
2012	14	Apparel Garments	893839	0.5389763	44,500,000	142,000,000	107,000,000	49.79
2013	14	Apparel Garments	989784	0.5105505	54,000,000	173,000,000	128,000,000	54.56
2014	14	Apparel Garments	1183963	0.4498164	118,000,000	217,000,000	153,000,000	99.67
2015	14	Apparel Garments	942295	0.6207762	58,600,000	197,000,000	139,000,000	62.19
2007	15	Production of leather and related products	576427	0.7069949	16,600,000	49,600,000	42,400,000	28.80
2008	15	Production of leather and related products	601472	0.5161622	29,600,000	59,100,000	81,000,000	49.21
2009	15	Production of leather and related products	561157	0.7331321	23,600,000	62,100,000	53,100,000	42.06

YEAR	VSIC2 (2 digit code)	Industrial Name	Labor	Foreign capital share	Equity (Mil VND)	Revenue (Mil VND)	Asset (Mil VND)	Capital per labor
2010	15	Production of leather and related products	628602	0.7427582	27,200,000	79,600,000	61,800,000	43.27
2011	15	Production of leather and related products	557454	0.7616447	66,400,000	88,700,000	67,800,000	119.11
2012	15	Production of leather and related products	772957	0.7734414	38,700,000	128,000,000	93,700,000	50.07
2013	15	Production of leather and related products	857570	0.7625114	44,200,000	160,000,000	112,000,000	51.54
2014	15	Production of leather and related products	1001424	0.7056176	95,600,000	203,000,000	134,000,000	95.46
2015	15	Production of leather and related products	879940	0.822863	55,700,000	211,000,000	133,000,000	63.30
2007	16	Processing wood and related products (except beds, cabinets, tables, chairs)	111911	0.2115081	7,540,109	18,200,000	17,600,000	67.38
2008	16	Processing wood and related products (except beds, cabinets, tables, chairs)	113844	0.1588099	8,400,206	22,400,000	19,300,000	73.79
2009	16	Processing wood and related products (except beds, cabinets, tables, chairs)	110439	0.1411215	11,900,000	24,600,000	27,600,000	107.75
2010	16	Processing wood and related products (except beds, cabinets, tables, chairs)	98394	0.1020844	19,500,000	31,900,000	38,000,000	198.18
2011	16	Processing wood and related products (except beds, cabinets, tables, chairs)	41294	0.2017145	24,400,000	23,500,000	25,000,000	590.88
2012	16	Processing wood and related products (except beds, cabinets, tables, chairs)	115397	0.1434971	25,400,000	59,700,000	61,000,000	220.11
2013	16	Processing wood and related products (except beds, cabinets, tables, chairs)	118268	0.145434	27,300,000	69,500,000	69,200,000	230.83
2014	16	Processing wood and related products (except beds, cabinets, tables, chairs)	111153	0.1228129	57,600,000	69,500,000	68,100,000	518.20
2015	16	Processing wood and related products (except beds, cabinets, tables, chairs)	67286	0.2056956	18,900,000	55,100,000	46,700,000	280.89
2007	17	Producing paper and paper products	73333	0.2397491	11,800,000	25,100,000	26,700,000	160.91
2008	17	Producing paper and paper products	75420	0.258972	15,000,000	35,000,000	34,400,000	198.89
2009	17	Producing paper and paper products	80519	0.3594185	18,800,000	37,100,000	48,800,000	233.49
2010	17	Producing paper and paper products	75919	0.414001	19,800,000	48,300,000	49,900,000	260.80
2011	17	Producing paper and paper products	53270	0.354664	47,900,000	47,500,000	49,100,000	899.19
2012	17	Producing paper and paper products	95095	0.364707	34,000,000	80,500,000	86,600,000	357.54
2013	17	Producing paper and paper products	100017	0.3668954	37,200,000	86,800,000	91,500,000	371.94
2014	17	Producing paper and paper products	96610	0.2852954	67,900,000	99,200,000	102,000,000	702.83
2015	17	Producing paper and paper products	72140	0.5216006	38,300,000	84,200,000	83,900,000	530.91
