Foreign Direct Investment Absorptive capacity of Vietnam

Vu Hoang Duong, Ph.D.

Doctoral Thesis Summary

Tomas Bata University in Zlín

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Faculty of Management and Economics

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Přímé zahraniční investice Absorpční kapacita ve Vietnamu

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ABSTRACT

FDI is one important source for development in Vietnam. FDI can generate positive and/or negative impacts on host countries. Hence, the main aim of the dissertation is to improve the absorptive capacity of Vietnam at the provincial level in order to fully take advantage of the positive impacts of FDI. At the firm level, the author puts forward a new measurement of the absorptive capacity of firms. Then, it is constructed as one dimension of absorptive capacity at the provincial level. At the provincial level, there are six dimensions of absorptive capacity. They are the level of openness, infrastructure, financial development, human capital, institutions and absorptive capacity of domestic firms. By combining quantitative and qualitative methods, the dissertation shows the following findings. At the firm level, absorptive capacity can boost the effect of horizontal effects from FDI and there are thresholds of absorptive capacity of domestic firms. At the provincial level, the importance of the dimensions of provincial absorptive capacity is as follow infrastructure, the absorptive capacity of domestic firms, human capital and financial development. The dissertation brings three academic contributions which are the framework to analyse absorptive capacity, the new measurement of absorptive capacity of firms and the evidence to connect the absorptive capacity of firms and absorptive capacity of provinces. In terms of political contribution, the dissertation shows the list of prioritized dimensions of absorptive capacity of suggests several policy implications improve this capacity in Vietnam.

ABSTRAKT

PZI jsou jedním z důležitých zdrojů rozvoje ve Vietnamu. PZI mohou mít pozitivní a / nebo negativní dopady na hostitelské země. Hlavním cílem disertační práce je proto zlepšit absorpční kapacitu Vietnamu na provinční úrovni, aby bylo možné plně využít výhod pozitivních dopadů PZI. Na úrovni firmy autor navrhuje nové měření absorpční kapacity firem. Pak je konstruován jako jedna dimenze absorpční kapacity na provinční úrovni. Na provinční úrovni existuje šest dimenzí absorpční kapacity. Jsou to: úroveň otevřenosti, infrastruktura, finanční rozvoj, lidský kapitál, instituce a absorpční kapacita domácích firem. Kombinace kvantitativních a kvalitativních metod ukazuje disertační práce následující poznatky. Na podnikové úrovni může absorpční kapacita posílit účinek horizontálních efektů z přímých zahraničních investic a existují mezní hodnoty absorpční kapacity domácích firem. Na provinční úrovni je význam dimenzí absorpční kapacity provincií následující: infrastruktura, absorpční kapacita domácích firem, lidský kapitál a finanční rozvoj. Disertační práce přináší tři akademické příspěvky, které jsou rámcem pro analýzu absorpční kapacity, nové měření absorpční kapacity podniků a důkazy o propojení absorpční kapacity podniků a absorpční kapacity provincií. Co se týče politického přínosu, disertační práce uvádí seznam prioritních dimenzí absorpční kapacity návrhů několika politických důsledků pro zlepšení této kapacity ve Vietnamu.

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1. INTRODUCTION

Foreign Direct Investment (FDI) can bring direct and indirect benefits to hosting counties. However, these benefits are not automatically coming to the host countries. Instead, it varies depending on the absorptive capacity of recipients (Borensztein, De Gregorio and Lee, 1998, Alfaro, Chanda and Kalemli-ozcan, 2004, Durham, 2004, Carkovic and Levine, 2005, Fu, 2008). Then, the dissertation is to answer the question on how to take full advantage of positive impacts from FDI by examining the absorptive capacity. The main purpose of the dissertation is to identify the most important dimensions of absorptive capacity at the provincial level in Vietnam. Then, several policy implications are suggested to improve this capacity. The author of the dissertation argues that the absorptive capacity of provinces includes six dimensions: Institutions, Financial development, Human capital, Openness, Infrastructure and the absorptive capacity of domestic firms. Then, the dissertation combines quantitative and qualitative methods to find the most important dimensions. Econometric techniques are used to empirically identify the most important dimensions while Delphi method is used to get opinions of specialists on the topic.

The dissertation has the following academic and policy contributions. In terms of academic contribution, the dissertation puts forward the framework to analyse the absorptive capacity at the macro level. This framework can apply at the provincial, regional or national level. Additionally, a new measurement of absorptive capacity at the firm level is proposed. This new measurement bases on estimation from production function therefore, it is possible to compare across regions or nations. Moreover, the dissertation connects absorptive capacity at the firm level and absorptive capacity at the provincial level by constructing the former as one dimension of the latter. Regarding policy contribution, it is specific for Vietnam. After creating a list of prioritized dimensions of absorptive capacity, the author gives some policy implications which can help improve the absorptive capacity of Vietnam.

The structure of the dissertation is as follows. The next part is the theoretical background and literature review which provides theories on foreign direct investments and absorptive capacity and puts forward the theoretical framework to analyse the absorptive capacity of provinces. The third part is research problems and the development of research hypotheses. The fourth part is methodology that describes in details all methods used in the dissertation. The dissertation combines quantitative and qualitative methods. The fifth part is findings and discussions. This part shows results from quantitative and qualitative method. The sixth part is limitation which detects the shortcomings of the dissertation. Finally, the conclusion part summarizes the main outcomes of the dissertation.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

2.1. Foreign Direct Investment

2.1.1. Main theories of foreign direct investment

FDI is becoming more and more important globally which led to the development of theories on this topic. These theories attempt to explain the motivation of Multinational corporations (MNCs) to invest in some territories and try to answer the question of why some countries can attract more FDI than another country. This dissertation points out some main theories of FDI including Production cycle theory of Vernon, Industrial organization theory, internalization theory, location hypothesis, and the eclectic paradigm. Apart from these theories, several theories are explaining the existence and operation of FDI. Generally, it is true to say that FDI is a movement trend which can bring benefits to both investors and host countries. MNCs want to make use of their ownership advantage to gain more profit while host countries want to increase the capital flows into the domestic market. Therefore, the next part will discuss the effect of this type of investment.

2.1.2. The effects of foreign direct investment.

The effects of FDI can be divided into two groups: direct contributions and indirect contribution. In terms of direct contributions, FDI can help recipients to raise capital, bring positive effects on output and growth, create jobs, affect the balance of payments. In terms of indirect contribution, FDI can generate spillover effects including horizontal and vertical effects. The horizontal effect happens among firms in the same industry and vertical effect happens among firms in different industries.

FDI can bring positive impacts but it can also create negative impacts. Note that, this dissertation only focuses on the side of recipients and does not focus on the benefits of investors. For developing and transition countries including Vietnam, FDI is one of the most important sources for the development. If host countries can take full advantages of benefits from FDI, they will have a chance to boost the economies significantly. However, if they are unable to absorb and learn from FDI, they will be dominated and the market might be directed by their foreign counterparts. That is the reason why the FDI absorptive capacity is essential for transition countries.

2.2. Absorptive capacity

2.2.1. Absorptive capacity at the firm level

The term "absorptive capacity" is was firstly used by Cohen & Levinthal (1989) in a close relationship with R&D activities of firms. However, R&D activity is not the same as absorptive capacity. R&D creates not only innovation but also capability of a firm to "identify, assimilate and exploit knowledge from the environment" (Cohen & Levinthal, 1989, p. 569) and the authors first define this capability as a firm's absorptive capacity. Essentially, the absorptive capacity is a prerequisite for firms to generate new knowledge. Then, Cohen & Levinthal (1990) slightly revise the definition of absorptive capacity as "the ability of a firm to recognize the value of new, external information, assimilate it and apply it to commercial ends" (Cohen and Levinthal, 1990: 1). Absorptive capacity requires prior related knowledge. It implies that in order to learn new skills, knowledge or technique, the worker (at the individual level) and the firm (at the organizational level) should already have a related background on the skills, knowledge or technique. Certainly, the absorptive capacity of a firm depends on the absorptive capacity of its members. However, it is not a simple summation; it also depends on the internal organization of this firm. At any level, Cohen & Levinthal (1990) underline the importance of prior knowledge. The authors argue that absorptive capacity is cumulative and therefore the "richer" prior related knowledge is, the better the absorptive capacity is. Additionally, absorptive capacity can help a firm to predict a new technological trend that could create new business opportunities (Cohen and Levinthal, 1994).

In fact, the definition of the absorptive capacity of Cohen & Levinthal is ambiguous. Consequently, various studies have re-defined and developed it. Some of them focus on the within-firm aspect of absorptive capacity. Szulanski (1996) argues that internal knowledge transfer is crucial to create a comparative advantage of firms. Zahra & George (2002), based on Cohen & Levinthal's definition, state that absorptive capacity is a dynamic capability that directly affects the competitiveness of a firm. The authors put forward a new reconceptualization of this term. Then, the absorptive capacity of firms is divided into four interdependent dimensions. They are acquisition, assimilation, transformation and exploitation. Zahra & George (2002) group acquisition and assimilation into the potential absorptive capacity that relates to the capability of a firm to identify and acquire new knowledge. Nevertheless, the potential absorptive capacity does not ensure that the firm could apply new knowledge in practice. Therefore, it is necessary to have the realized absorptive capacity (which includes transformation and exploitation). The authors state that absorptive capacity depends not only on prior knowledge but also on knowledge complementarity and knowledge resources diversification. Tu, Vonderembse, Ragu-Nathan, & Sharkey (2006) support the perspective that underlines the importance of internal knowledge development and suggests a broader definition, stating that absorptive capacity should be an organizational mechanism that helps to identify an assimilate both internal and external knowledge and apply it to

improve the productivity of a firm. Martinkenaite & Breunig (2015) also examine the importance of the firm-level absorptive capacity and argue that individual and organizational absorptive capacity are different. Then, a firm's absorptive capacity requires the interaction between micro-level (individual) and macro-level (firm).