2007	18	Print and copy all types of records	42937	0.0593664	7,265,778	11,700,000	12,300,000	169.22
2008	18	Print and copy all types of records	48219	0.094106	8,500,155	15,400,000	15,100,000	176.28
2009	18	Print and copy all types of records	51162	0.1040522	9,974,656	16,500,000	19,400,000	194.96

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2010	18	Print and copy all types of records	34534	0.1027569	8,805,430	15,800,000	16,500,000	254.98
2011	18	Print and copy all types of records	29946	0.0952924	14,600,000	17,200,000	14,800,000	487.54
2012	18	Print and copy all types of records	62272	0.0948705	14,300,000	26,600,000	28,400,000	229.64
2013	18	Print and copy all types of records	59480	0.1300199	15,000,000	30,000,000	29,900,000	252.19
2014	18	Print and copy all types of records	59147	0.1450019	20,900,000	33,400,000	33,200,000	353.36
2015	18	Print and copy all types of records	31624	0.2675471	11,900,000	23,000,000	21,900,000	376.30
2007	19	Producing coke, refined petroleum products	1379	0.743327	817,998	2,919,711	1,379,028	593.18
2008	19	Producing coke, refined petroleum products	1163	0.720055	888,596	3,637,886	1,607,312	764.06
2009	19	Producing coke, refined petroleum products	3291	0.0461354	33,700,000	17,800,000	66,900,000	10,240.05
2010	19	Producing coke, refined petroleum products	3360	0.0733561	22,600,000	74,700,000	77,100,000	6,726.19
2011	19	Producing coke, refined petroleum products	3768	0.0292377	84,500,000	136,000,000	85,000,000	22,425.69
2012	19	Producing coke, refined petroleum products	4867	0.058656	27,400,000	144,000,000	88,100,000	5,629.75
2013	19	Producing coke, refined petroleum products	4682	0.0650295	32,600,000	174,000,000	99,500,000	6,962.84
2014	19	Producing coke, refined petroleum products	5289	0.0432785	52,600,000	144,000,000	93,200,000	9,945.17
2015	19	Producing coke, refined petroleum products	3394	0.0725883	34,000,000	104,000,000	64,100,000	10,017.68
2007	20	Manufacturing chemicals and chemical products	69305	0.5397876	17,400,000	64,900,000	42,000,000	251.06
2008	20	Manufacturing chemicals and chemical products	76691	0.4039937	26,300,000	92,300,000	59,900,000	342.93
2009	20	Manufacturing chemicals and chemical products	84721	0.3960227	36,300,000	108,000,000	78,600,000	428.47
2010	20	Manufacturing chemicals and chemical products	71201	0.4445746	42,100,000	124,000,000	93,800,000	591.28
2011	20	Manufacturing chemicals and chemical products	62184	0.4607432	97,100,000	132,000,000	100,000,000	1,561.49
2012	20	Manufacturing chemicals and chemical products	96151	0.412479	65,200,000	191,000,000	159,000,000	678.10
2013	20	Manufacturing chemicals and chemical products	98523	0.4400476	74,200,000	209,000,000	180,000,000	753.12
2014	20	Manufacturing chemicals and chemical products	99070	0.3860047	142,000,000	226,000,000	195,000,000	1,433.33
2015	20	Manufacturing chemicals and chemical products	78564	0.5353047	76,200,000	202,000,000	153,000,000	969.91
2007	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	29517	0.1973824	7,220,219	14,900,000	13,900,000	244.61
2008	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	32964	0.2247531	8,777,531	19,300,000	17,000,000	266.28
2009	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	34567	0.2257342	10,600,000	21,600,000	20,300,000	306.65

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2010	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	32814	0.2375084	11,900,000	26,800,000	23,200,000	362.65
2011	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	28645	0.2734294	24,000,000	26,100,000	24,800,000	837.84
2012	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	38773	0.2460181	17,600,000	37,600,000	33,400,000	453.92
2013	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	41307	0.2498046	19,800,000	42,700,000	35,900,000	479.34
2014	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	43697	0.2177608	35,100,000	46,400,000	45,800,000	803.26
2015	21	Production of medicines, pharmaceutical chemicals and pharmaceutical materials	38188	0.3170701	26,500,000	47,600,000	45,500,000	693.94
2007	22	Producing products from rubber and plastic	143323	0.4434414	22,000,000	54,100,000	49,400,000	153.50
2008	22	Producing products from rubber and plastic	154340	0.4766418	28,700,000	72,100,000	66,600,000	185.95
2009	22	Producing products from rubber and plastic	167337	0.443295	38,600,000	80,400,000	86,100,000	230.67
2010	22	Producing products from rubber and plastic	167047	0.4712008	41,200,000	107,000,000	96,500,000	246.64
2011	22	Producing products from rubber and plastic	144091	0.4311124	103,000,000	129,000,000	106,000,000	714.83
2012	22	Producing products from rubber and plastic	202095	0.44582	64,400,000	164,000,000	144,000,000	318.66
2013	22	Producing products from rubber and plastic	215218	0.440421	76,400,000	179,000,000	167,000,000	354.99
2014	22	Producing products from rubber and plastic	235850	0.4252347	135,000,000	212,000,000	207,000,000	572.40
2015	22	Producing products from rubber and plastic	194580	0.5897232	82,100,000	189,000,000	177,000,000	421.93
2007	23	Producing other non-metallic mineral products	226738	0.3416012	45,100,000	64,100,000	105,000,000	198.91
2008	23	Producing other non-metallic mineral products	239493	0.3766496	48,100,000	82,000,000	128,000,000	200.84
2009	23	Producing other non-metallic mineral products	270983	0.4139195	85,000,000	124,000,000	222,000,000	313.67
2010	23	Producing other non-metallic mineral products	255405	0.3494313	71,100,000	133,000,000	208,000,000	278.38
2011	23	Producing other non-metallic mineral products	156048	0.2178112	205,000,000	127,000,000	209,000,000	1,313.70
2012	23	Producing other non-metallic mineral products	271430	0.3530938	97,700,000	185,000,000	288,000,000	359.95
2013	23	Producing other non-metallic mineral products	259539	0.3234169	110,000,000	196,000,000	300,000,000	423.83
2014	23	Producing other non-metallic mineral products	240800	0.1357966	172,000,000	204,000,000	296,000,000	714.29
2015	23	Producing other non-metallic mineral products	174913	0.4150173	99,400,000	195,000,000	258,000,000	568.28
2007	24	Metal production	50755	0.2502345	17,300,000	73,500,000	45,200,000	340.85
2008	24	Metal production	57614	0.199968	21,300,000	120,000,000	63,400,000	369.70
2009	24	Metal production	61373	0.2876887	37,100,000	114,000,000	102,000,000	604.50

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2010	24	Metal production	62395	0.2647403	39,400,000	170,000,000	124,000,000	631.46
2011	24	Metal production	45102	0.2681008	92,100,000	124,000,000	94,100,000	2,042.04
2012	24	Metal production	64301	0.3451452	44,200,000	198,000,000	149,000,000	687.39
2013	24	Metal production	67675	0.5026694	61,400,000	200,000,000	180,000,000	907.28
2014	24	Metal production	71511	0.2064345	131,000,000	221,000,000	200,000,000	1,831.89
2015	24	Metal production	46459	0.367483	44,700,000	150,000,000	121,000,000	962.14
2007	25	Manufacturing products from prefabricated metals (except machinery and equipment)	173151	0.5055738	24,000,000	64,000,000	62,300,000	138.61
2008	25	Manufacturing products from prefabricated metals (except machinery and equipment)	188008	0.4856873	33,900,000	93,000,000	79,100,000	180.31