From another perspective, some papers value the importance of inter-firm factors when studying the absorptive capacity of firms. Lane & Lubatkin (1998) pay attention to the relative absorptive capacity, claiming that a firm has the same starting point to learn new knowledge as long as this firm can choose the appropriate partners. Lane & Lubatkin (1998) shift the analysis to external learning of firms. More specifically, the "student" firms can learn more effectively from the "teacher" firms if they share some common characteristics and the student firms somehow have a sound background about new knowledge offered by the teacher firms. This argument to some extent coincides with the idea of Dyer & Singh (1998). Dyer & Singh (1998) state that inter-firm factors are essential to improve the absorptive capacity and competitive advantages of a firm. It implies that the firm could enhance its competitiveness by making use of the relationship with partners at some specific stages including resources utilizing, knowledge sharing and asset supplementing.

Generally, there is a consensus that absorptive capacity is an important factor that can improve the productivity of any firm. However, while some authors only analyze the within-firm structure and mechanism to develop and transfer internal knowledge, some believe that it is more important to analyze the inter-firm mechanism to improve the absorptive capacity of a firm. Respectively, there are many proxies to measure the absorptive capacity of firms. Many papers used R&D – related variables to represent for absorptive capacities, such as R&D intensity, R&D expenditures, patents. However, the findings are not consistent. For instance, (Tsai, 2001) found that absorptive capacity (proxied by R&D intensity) have a positive effect on productivity, meanwhile, Mowery & Oxley (1995) also used R&D intensity but concluded that it did not positively influence the external learning capability. Apart from R&D proxies, some authors used human capital (ratio of white-collar workers to total employment) to represent the absorptive capacity and some measured absorptive capacity by the technology gap among firms. The technology gap was presented by TFP, but TPF could include anything but production inputs, such as labor and capital so that it would not be the best proxy for absorptive capacity.

Absorptive capacity is a broad definition that could include various factors. Hence, attempting to proxy absorptive capacity by considering different parts of it (intra firms and inter firms) seems to have limitations. In this dissertation, the author believes that it is better to consider both inter-firm and intra-firm factors when measuring the absorptive capacity of firms. Firstly, intra-firm factors are included in the capability of firms. The capability here is the internal factors,

which are not labor and capital. Secondly, the external factors are examined by considering the gap between domestic firms and foreign firms. The dissertation agrees with the argument that the student firm can learn better from the teacher firm if they are sharing some common knowledge and characteristics. Then, it premises that firms in the same industry could have more chance to learn from each other than from firms in another industry. ***Therefore, the absorptive capacity of a firm is the distance from its firm-specific-capability to the top firm-specific-capability firms in the same industry***. Consequently, FDI absorptive capacity of a firm is the distance between this firm and the top FDI firms in the same industry.

2.2.2. Absorptive capacity at the macro level

History shows that some nations have experienced a higher growth rate as a result of attracting FDI, while others have been not. It might imply that the positive spillover effect of FDI depends on the absorptive capacity of host countries. Absorptive capacity could be understood as local conditions favourable economic growth. Theoretically, FDI would benefit host countries by diffusing advanced technology or managerial skills but the benefit could not convert automatically into host countries. Nunnenkamp & Spatz (2002) argue that being benefit from FDI is harder than attracting FDI and the authors state that recipient countries should obtain some certain development level before mobilizing FDI benefits.

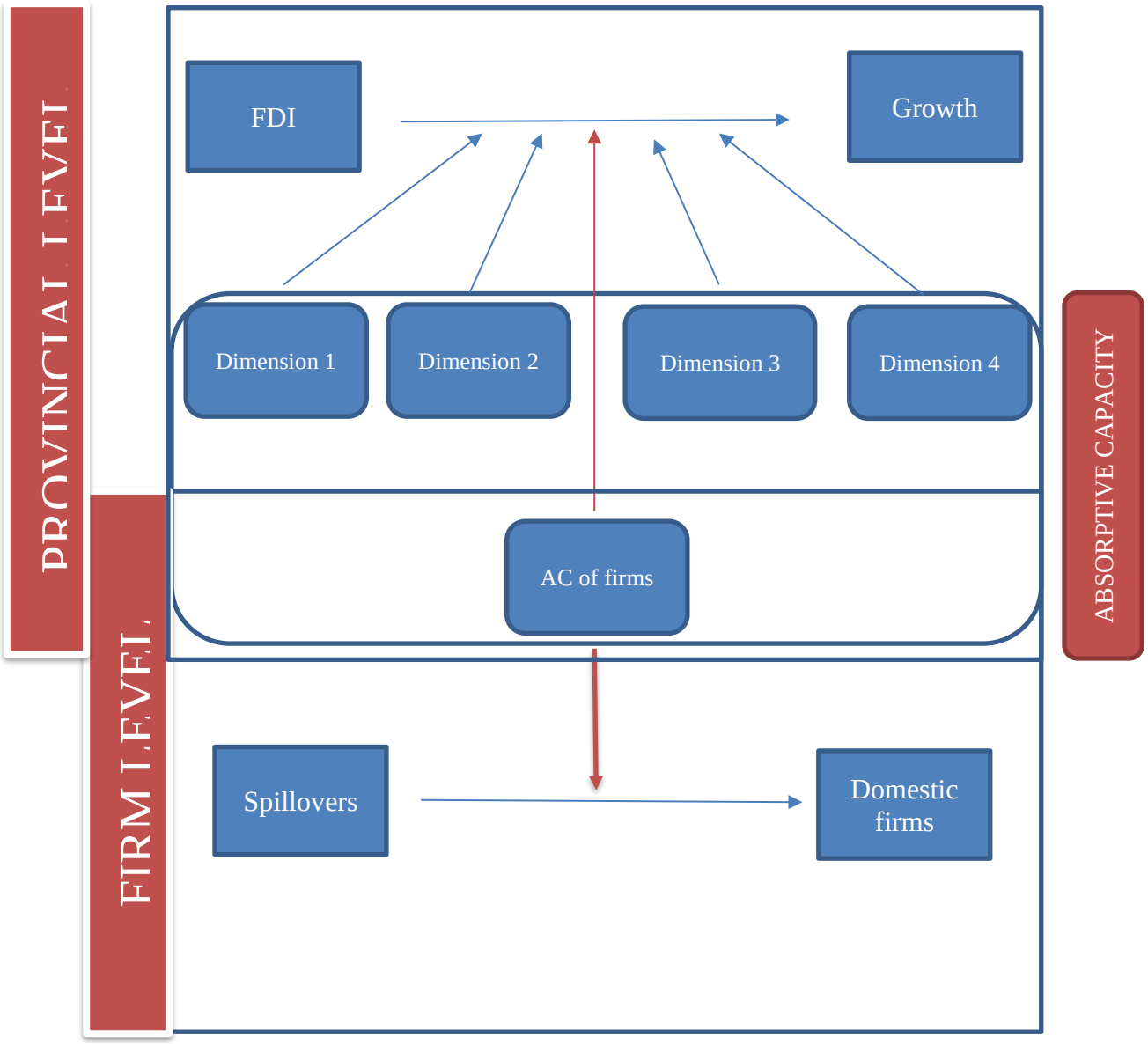
So what are the necessary conditions of host countries to benefit from inward FDI? In fact, several studies tried to examine the impact of absorptive capacity at the macro level. Roper & Love (2006) focused on the importance of the labor market characteristics to regional absorptive capacity and the authors argued that the former can shape the latter. Similarly, the highly educated workforce also used when discussing the topic of absorptive capacity (Borensztein, De Gregorio and Lee, 1998). Additionally, there are other factors which were used to proxy for absorptive capacity including economic development level, domestic financial system, technology level, and trade. However, it is not enough to look at one single factor when analyzing absorptive capacity at the macro level.

Then, Nguyen, Duysters, Patterson, & Sander (2009) sought to develop absorptive capacity theory, namely the FDI photosynthesis model. In which the authors divided FDI absorbability into 2 stages: “one is to bring FDI projects to practice and the next one is to convert the benefit of FDI into host country’s competences” (Nguyen et al. 2009, p.5). After attracting FDI, the host countries need sufficient absorptive capacity to ensure the gap between registered capital and disbursement is as small as possible. At this stage, host countries might gain from direct benefit of FDI such as physical capital, job creation or contribution of FDI to national output etc. They are a direct effect of FDI on host countries and they are visible. However, recipients expect more than these direct benefits. Host countries certainly expect that foreign investors could create spillovers effects

(indirect effect) through technology or know-how diffusion. And at this point, one country will differ from others in terms of gaining benefits from FDI. Countries have better absorptive capacity will gain more than countries that have the weak absorptive capacity. Nguyen et al., (2009) identify six determinants of absorptive capacity including the capacity of firms, human capital, technology level, institutions, infrastructure and financial system. The authors consider six components as photosynthesis process of a plant in which institutions and technology are the ground, infrastructure and financial system are the body and firms and human capital are leaves of "the tree".