2009	25	Manufacturing products from prefabricated metals (except machinery and equipment)	203628	0.5119165	43,500,000	106,000,000	106,000,000	213.62
2010	25	Manufacturing products from prefabricated metals (except machinery and equipment)	170192	0.5760269	45,400,000	137,000,000	127,000,000	266.76
2011	25	Manufacturing products from prefabricated metals (except machinery and equipment)	131772	0.4162462	134,000,000	136,000,000	138,000,000	1,016.91
2012	25	Manufacturing products from prefabricated metals (except machinery and equipment)	237354	0.4460843	86,500,000	208,000,000	230,000,000	364.43
2013	25	Manufacturing products from prefabricated metals (except machinery and equipment)	241583	0.5126028	83,400,000	235,000,000	228,000,000	345.22
2014	25	Manufacturing products from prefabricated metals (except machinery and equipment)	252315	0.3511839	186,000,000	258,000,000	249,000,000	737.17
2015	25	Manufacturing products from prefabricated metals (except machinery and equipment)	171272	0.6150947	75,400,000	224,000,000	182,000,000	440.24
2007	26	Manufacturing electronic products, computers and optical products	82297	0.8332253	17,500,000	60,600,000	38,500,000	212.64
2008	26	Manufacturing electronic products, computers and optical products	88461	0.8853329	19,700,000	72,800,000	42,900,000	222.70
2009	26	Manufacturing electronic products, computers and optical products	105192	0.8883462	25,600,000	83,200,000	56,600,000	243.36
2010	26	Manufacturing electronic products, computers and optical products	139956	0.9352584	32,200,000	128,000,000	70,200,000	230.07
2011	26	Manufacturing electronic products, computers and optical products	167938	0.9539813	134,000,000	263,000,000	137,000,000	797.91
2012	26	Manufacturing electronic products, computers and optical products	269354	0.9457048	95,400,000	473,000,000	196,000,000	354.18
2013	26	Manufacturing electronic products, computers and optical products	311229	0.9665958	152,000,000	770,000,000	271,000,000	488.39
2014	26	Manufacturing electronic products, computers and optical products	380508	0.9697295	311,000,000	899,000,000	418,000,000	817.33
2015	26	Manufacturing electronic products, computers and optical products	434425	0.9819718	273,000,000	1,180,000,000	521,000,000	628.42
2007	27	Production of electrical equipment	117654	0.4845412	22,900,000	62,200,000	48,500,000	194.64
2008	27	Production of electrical equipment	117509	0.5329466	24,400,000	71,100,000	52,800,000	207.64
2009	27	Production of electrical equipment	122676	0.4863172	31,100,000	79,900,000	69,500,000	253.51

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2010	27	Production of electrical equipment	126298	0.5214475	32,900,000	106,000,000	75,300,000	260.50
2011	27	Production of electrical equipment	104925	0.5582355	82,600,000	111,000,000	84,700,000	787.23
2012	27	Production of electrical equipment	139487	0.5867632	41,500,000	145,000,000	107,000,000	297.52
2013	27	Production of electrical equipment	143055	0.632675	46,300,000	162,000,000	119,000,000	323.65
2014	27	Production of electrical equipment	152589	0.5425696	91,700,000	188,000,000	126,000,000	600.96
2015	27	Production of electrical equipment	142714	0.7047432	51,000,000	186,000,000	119,000,000	357.36
2007	28	Production of machinery and equipment not yet classified	45863	0.4021448	10,200,000	16,800,000	21,100,000	222.40
2008	28	Production of machinery and equipment not yet classified	47900	0.4963515	13,000,000	21,200,000	24,400,000	271.40
2009	28	Production of machinery and equipment not yet classified	49643	0.5856125	14,900,000	22,200,000	29,500,000	300.14