From another perspective, Schillaci, Romano, & Nicotra (2013) base on this root definition of Cohen and Levinthal and define the absorptive capacity of a territory "the ability of a region to identify, assimilate, and exploit external knowledge" (Schillaci et al., 2013, p. 1). The definition is extended from the definition of Cohen & Levinthal that considers absorptive capacity "the ability of firms to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 1). In their study, Schillaci et al. (2013) claimed that the absorptive capacity of territory includes three determinants: human skills, R&D expenditure and knowledge gatekeepers. Schillaci at al. (2013) argues that some organizations in one territory have to play a key role as knowledge gatekeepers. These organizations can bridge the external knowledge and regional innovation system.

Generally, it seems that the absorptive capacity of one entity (provinces, regions or countries) cannot be captured by a single measurement. Instead, absorptive capacity includes several dimensions. In this dissertation, the author examines the absorptive capacity of a province which is the capability of this province to identify, learn and apply the new knowledge from FDI into practice (similar to the definition of Schillaci et al., 2013). Additionally, one important factor of provincial absorptive capacity is the capability of local firms in this province. In fact, this idea bases on one root argument of Cohen & Levinthal (1990). Cohen & Levinthal argue that the absorptive capacity of an organization depends on the absorptive capacity of individuals, but it cannot simply be an adding up of individuals' capacity. Other factors could determine the absorptive capacity of the organization including structure or environment of this organization. Consequently, the authors claim that the absorptive capacity "depends on the individuals who stand at the interface of either the firm and the external environment or the interface between subunits within the firm" (Cohen & Levinthal, 1990, p. 132). Based on it, this dissertation premises that absorptive capacity of a province depends on the absorptive capacity of firms and other factors. In which, the role of firms in the absorptive capacity of provinces is similar to the role of individuals in the absorptive capacity of firms. Consequently, the dissertation puts forward the theoretical framework as in Figure 2.



Source: Author

Figure 1: Theoretical framework

From the theoretical framework, there are two levels to analyse absorptive capacity. The first level is the firm level in which an impact of absorptive capacity on the link from spillover to the performance of domestic firms is examined. Next, this absorptive capacity of domestic firms is developed into one component of absorptive capacity at the provincial level and then its impact is assessed along with other components.

In the case of Vietnam, there are some research on FDI and the impact of FDI on socio-economic development. Majority of the existing research on FDI in Vietnam have focused on the benefits of FDI and an attraction of foreigner investors.

2.3.Research gap

Generally, the existing studies do not deeply analyse FDI absorptive capacity or, if any, they are scattered. At the firm level, the majority of them used R&D activity of firms to proxy for absorptive capacity. However, there are some drawbacks to this indicator. In some developing countries, data on R&D are not available and then it is impossible to compare across regions/nations. Therefore, the first gap is the ununiformed measurement of absorptive capacity at the firm level. The second gap can be seen at the macro level. Each author looks at different dimensions of absorptive capacity and consequently, their proxies are unable to fully cover the issue. In addition, there lack empirical papers using a firm's absorptive capacity as an indicator at the macro level. Hence, the second gap is that within the knowledge of the author, there are no studies connect absorptive capacity at the firm level with absorptive capacity at the macro level.

Therefore, the dissertation enriches the literature on absorptive capacity by proposing a new method to measure absorptive capacity at the firm level and connecting absorptive capacity at the firm level to absorptive capacity at the provincial level.

3. RESEARCH PROBLEMS AND THE DEVELOPMENT OF RESEARCH HYPOTHESES

3.1.Overview of FDI in Vietnam

From 1986, Vietnam started transforming into the socialist-oriented market economy and achieved a significant economic improvement. As a result, Vietnam has become a promising destination of foreign investors and in fact, the flow of FDI capital into Vietnam has increased over time. We can see from Figure 3 that the number of FDI projects and capital in Vietnam has risen remarkably from 1986 to 2017.

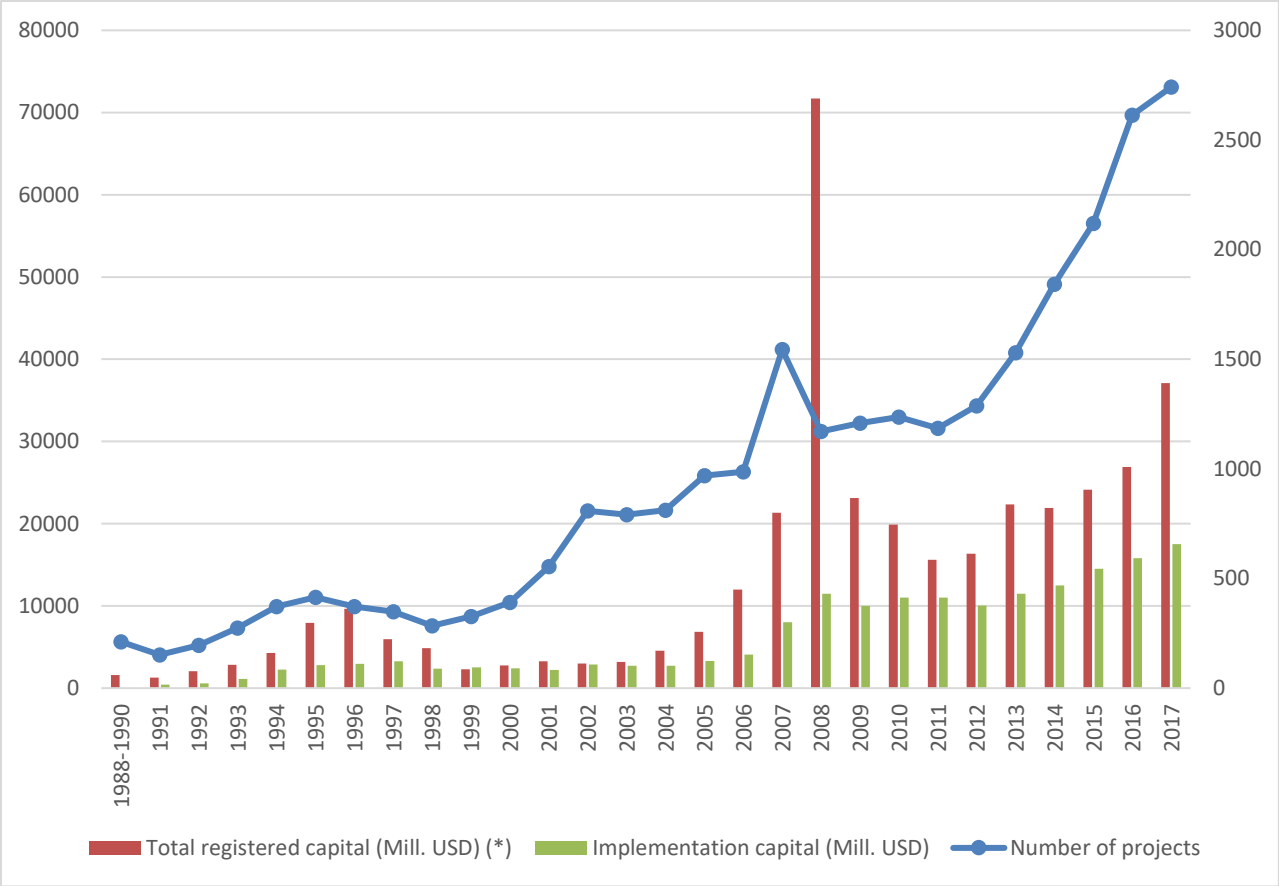


Figure 2: FDI projects and FDI capital in Vietnam

Source: Vietnam General Statistics Office

In terms of field of investment, the majority of foreign investors choose the manufacturing sector to invest (57%). It is followed by the real estate sector and electricity, gas, steam and air-conditional supply sector. Additionally, the main investors in Vietnam are Korea, Japan, Singapore and Taiwan. FDI contributes significantly to the economic development of Vietnam. The main impact of FDI can be seen via exports. From 1995 to 2017, the contribution of FDI sectors to exports has increased significantly. In 2017, the proportion of FDI exports is about 78%. Additionally, the contribution to the state budget of FDI has been increasing gradually and even in 2018, FDI contributes about 14 % of the state budget which is higher than the contribution of state owned sectors.

It is clear that FDI has played an important role in the development of Vietnam. It not only brings direct contributions but also improves the prosperity of Vietnam under the eyes of foreign investors. However, apart from benefits, FDI can bring some problems to the host economy which will be discussed in the next part.

3.2. FDI – related problems in Vietnam

The problem can be detected easily at the firm level where the link between FDI and local firms is very weak. This is confirmed by the newest Decision no.50 NQ-TW dated 20/08/2019. The local firms could not have a chance to join in the chain and then they could have a chance to learn new technology and managerial skills from FDI. The main reason is that the gap between FDI and local firms are quite big and then even FDI firms want to diffuse their advanced technology and local firms want to learn, the technology transfer is unlikely to happen. It implies that the prerequisite of taking full advantage of FDI is to improve the absorptive capacity of FDI firms. At the macro level, the registered FDI capital into Vietnam is high but the implementation number is limited. FDI can be a driving force of the development of Vietnamese economy but if Vietnam is unable to learn from them and develop itself, the domestic market can be exploited and local firms can be hampered by the competition from MNCs. The author of the dissertation argues that the strength of the domestic sector is vital to help Vietnam avoid the middle-income trap. However, if the absorptive capacity is weak, the domestic sector cannot improve and it could be a reason to keep Vietnam at the middle-income level for a long time. Therefore, improving FDI absorptive capacity should be the prioritized target in this developing period of Vietnam.

3.3. Research questions, research objectives and the development of research hypotheses

3.3.1. Research question

The main purpose of this dissertation is to answer the question that which dimensions should be prioritized to improve the FDI absorptive capacity of Vietnam. Based on this, there are three partial research questions to solve the problem as the following:

Question 1: How does FDI absorptive capacity affect Vietnamese economic development?

Question 2: What are the most important determinants of FDI absorptive capacity of Vietnam?

Question 3: Which measures the Government should implement to enhance FDI absorptive capacity?

3.3.2. Research objective

The ***main objective of the dissertation is to identify the most important dimensions of FDI absorptive capacity and then to suggest some implementations to boost FDI absorptive capacity of Vietnam***. Consequently, there are ***three sub-objectives*** of the dissertation.

Sub-Objective 1: ***Identifying the impacts of FDI absorptive capacity on Vietnamese economic growth.***

At the firm level

It expects that the performance of FDI firms could bring spill-over effects that facilitate the performance of domestic firms. Spill-over can happen within the industry and inter-industry. Theoretically, FDI spillovers can be a good source for the development of the domestic sector, especially in the developing and transition countries. In the case of Vietnam, FDI can generate positive spillovers effect to the domestic sector through vertical backward linkages, competition and demonstration effects or wage spillovers. Based on existing literature, the paper attempts to test the positive impact of spillover effects on Vietnamese firms.

Hypothesis 1: Spillover effects have positive impacts on the performance of domestic firms in Vietnam.

However, the presence of MNCs does not automatically bring positive effects to domestic firms. The local firms can benefit or not depending on their absorptive capacity. To some certain, the mediating role of absorptive capacity has been examined in Vietnam by Chuc et al., 2008 and H. D. Vu & Le, 2017. These authors state that absorptive capacity could boost the positive externalities from FDI in Vietnam. Therefore, it is worth testing the role of absorptive capacity in the case of Vietnam.

Hypothesis 2: Absorptive capacity affects the benefit from FDI spillovers to the domestic firms in Vietnam.

Nevertheless, if the absorptive capacity of domestic ones is too low, they are unlikely to benefit from FDI spillovers. Girma (2005) argues that the impacts of FDI on domestic firms could be positive or negative subject to the level of absorptive capacity. It implies that the technology diffusion could be non-linear and there exist some thresholds of absorptive capacity. In the case of Vietnam, there are no studies examine the thresholds of absorptive capacity. Most papers only show that absorptive capacity is important but none of them shows the level of absorptive capacity. Consequently, this paper attempts to figure out which level of absorptive capacity the domestic firms should have in order to gain benefits from FDI spillovers.

Hypothesis 3: Absorptive capacity affects the benefit from FDI spillovers to the domestic firms in Vietnam by threshold levels.

At the provincial level

Based on the theoretical framework, the study reviews various studies from Scopus and Web of Science on this topic and finds out that there are main five components of absorptive capacity at the provincial or national level. They are Institutions, Infrastructure, Financial development, the level of Openness and Human Capital. Then, there are following hypotheses need testing.

Hypothesis 4: Institutions affects the impact of FDI on economic development.

Hypothesis 5: Infrastructure affects the impact of FDI on economic development.

Hypothesis 6: Level of openness affects the impact of FDI on economic development.

Hypothesis 7: Level of human capital affects the impact of FDI on economic development.

Hypothesis 8: Level of financial development affects the impact of FDI on economic development.

Hypothesis 9: AC of domestic firms affects the impact of FDI on economic development.

Sub-Objective 2: Identifying the most important dimensions of FDI absorptive capacity of Vietnam.

The Delphi method provides opinions of specialists on the importance of FDI absorptive capacity in Vietnam. Then, specialists' opinions are being compared with the empirical results to reach a consensus. After that, recommendations from the specialists on how to improve FDI absorptive capacity of Vietnam is collected.

Sub-Objective 3: Suggesting policy implication to enhance FDI absorptive capacity of Vietnam.

Finally, after getting results from empirical part and Delphi interview, the dissertation suggests some policy implementations to improve the absorptive capacity of Vietnam.

4. METHODOLOGY

The sub-objective 1 is solved by the quantitative method while the second sub-objective is solved by combining quantitative and qualitative methods. Finally, the last sub-objective is solved by a qualitative method. The research design can be simplified in Figure 3.

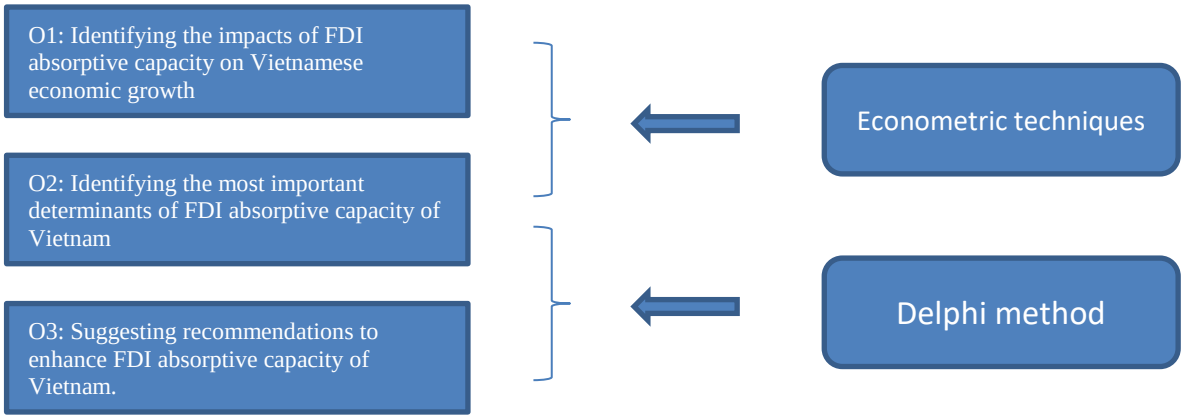


Figure 3: Simplified research design

4.1. Identifying an impact of FDI absorptive capacity on Vietnamese economic growth

4.1.1. At the firm level

For the estimating purpose, the log-linear production function of the domestic firms is applied (Equation 1). The main purpose of the regression is to estimate the effect of FDI spillover effects on the performance of domestic firms and then to examine the role of absorptive capacity in this link.

$$y_{ijt} = \alpha + \alpha_i + \beta_1 k_{ijt} + \beta_2 l_{ijt} + \beta_3 spill_{jt} + \beta_4 spill_{jt} * AC_{ijt} + \beta_5 X_{ijt} + \varepsilon_{ijt} \quad (1)$$

Where i is firm i, j is sector j and t is time t. *Y* is output of domestic firm, *K* is fixed capital of domestic firm and *L* is total labor of domestic firm. *Spill* is FDI spillovers include three measurements: horizontal effect (*Horizontal)*, forward linkage (*Forward*) and backward linkage (*Backward*). The interaction term is created to examine the mediating role of absorptive capacity (AC) in the link from FDI to domestic firms. *X* is the set of other control variables including *concentration index, human capital, institutions* and *size* of firms. The variable of absorptive capacity (AC) is also added. *Y, K* and L are in logarithm transformation. Constructions of absorptive capacity and spillovers and description of other control variables are specified later.

The hypothesis 1 (H1) and 2 (H2) can be solved from estimating results of the fixed effect model with panel data. And the hypothesis 3 (H3) needs to apply the threshold regression method (Girma, 2005) as follow:

$$y_{ijt} = \alpha + \alpha_i + \beta_1 k_{ijt} + \beta_2 l_{ijt} + \beta_3 spill_{jt} + \theta_1 spill_{jt}\, I(AC_{ijt} < \gamma_1) + \theta_2 spill_{jt}\, I(AC_{ijt} \geq \gamma_1) + \beta_5 X_{ijt} + \varepsilon_{ijt} \quad (2)$$

Where $I(\cdot)$ is the indicator function and AC is absorptive capacity. Note that it could be one or two thresholds and the number of thresholds can be tested. It implies that there might exist γ_2 such that $\gamma_1 \leq AC_{ijt} < \gamma_2$.