2010	28	Production of machinery and equipment not yet classified	45966	0.6560605	17,000,000	29,300,000	34,000,000	369.84
2011	28	Production of machinery and equipment not yet classified	42688	0.6230491	35,700,000	33,500,000	36,600,000	836.30
2012	28	Production of machinery and equipment not yet classified	57316	0.6399717	23,700,000	47,500,000	54,100,000	413.50
2013	28	Production of machinery and equipment not yet classified	59735	0.6303368	27,100,000	53,700,000	60,600,000	453.67
2014	28	Production of machinery and equipment not yet classified	62019	0.6008099	49,300,000	59,300,000	63,200,000	794.92
2015	28	Production of machinery and equipment not yet classified	54450	0.7335193	29,900,000	64,400,000	64,000,000	549.13
2007	29	Manufacturing automobiles and other motor vehicles	43528	0.6796867	14,100,000	41,200,000	28,300,000	323.93
2008	29	Manufacturing automobiles and other motor vehicles	44517	0.6817129	17,600,000	54,900,000	37,600,000	395.35
2009	29	Manufacturing automobiles and other motor vehicles	57539	0.6726662	20,500,000	73,500,000	43,300,000	356.28
2010	29	Manufacturing automobiles and other motor vehicles	50525	0.6830423	23,700,000	80,400,000	49,700,000	469.07
2011	29	Manufacturing automobiles and other motor vehicles	57108	0.6448629	62,300,000	96,700,000	63,600,000	1,090.92
2012	29	Manufacturing automobiles and other motor vehicles	84673	0.7475542	34,200,000	113,000,000	74,300,000	403.91
2013	29	Manufacturing automobiles and other motor vehicles	91945	0.7552083	39,500,000	132,000,000	82,700,000	429.60
2014	29	Manufacturing automobiles and other motor vehicles	101505	0.6230117	68,000,000	177,000,000	104,000,000	669.92
2015	29	Manufacturing automobiles and other motor vehicles	82772	0.8022904	45,200,000	177,000,000	101,000,000	546.08
2007	30	Production of other means of transport	116105	0.7260346	24,500,000	74,000,000	78,400,000	211.02
2008	30	Production of other means of transport	116377	0.6947089	27,900,000	82,700,000	92,600,000	239.74
2009	30	Production of other means of transport	120213	0.6682714	30,900,000	97,300,000	114,000,000	257.04

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2010	30	Production of other means of transport	96080	0.7601843	38,700,000	116,000,000	109,000,000	402.79
2011	30	Production of other means of transport	76392	0.5967444	105,000,000	142,000,000	107,000,000	1,374.49
2012	30	Production of other means of transport	90017	0.7893103	52,600,000	167,000,000	108,000,000	584.33
2013	30	Production of other means of transport	89403	0.801519	63,600,000	170,000,000	126,000,000	711.39
2014	30	Production of other means of transport	96439	0.5355512	114,000,000	179,000,000	155,000,000	1,182.09
2015	30	Production of other means of transport	80276	0.8098377	67,100,000	183,000,000	132,000,000	835.87
2007	31	Production of beds, wardrobes, tables and chairs	269516	0.4739384	14,700,000	43,500,000	40,900,000	54.54
2008	31	Production of beds, wardrobes, tables and chairs	260580	0.3618526	23,200,000	51,200,000	56,900,000	89.03
2009	31	Production of beds, wardrobes, tables and chairs	249454	0.3488081	26,200,000	53,400,000	62,300,000	105.03
2010	31	Production of beds, wardrobes, tables and chairs	241324	0.4135064	26,000,000	66,100,000	64,400,000	107.74
2011	31	Production of beds, wardrobes, tables and chairs	156241	0.4881639	50,400,000	56,200,000	53,000,000	322.58
2012	31	Production of beds, wardrobes, tables and chairs	263690	0.4124078	33,300,000	92,000,000	85,900,000	126.28
2013	31	Production of beds, wardrobes, tables and chairs	275944	0.4181309	37,600,000	106,000,000	102,000,000	136.26