Spillover variables

The paper bases on the methodology of Javorcik (2004) to calculate spillover effects of FDI. There are three spillover variables: *Forward*, *Backward* and *Horizontal*.

$$Horizontal_{jt} = \frac{\sum_{i \in j} Foreign\ share_{it} * A_{it}}{\sum_{i \in j} A_{it}} \quad (9)$$

A_{it} can be revenue of firm i in the industry j or total labor of firm i in the industry j. Therefore, horizontal represents for the appearance of FDI in the industry j. This paper uses total revenue to calculate the horizontal effect.

$$Backward_{jt} = \sum_{k \neq j} a_{jk} * Horizontal_{jt} \quad (10)$$

a_{jk} is the proprtion of industry j's ouput consumed by industry k. Note that $k \neq j$. This coefficient is collected from the Input-Output table of Vietnam in 2012. It is assumed that this coefficient does not change from 2007 to 2015.

$$Forward_{jt} = \sum_{m \neq j} b_{jm} * \frac{\sum_{i \in m} y_{ijt} - e_{ijt}}{Y_{jt} - E_{jt}} \quad (11)$$

where b_{jm} is the proportion of industry m's output consumed by industry j to produce final outputs. Once again, this coefficient is taken from the Input-Output table 2012. e_{ijt} is exports of foreign firm i in the industry j at time t and E_{jt} is total exports of industry j at time t.

Based on the methodology of Chuc et al. (2008), e_{ijt} is assumed to be linear correlation with the equity share. Hence, it is approxiated as follow:

$$\sum_i e_{ijt} = \frac{\sum_i ka_{ijt}}{KA_{jt}} * E_{jt} \quad (12)$$

where ka_{ijt} is fixed capital of foreign firm i in the industry j at time t and KA_{jt} is total equity of industry j. E_{jt} can be taken directly from the Input-Output table 2012. Note that, using only one input-output table for many years cannot be a good idea and can be strong. However, the I-O table in Vietnam is not available for every year. Therefore, the paper has to base on this strong assumption.

The absorptive capacity of the domestic firms

Classically, it is possible to estimate the technical efficiency of firms based on the following equation:

$$y_{it} = f(x_{it}; \beta) + \epsilon_{it}, \quad (15)$$

$$\epsilon_{it} = v_{it} - u_i, \qquad u_i \geq 0, i = 1, \ldots\ldots, N \;\&\; t = 1, \ldots\ldots, T \quad (16)$$

where u_i is technical inefficiency which is time-invariant of firm i and v_{it} can be fixed or random error term.

Now, based on the approach of Kumbhakar, Lien, & Hardaker (2014), ϵ_{it} is decomposed into four parts:

$$\epsilon_{it} = \mu_i + v_{it} - \rho_i - u_{it} \quad (17)$$

where μ_i presents for latent heterogeneity which assumes to be normal distribution with variance of δ_μ^2. Then, ρ_i is persistent inefficiency and it is i.i.d $N^+(0, \delta_\rho^2)$. This part is the key one to calculate the absorptive capacity of the domestic firms. v_{it} and u_{it} are random shock and time-invariant inefficiency in short-run with distribution $N(0, \delta_v^2)$ and $N^+(0, \delta_u^2)$ respectively.

$f(x_{it}; \beta)$ is the technology function of firm i with x_{it} is inputs (labor and capital) to produce the final product. y_{it} is the productivity of a firm which is

measured by logarithm of value of added of this firm. Consequently, the regression is rearranged as follow (Kumbhakar, Wang and Horncastle, 2015):

$$y_{it} = \theta_0^* + f(x_{it}; \beta) + \theta_i + \varepsilon_{it} \quad (18)$$

Where:

$$\theta_0^* = \theta_0 - E(\rho_i) - E(u_{it}) \quad (19)$$

$$\theta_i = \mu_i - \rho_i + E(\rho_i) \quad (20)$$

$$\varepsilon_{it} = v_{it} - u_{it} + E(u_{it}) \quad (21)$$

θ_i and ε_{it} are assumed normal distribution with variance of δ^2

$\hat{\beta}$ in the equation 18 can be estimated by applying the fixed-effect model with panel data. After getting $\hat{\beta}$, the $\widehat{\theta_i}$ *and* $\widehat{\varepsilon_{it}}$ can be predicted as the residual of regression. Then, based on the distribution assumption of $v_{it} \sim N(0, \delta_v^2)$ and $\widehat{\varepsilon_{it}}$, the residual technical inefficiency $\widehat{u_{it}}$ can be predicted from equation (21). Finally, the persistent inefficiency $\widehat{\rho_i}$ can be estimated from the equation (20) and the distribution assumption of μ_i and ρ_i. And persistent efficiency (PE) simply equals to exp(-$\widehat{\rho_i}$).

Finally, the absorptive capacity is proxied by the following index:

$$AC_{ijt} = \frac{DPE_{ijt}}{\overline{FPE_j}} \times 100 \quad (22)$$

AC_{ijt} represents for the absorptive capacity of the domestic firm i in the industry j in time t and DPE_{ijt} is persistent efficiency of the domestic firm i in industry j in time t. $\overline{FPE_j}$ is the mean value of persistent efficiency of foreign firms in the sector j over the years.

4.1.2. At the provincial level

This paper reviews various studies to argue that the absorptive capacity of a province includes six components which are institutions, financial development, human capital, openness, the absorptive capacity of domestic firms and infrastructure. Based on this argument, it is necessary to test that if the six components are valid for the construction of absorptive capacity by using confirmatory factor analysis (CFA). The estimated model can be presented as the following:

$$\begin{aligned} \ln(HC) &= \alpha_1 + AC * \beta_1 + \varepsilon_1 \\ \ln(FD) &= \alpha_2 + AC * \beta_2 + \varepsilon_2 \\ \ln(INS) &= \alpha_3 + AC * \beta_3 + \varepsilon_3 \\ \ln(OPN) &= \alpha_4 + AC * \beta_4 + \varepsilon_4 \\ \ln(INFR) &= \alpha_5 + AC * \beta_5 + \varepsilon_5 \\ \ln(ACP) &= \alpha_6 + AC * \beta_6 + \varepsilon_6 \end{aligned} \quad (I)$$

Human capital (HC), Financial Development (FD), Institutions (INS), Openness (OPN), Infrastructure (INFR) and Absorptive capacity of domestic firms at provinces (ACP) are six components of absorptive capacity. AC is the

latent variable of absorptive capacity, ε is error term and β is coefficient which indicates the path from latent variable and its components.

Then, after evaluating the measurement of absorptive capacity of provinces, the paper process further steps. The study establishes a production function with FDI as one independent variable to test the hypotheses. The Cobb-Douglas production function at the provincial level is as follows:

$$Y_{it} = A_{it}(K_{it})^{\alpha}(L_{it})^{\beta} \quad (23)$$

Where i is province i, t is time t, Y is output of province, K is capital and L is labor of province. α and β are the elasticity of K and L and A is total factor productivity (TFP). Taking logarithm after dividing both sides by L_{it}, one has:

$$\ln\left(\frac{Y_{it}}{L_{it}}\right) = \ln(A_{it}) + \alpha * \ln\left(\frac{K_{it}}{L_{it}}\right) \quad (24)$$

assume that α+β=1.

The interest of this paper is about the indirect effect of FDI, therefore an impact of FDI is examined via TPF. It implies that A is a function of FDI and other factors (Huang, Liu and Xu, 2012). Consequently, one obtains:

$$A_{it} = f(FDI_{it}, AC_{it}) = {FDI_{it}}^{\beta} * {AC_{it}}^{\theta} * e^{\varepsilon_{it}} \quad (25)$$

Replace (25) into (24), one has:

$$\ln\left(\frac{Y_{it}}{L_{it}}\right) = \beta * \ln(FDI_{it}) + \alpha * \ln\left(\frac{K_{it}}{L_{it}}\right) + \theta * \ln(AC_{it}) + \varepsilon_{it} \quad (26)$$

Then, the author examines the role of absorptive capacity by creating interaction terms between AC and FDI:

$$\ln\left(\frac{Y_{it}}{L_{it}}\right) = \beta * \ln(FDI_{it}) + \alpha * \ln\left(\frac{K_{it}}{L_{it}}\right) + \theta * \ln(AC_{it}) + \delta * \ln(FDI_{it}) * \ln(AC_{it}) + \varepsilon_{it} \quad (27)$$

where ε_{it} is the random disturbance and it is normally distributed. Notably, the dimensions of absorptive capacity including infrastructure, institutions, financial development, human capital and provincial absorptive capacity. All the variables can be considered as endogenous ones; therefore, the study applies IV method with instrument variables are lag of them. The lag level is identified after testing. Additionally, the usage of a fixed effect or random effect model is needed to test to fit the database.

The proxies for infrastructure, institutions, financial development, human capital can be seen in Table 2. All of them are secondary data which are provided by the provincial statistical office. Only the proxy for absorptive capacity at the provincial level is constructed as follows:

$$AC_{qjt} = \frac{DPE_{qjt}}{\overline{FPE_j}} \times 100$$

AC_{qjt} is the absorptive capacity of the domestic firm q in the industry j in time t and DPE_{qjt} presents for the persistent efficiency of the domestic firm q in

industry j in time t. $\overline{FPE_j}$ is the mean value of the persistent efficiency of foreign firms in the sector j over the years.

Based on the absorptive capacity of domestic firms, the absorptive capacity of provinces is constructed by taking the mean value of all domestic firms within one territory. It is best if the territory is the provinces. However, the database does not cover all provinces in Vietnam, the study calculates the absorptive capacity at the regional level. There are 06 regions in Vietnam which are classified based on geographical and economic proximity. Therefore, the absorptive capacity of provinces is proxied by the absorptive capacity at the regional level.

Notably, the study desires to examine the impact of the indirect effect of FDI (spillover effects). Therefore, it is the best if FDI variable here can measure the spillover effects. Unfortunately, the database to calculate spillover effects at the provincial level is not available. Therefore, the paper uses the stock of FDI in provinces which expects to capture both the direct and indirect effect of this foreign capital.

4.1.3. Data

At the firm level

By using the threshold regression model, it is necessary to have a strongly balanced panel data. Note that the panel data is created based on the cross-section data from 2007 to 2015 of the Annual Enterprises Survey. The database includes basic information of firms including operating industries, output, total labor, fixed capital and wage of workers. Only repeated firms in the period 2007-2015 are kept in the panel data. Therefore, from 2007 to 2015, there are 19,971 observations including repeated 1803 domestic firms and 416 foreign firms (details can be found in the Appendix). There are 21 sectors in Vietnamese manufacturing.

In equation (13), x_{it} includes logarithm of total labor and fixed asset of firm i in time t. Firm i can be a domestic firm or foreign firm. and y_{it} is logarithm of value added of this firm i in the time t. The values of these variables are taken from the Annual Enterprises Survey from 2007 to 2015. The value-added is calculated by authors from the Annual Enterprises Survey.

In equation (2), y_{jit}, k_{jit}, l_{jit} are logarithm of value added, fixed assets and total labor of firm i in the industry j in time t. However, i can be the domestic firm only. Additionally, $spill_{jt}$ comprises of $Horizontal_{jt}$, $Backward_{jt}$, $Forward_{jt}$ which are described above. AC_{ijt} is absorptive capacity of the domestic firm i. Finally, X_{jit} is a set of other control variables *including concentration index, human capital, institutions* and *size of firms*. *Concentration index* is a Herfindhal index of two-digit industry concentration which is log-transformed. *Human capital* is proxied by wage level assuming that higher-skilled labor can receive a higher wage, therefore, if a firm pay higher wage per cap, it can have better human

capital. It is constructed by the ratio between the wage level of individual and the highest wage level in the same industry. It is also log-transformed. Firms are categorized into three groups by size based on the revenue. Finally, *institutions* is a provincial variable which is collected from PCI index in Vietnam. This index allows us to compare the institutions environment among provinces in Vietnam[1]. The Harris–Tzavalis for unit root test is conducted to test the stationary of the database because the time period is relatively small to the sample size. The results show that the database is stationary.

At the provincial level

The study examines 06 hypotheses in the case of Vietnam at the provincial level from 2007 to 2015. There are selected 63 provinces in Vietnam which are grouped into 06 regions. Therefore, the total observation is 504. Notably, the study uses the lag value as instruments of endogenous variables. It implies that it must trade-off between the number of observation and the validity of instruments.

In the equation (26), Y_{it} is real gross domestic product of province i at time t. L_{it} is total labor of province i at time t. Hereafter Y_{it}/L_{it} is mentioned as GDP of province i. FDI_{it} is stock of FDI capital of province i at time t. This is an accumulation of FDI capital as at the end of December every year. K_{it} is stock of capital which is calculated by applying the perpetual inventory method. The method requires the availability of investment of province i which has been collected from provincial statistic offices. Note that, the investment equals the investment of private sector plus the investment of the public sector. Hereafter K_{it}/L_{it} is mentioned as capital stock of province i. All these variables are collected from the annual provincial statistical books.

AC_{it} is dimensions of absorptive capacity of province i at time t including institutions, financial development, human capital, infrastructure, openness and provincial absorptive capacity. *Institutions* is proxied by provincial competitiveness index (PCI) which has been developed in Vietnam by Vietnam Chamber of Commerce and Industry. It measures the quality of provincial governance in creating a business environment [2]. *Financial development* of a province is represented by market capitalization of listed companies in 63 provinces. *Human capital* is measured by the ratio of trained workers[3] over 15 to the total labor of a province. *Infrastructure* is proxied by km of road used for freight and passenger transport per cap. *Openness* is the ratio of imports and exports to GDP. Finally, *provincial absorptive capacity* is calculated by the

[1] *For further detail, please look at http://eng.pcivietnam.org/*

[2] *For further information of PCI, please look at http://eng.pcivietnam.org/about/about-pci/*

[3] Those who have been trained to meet minimum requirements of jobs, might have or not have certificates

method of Vu (2018) with modification. The monetary variables are real values and in million USD. All variables are in logarithm transformation.

4.2. Identifying the most important determinant of FDI absorptive capacity of Vietnam.

The general aim of the Delphi method is to identify the most important determinants of FDI absorptive capacity of Vietnam and recommended solutions to improve FDI absorptive capacity. The author of this dissertation identifies the expert panel of 8 panellists. The panel includes 4 researchers, 2 policy makers and 2 persons from state Ministries.

4 researchers must meet the following requirements:

- At least five years working experiences in economic-relates fields (academic institutions)
- At least five publications
- Obtain the PhD. Certificate

2 policy makers and 2 persons must meet the following requirements:

- At least three years working experiences in investment-relates fields

The first step is to prepare the discussion note. It must include the definition of absorptive capacity and measurements of absorptive capacity's determinants. Then, the note includes some open questions on the importance of determinants and solutions to improve the absorptive capacity in Vietnam. After that, the first round is conducted by sending the note to members of the expert panel to collect ideas (2 weeks). The first round of the Delphi method collects the opinions of panellists on the validity of the construction and measurement of absorptive capacity at the firm level and the provincial level. It is followed by the second round by sending the answer notes from the first round (without names of experts) to members of the expert panel to collect critical ideas (2 weeks). If a consensus is reached, the Delphi method is done. If it is not, continue to conduct the next rounds. The consensus is decided by the IQR index. The Delphi method collects primary data from the opinions and suggestions from the panellists. All members send their notes to the author via emails and then the data is processed by using excel.

5. FINDINGS AND DISCUSSIONS

5.1. Empirical results

5.1.1. The validity of the measurement of absorptive capacity at the firm level.

A good proxy of the absorptive capacity of firms should have positive correlations with some important factors which are stated in the previous studies including age and size of firms, number of skilled-workers and technology level.

The dissertation finds the positive correlation between the measurement and these factors, Hence, it seems that the measurement of firm's absorptive capacity based on the gap in persistent efficiency is reliable at least in case of Vietnam when the expected correlations are met.

5.1.2. Absorptive capacity at the firm level

Absorptive capacity and FDI spillovers

The study examines the correlation between the absorptive capacity of domestic firms and FDI spillover effects by using Pearson correlation. It finds that absorptive capacity has significant and positive correlations with *horizontal, backward and forward*.

Regression results

Hypothesis 1 and hypothesis 2 are examined by exploring the regression results of the model in Equation (1). Firstly, the model is run without interaction terms between FDI spillovers and absorptive capacity to examine the main effect of FDI spillovers on the domestic firms' performance (the Model 1). Then, the mediating role of absorptive capacity is tested by adding the interaction terms (the Model 2).

The regression results from the first column of Table 7 shows that apart from labor and physical capital, human capital, institutions and industry concentration have positive effects on the performance of domestic firms. Essentially, although the Model 1 detects the positive influences of the three types of spillovers, only horizontal effect and backward linkage are significant statistically. The positive and significant of *Horizontal* coefficient implies that in Vietnam the appearance of foreign firms brings a positive impact to the domestic firms in the same industry. Note that the horizontal effect here is calculated based on total revenue, it indicates that domestic firms have improved its capability via competition with FDI firms and learning-by-doing process (equivalent to Chuc et al., 2008). Moreover, while the backward linkage from FDI to the local enterprises is found, the forward linkage seems not to exist (it is relevant to the results of Anwar & Nguyen, 2010). Note that the coefficient of AC is positive but not statistically significant, and it implies that absorptive capacity does not directly affect the performance of the domestic firms. It is explainable because this is FDI absorptive capacity and it could not directly bring impacts to the domestic firms. Therefore, the model 2 examines the role of AC in the relationship with spillover effects.

The second column of Table 7 displays the regression results after adding the interaction terms between FDI spillovers and *AC*. Interestingly, the statistical significance of the variable *AC* now implies that the absorptive capacity of the domestic firms only has a positive impact on their performance conditional on spillover effects. Additionally, the significance of *Horizontal* and *Horizontal*AC* show that absorptive capacity can be a catalyst to improve the effect of the horizontal effect from FDI on the performance of the domestic firms. The negative sign of *Horizontal* does not show the negative impact of horizontal effect. It is necessary to take the value of AC into consideration. From Table 1, the mean

value of *AC* is 84.4653, then the impact of the horizontal effect on the performance of the domestic firms is 0.0004*84.4653 – 0.0183 = 0.0155 on average. It can interpret that the domestic firms can enjoy the benefits from FDI firms in the same industry if they have some certain levels of absorptive capacity. Specifically, one per cent goes up in horizontal effect leads to 0.0155% arise in value-added of domestic firms, subject to their absorptive capacity. Unfortunately, it seems that absorptive capacity cannot boost the influence of backward linkage and forward linkage when the coefficient of *Backward*AC and Forward*AC* are not statistically significant. The insignificance of *Backward*AC and Forward*AC* can be interpreted that the absorptive capacity of domestic firms does not have any effect on backward linkage as expected. Note that, the Model 1 confirms that positive effect of backward linkage but then the Model 2 shows that the absorptive capacity of the domestic firm does not bring any impact to boost this channel. It can be seen as a reason for the weak linkage between FDI firms and domestic firms in different industries.