2014	31	Production of beds, wardrobes, tables and chairs	303624	0.3231315	106,000,000	126,000,000	125,000,000	349.12
2015	31	Production of beds, wardrobes, tables and chairs	277668	0.5507511	37,900,000	127,000,000	100,000,000	136.49
2007	32	Other processing and manufacturing industries	75018	0.7908368	5,493,431	12,400,000	11,300,000	73.23
2008	32	Other processing and manufacturing industries	77181	0.8115872	6,460,393	14,800,000	13,400,000	83.70
2009	32	Other processing and manufacturing industries	89036	0.7312115	10,800,000	20,900,000	21,200,000	121.30
2010	32	Other processing and manufacturing industries	85326	0.8915147	12,100,000	24,600,000	21,800,000	141.81
2011	32	Other processing and manufacturing industries	67329	0.8292202	24,500,000	27,100,000	25,200,000	363.88
2012	32	Other processing and manufacturing industries	103620	0.7946717	20,800,000	37,700,000	39,200,000	200.73
2013	32	Other processing and manufacturing industries	120285	0.8176172	24,300,000	43,300,000	44,000,000	202.02
2014	32	Other processing and manufacturing industries	143488	0.6747134	38,300,000	54,400,000	52,200,000	266.92
2015	32	Other processing and manufacturing industries	114614	0.8552272	25,600,000	48,600,000	45,700,000	223.36
2007	33	Repair, maintenance and installation of machinery and equipment	21401	0.0716419	1,646,411	6,180,017	3,680,548	76.93
2008	33	Repair, maintenance and installation of machinery and equipment	22481	0.0900343	1,906,906	4,365,639	4,435,131	84.82
2009	33	Repair, maintenance and installation of machinery and equipment	23796	0.1557457	3,658,842	9,710,186	16,800,000	153.76

YEAR	VSIC2 (2 digit code)	Industrial Name	Labor	Foreign capital share	Equity (Mil VND)	Revenue (Mil VND)	Asset (Mil VND)	Capital per labor
2010	33	Repair, maintenance and installation of machinery and equipment	15449	0.2754023	2,019,961	13,200,000	13,400,000	130.75
2011	33	Repair, maintenance and installation of machinery and equipment	13603	0.0306839	15,900,000	16,600,000	16,000,000	1,168.86
2012	33	Repair, maintenance and installation of machinery and equipment	28794	0.0994175	5,543,502	20,600,000	18,500,000	192.52
2013	33	Repair, maintenance and installation of machinery and equipment	30715	0.1176595	6,519,273	16,000,000	22,500,000	212.25
2014	33	Repair, maintenance and installation of machinery and equipment	30525	0.1014739	16,700,000	14,100,000	18,400,000	547.09
2015	33	Repair, maintenance and installation of machinery and equipment	22064	0.2620787	5,105,053	11,300,000	14,200,000	231.37
2007	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	102805	0.0802081	77,600,000	80,500,000	187,000,000	754.83
2008	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	111500	0.063874	92,600,000	120,000,000	283,000,000	830.49
2009	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	225493	0.0321775	228,000,000	334,000,000	765,000,000	1,011.12
2010	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	130027	0.0467883	179,000,000	332,000,000	612,000,000	1,376.64
2011	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	112736	0.0004189	315,000,000	209,000,000	316,000,000	2,794.14
2012	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	145354	0.0301905	303,000,000	389,000,000	828,000,000	2,084.57
2013	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	140485	0.0267636	373,000,000	468,000,000	1,020,000,000	2,655.09
2014	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	136431	0.0163861	425,000,000	404,000,000	735,000,000	3,115.13
2015	35	Production and distribution of electricity, gas, hot water, steam and air conditioning	119454	0.0581305	202,000,000	407,000,000	663,000,000	1,691.03