Table 1: Regression results

LnY	**Model 1**	**Model 2**	**Model 3**
Ln(Labor)	0.5802***	0.5779***	0.5777***
	(0.0382)	(0.0194)	(0.0365)
Ln(Capital)	0.1776***	0.1765***	0.1752***
	(0.0150)	(0.0103)	(0.0152)
Ln(Human capital)	0.1667***	0.1676***	0.1688***
	(0.0157)	(0.0143)	(0.0155)
Ln(HHI)	0.2354***	0.2447***	0.2628***
	(0.0691)	(0.0663)	(0.0695)
size	0.0532	0.0595	0.0426
	(0.1226)	(0.0427)	(0.1194)
Ln(Institutions)	1.3164***	1.3121***	1.3003***
	(0.1083)	(0.1331)	(0.1074)
AC	0.0868	0.0896*	0.1078+
	(0.0686)	(0.0363)	(0.0636)
Horizontal	0.0124***	-0.0183**	
	(0.0025)	(0.0070)	
Backward	0.0179***	0.0146+	0.0187***
	(0.0037)	(0.0085)	(0.0037)
Forward	0.0064	-0.0112	0.0046
	(0.0056)	(0.0190)	(0.0055)
Horizontal*AC		0.0004***	
		(0.0001)	
Backward*AC		0.0001	
		(0.0001)	

Forward*AC		0.0002 (0.0002)	
Horizontal ($AC < \gamma_1$)			-0.0283 (0.0215)
Horizontal ($\gamma_1 < AC < \gamma_2$)			-0.0719+ (0.0412)
Horizontal ($AC > \gamma_2$)			0.0152*** (0.0024)

(i) +Significant at 10% level, *significant at 5% level, **significant at 1% level, ***significant at 0.1% level

(ii) Heteroskedasticity and within-firm serial correlation robust standard errors in the parenthesis

Source: Author

The threshold regression is shown in the third column of Table 7. The threshold divides the value of *AC* into three quartiles. The first one is the lowest values of *AC* (*AC*<γ_1) while the third quartile includes firms with the highest value of absorptive capacity (*AC*>γ_2). It is obvious to see that a firm with an absorptive capacity which is larger than γ_2 can receive a positive horizontal effect from FDI. It can interpret that a 1% increase in the horizontal effect of the firms which have good absorptive capacity leads to an 0.0152% increase in their value added. However, if a firm has its absorptive capacity which is below γ_2 but over γ_1 can suffer from the presence of foreign counterparts. Lastly, firms in the first quantile seem not to be affected by the horizontal effect when the coefficient is not statistically significant. Generally, the operation of FDI firms might create externalities on domestic firms. It can be positive if the domestic firms have the good absorptive capacity (their AC> γ_2), otherwise, the externalities can be negative ($\gamma_1 < AC < \gamma_2$). Note that, if a firm falls below the threshold γ_2, the negative impact is -0.0719 which is bigger than the positive impact of 0.0152 if a firm has its AC over γ_2. It means that if a firm does not have a sufficient level of absorptive capacity, it is likely that it could be lagged behind further when FDI firms appear in the same industry. However, there are only 1208 observations which have their absorptive capacity below γ_1 and it indicates that most of the Vietnamese firms in the manufacturing industry can benefit from competing and cooperating with FDI firms in the same industry.

5.1.3. Absorptive capacity at the provincial level

At the provincial level, absorptive capacity is constructed as one dimension of absorptive capacity of provinces. Apart from that, there are another five dimensions including openness, infrastructure, financial development, human capital and institutions. The CFA result shows that the hypothesis that the absorptive capacity of a province includes six components is robust. The proposed

model of six components of absorptive capacity is confirmed by several tests. Then, it is possible to say that the proposed measurement model of absorptive capacity is valid and it fits well to data.

Then, the study estimates the impact of absorptive capacity on the link from FDI to the economic performance of 63 provinces in Vietnam by applying the G2SLS random effect IV regression and clusters for 63 provinces to correct heteroscedasticity and autocorrelation.

Table 2: Regression results

Ln(Y/L)	**Model 1 Coefficient (p-value)**	**Model 2 Coefficient (p-value)**	**Model 3 Coefficient (p-value)**	**Model 4 Coefficient (p-value)**	**Model 5 Coefficient (p-value)**	**Model 6 Coefficient (p-value)**	**Model 7 Coefficient (p-value)**
Ln(FDI)	0.0527* (0.0336)	0.0020 (0.9642)	0.0061 (0.7944)	0.0175 (0.5440)	0.0123 (0.7500)	0.0971* (0.0122)	-0.6398 (0.6677)
Ln(INFR)	0.1791+ (0.0671)	-0.4690 (0.1302)	0.1927* (0.0366)	0.1901+ (0.0555)	0.1790+ (0.0506)	0.1867+ (0.0524)	0.3465 (0.3249)
Ln(K/L)	0.2172*** (0.0000)	0.2013+ (0.0761)	0.1974*** (0.0000)	0.1975+ (0.0884)	0.2112*** (0.0000)	0.1826*** (0.0000)	0.3312 (0.5196)
Ln(HC)	0.0166* (0.0277)	0.0095 (0.4197)	0.0139* (0.0442)	0.0112 (0.2229)	-0.0083 (0.6246)	0.0169* (0.0148)	-0.0210 (0.7029)
Ln(ACP)	1.0869+ (0.0694)	1.1424 (0.3114)	1.3874** (0.0090)	0.8828 (0.1903)	0.9053 (0.1484)	-2.5501 (0.1179)	-1.8990 (0.8215)
Ln(INS)	0.2136 (0.7300)	0.1120 (0.9003)	0.3581 (0.5652)	0.4681 (0.5268)	0.3372 (0.5630)	0.4193 (0.5231)	-5.9535 (0.6896)
Ln(OPN)	0.1097* (0.0375)	0.1119 (0.1539)	-0.1309* (0.0450)	0.1161* (0.0317)	0.1108* (0.0384)	0.1540** (0.0015)	0.0349 (0.9547)
Ln(FD)	0.0245 (0.2614)	0.0229 (0.6261)	0.0031 (0.8822)	-0.0668 (0.4040)	0.0156 (0.4578)	0.0174 (0.3480)	0.0765 (0.8790)
Ln(FDI)* Ln(INFR)		0.0912+ (0.0698)					
Ln(FDI)* Ln(OPN)			0.0426*** (0.0001)				
Ln(FDI)* Ln(FD)				0.0128 (0.2130)			
Ln(FDI)* Ln(HC)					0.0032+ (0.0902)		
Ln(FDI)* Ln(ACP)						0.6201* (0.0271)	
Ln(FDI)* Ln(INST)							0.0135 (0.6341)

(i) +,*,**,*** statistically significant at 10%, 5%, 1% and 0.1%

(ii) Standard errors are autocorrelation and heteroskedasticity corrected.

Source: Author

From the first column of Table 10, we can see the key point is that FDI positively influences provincial GDP. A 1% increase in the stock of FDI may lead to a 0.052% increase in GDP per worker. The coefficient of FDI is statistically significant at 5% level. Moreover, the capital stock per worker also has a positive and significant impact on provincial GDP per worker at a 0.1% level. A 1% go up of the former leads to a 0.2172% rise of the latter. Turning to other variables, all coefficients are positive, and it implies that they might have positive effects on the performance of provinces. Nevertheless, in the case of Vietnam, only human capital, openness, infrastructure and absorptive capacity of firms are statistically significant. The impacts of financial development and institutions in Vietnam are unable to claim in this study.

However, the main interest of the paper is the impact of absorptive capacity dimensions on the link from FDI to provincial GDP. Therefore, the interaction terms between these dimensions and FDI are created. The most important points now are the coefficients of the interaction terms in column 2 to column 7. The results show that amongst 06 dimensions of absorptive capacity, only four of them have impacts on the relationship between FDI and provincial GDP which are Openness, ACP, Human capital and Infrastructure. Based on the magnitude of coefficients, to some extent, we can see that infrastructure can bring the highest impact on the link between FDI and provincial FDI. Next is openness level but it requires provinces to have from the medium to a high level of openness. Otherwise, the reverse impact can occur. The role of human capital and the absorptive capacity of domestic firms are somehow equivalent. Therefore, at first glance, policy makers should pay more attention to the current state of infrastructure, the level of openness, the capacity of workers and the capability of domestic firms.

5.2. Delphi method

In this dissertation, the Delphi method has 04 rounds. The first round is to identify the validity of six dimensions. Then from the second round, the importance of each dimension is evaluated by independent perspectives of panellists.

The first round of the Delphi method collects the opinions of panellists on the validity of the construction and measurement of absorptive capacity at the firm level and the provincial level. The assess consensus is 70%. It implies that one dimension is valid if 70% of panellists agree with it. After the first round, all six components are confirmed by the panellists as one component of absorptive capacity at the provincial level (Table 12).

Table 3: Results from the first round

Component of AC	**Agree**
Absorptive capacity of domestic firm	100 %

Institutions	100%
Infrastructure	100%
Financial development	85.7%
Human capital	100%
Openness	85.7%

Source: Author

After finishing the first round, the author prepares the second round note which includes the question relating to the six dimensions. The panellists share their opinion on the importance of these dimension by assigning points to each of them. The author uses the scale from 1 to 6 for six dimensions which 1 is the most important and 6 is the less important. The main point is to figure out which dimensions are the most important ones. The IQR is used to decide the consensus. After four rounds, the result can be seen in Table 13.

Table 4: Result of the Delphi method

Dimensions	**Average**
AC of firms	1.38
Infrastructure	3.13
Financial Development	5.63
Institutions	2.50
Human capital	3.25
Openness	5.25

Source: Author

Generally, the Delphi method reveals several important remarks. Firstly, the panellists have an agreement that the six dimensions are vital and using them to capture the absorptive capacity at the provincial level is appropriate in the case of Vietnam. Secondly, the most important dimension is the absorptive capacity of domestic firms. It is followed by Infrastructure and Human capital. The least important dimensions are financial development and openness. Thirdly, although the score of Institutions is quite high (2.50), the role of Institutions need confirming in further studies because it does not reach a consensus after 04 rounds.

5.3. Discussion from empirical results and Delphi method results

The results from the empirical part and Delphi method have several similarities and differences. First of all, both methods confirm the importance of the six dimensions in the case of Vietnam. By the quantitative method, it is confirmed by CFA and by the qualitative it is confirmed by the consensus of majority member in the panel. Then, the next purpose of the dissertation is to create a list of prioritized dimensions based on the importance of them.

Table 5: Results from empirical part and Delphi method

Dimension	**Empirical part**	**Dephi**
AC of firms	4	1
Infrastructure	1	2
Financial Development	n/a	6
Institutions	n/a	n/a
Human capital	3	3
Openness	2	5

Source: Author

The results of the two methods show some common points (Table 21). It can be seen from Table 21 that the role of infrastructure and human capital are identified. Regarding infrastructure, it is the most important one from the quantitative method and the second important factor from Delphi method. Therefore, it is possible to put this factor in the first place of the list. In terms of human capital, it is the same conclusion that it is the third important factor among the six dimensions. Additionally, the empirical part and Delphi method share the same result that financial development is the least important factor in this period for Vietnam. More specifically, the coefficient of the interaction term between spillovers and financial development proxy is not statistically significant in the empirical part the average point of it in the Delphi method is 5.63. Therefore, it seems that although financial development is still important, it is not the priority for Vietnam at the moment. Finally, both method is unable to identify the impact of institutions in Vietnam however this factor is note-worthy. The statistical insignificance of the interaction term between Institutions and spillovers might blur the role of this factor from the quantitative perspective but bear in mind that it is really hard to find a proxy for Institutions. Therefore, the result can come from the disadvantage of the current proxy. Regarding Delphi method, it is unable to have a consensus on the role of this factor. There are 37.5% of the panel argues that Institutions should be extremely important (point 1) or very important (point 2) while there are 62.5% indicates that it is important (point 3) or only somehow important. However, the average point of 2.50 is the second-highest from Delphi method. Therefore, at the moment, the only conclusion is that Institutions is an important dimension but it needs further research to identify how important it is.

Apart from the similarities, the empirical result and the Delphi method also have some differences. In terms of Openness, the quantitative part shows that Openness is the second important factor while the Delphi method states that this dimension is less important (5.25). This difference is understandable. The level of Openness directly relates to FDI inflow because exports and imports are the main activity of FDI. That is the reason why from the empirical part, FDI in some provinces with a higher level of Openness can contribute to the economic performance better than in other provinces. However, from the perspective of members in the panel, the level of openness depends on the general trade policy

at the national level and regional level which cannot be changed immediately. Additionally, Vietnam has changed from a closed economy from the past to opened economy now and it is not easy to open more because it might affect the sovereignty of the country. That is the reason why although changes in the level of openness can bring a big improvement, it is not the best way for Vietnam at this period. Therefore, this dimension is put at the fourth place of the list and the author of the dissertation agrees with this argument. Similar is the explanation for the difference of results for the absorptive capacity of the domestic firms. The quantitative result shows that the impact level of this dimension on the link between FDI and economic performance is lower than this of other dimensions. However, panellists argue that it should be the first prioritized factor because it is the most feasible way for Vietnam. Please note that the absorptive capacity of domestic firms is the gap between domestic firms and FDI firms in the same industry. In fact, this gap now in Vietnam is quite big and to shorten this gap is a must in Vietnam. If Vietnam is unable to do it, domestic firms can be dominated and directed by the FDI ones which can cause the low middle-income trap. That is the reason why the role of this dimension has been reached a consensus after two rounds. Consequently, the author ranks this dimension 2nd place in the list (Table 15).

Generally, from the quantitative and qualitative results, it is possible to have the list of prioritized dimensions. The first prioritized one is Infrastructure, the second one is Absorptive capacity of domestic firms, the third one is Human Capital, the fourth one is Openness and the last one is Financial Development. The dimension of Institutions is excluded from the final list. It does not imply that this dimension is not important but it needs further study to identify its level of importance.

Table 6: The final list of prioritized dimensions of absorptive capacity

Dimensions
Infrastructure
Absorptive capacity of domestic firms
Human capital
Openness
Financial Development

Source: Author

6. LIMITATIONS

The first limitation of the dissertation is the shortage of database. The author can only use the dataset from 2007 to 2015. Additionally, when calculating the spillover effects at the firm level, the dissertation uses the Input-Output table in 2012. It would be better to use the Input-Output table for every year from 2007 to 2015. However, in Vietnam, the Input-Output table is not available every year.

Another limitation of the dissertation lies in the proxy of institutions and financial development. Regarding institutions, the paper uses PCI which is indices at the provincial level. However, data for each province from the small country where policy is somehow homogenous might be not the best proxy for institutions. In addition, although PCI covers some important sectors, it is unlikely to fully cover the concept of institutions. In addition, the proxy for the financial development of provinces seems not to be the best one. There are other well-known proxies including the ratio of saving to provincial GDP or the ratio of M2 to GDP but unfortunately, the author could not access to this data. Moreover, at the cross-country level, openness can reflect the differences in trading policy but at the provincial level, especially in a small country like Vietnam, it might bring different meaning. Therefore, it needs a better proxy. One more shortcoming of the paper is that the author applies the random effect model which based on a strict assumption that there are no correlations between error terms and covariates. Technically, the Hausman test confirms that using a random model with this database is valid, however, the assumption is quite strict. Therefore, there are rooms for improvement in further research.

Additionally, it is worthy to point out some limitation of the Delphi method. Firstly, the panel only includes 8 members. Although it is not a rule for the minimum number of the panelist, it is still better to have a panel of 10-15 members. However, the Delphi method requires the availability and commitment of those who know the topic. Therefore, the author can only invite 8 panellists. Moreover, due to time limitation, the dissertation is unable to conduct more rounds of Delphi method to reach the final consensus on the role of Institutions.

7. CONTRIBUTIONS

7.1. Academic contributions

The dissertation contributes to the new measurement of FDI absorptive capacity at the firm level. This measurement based on the Cobb-Douglas production function and persistent efficiency. This dissertation bases on the classic Cobb-Douglas production function which includes labor and capital. Then, the measurement can be improved if the production factors are better identified and included in the production function (such as intermediating factors).

Secondly, the dissertation proves that the absorptive capacity at the firm level is one important factor of absorptive capacity at the provincial level and then contribute the method to connect these in the case of Vietnam.

Thirdly, the dissertation puts forward the framework to analyze the impacts of FDI absorptive capacity at the provincial level. Based on this framework, further studies can identify more dimensions of FDI absorptive capacity or find better proxies for the six dimensions.

7.2. Policy contributions

Firstly, it is better to pay more attention to the physical infrastructure at the national level, regional level and provincial level. The first step is to identify what kind of infrastructure is necessary for the development of regions or provinces. This step must base on the advantages and disadvantages of regions or provinces. No need to copy the development model from another region if it is not suitable. The second step is to improve the effectiveness of capital usage and raise capital via the public-private partnership (PPP) method. Finally, the effectiveness of operation and maintenance should be improved.

Secondly, it is necessary to invest more in human capital. In the dissertation, human capital is proxied by the rate of skilled workers to total labor force. It implies that the number of skilled workers should be increased. Then, it is vital to research and forecast the labor demand and foster the relationship between schools and firms to make sure that the labor supply can meet the labor demand. More importantly, it is a must to identify the prioritized industries and then focus on providing workers with enough skills to work in these industries.

Thirdly, the absorptive capacity of domestic firms must be improved. Note that the absorptive capacity of firms is measure by the gap in persistent efficiency which is unlikely to change unless there are changes in ownership or industrial policy. It implies that it is better to identify and compare the effectiveness of all type of firms based on ownership. In Vietnam, there are two main types of domestic firms which are private and state-owned firms. The privatization process has been fostered in Vietnam recently to transform several ineffective state-owned firms into private firms. This process should be continued but in another way around, ineffective private firms should be monitored and improved the capability or closed if they are unable to provide a positive contribution to themselves and the economy. Additionally, the quality of industrial policies must be improved as well. Actually, the industrial policies are sound but the implementation of these policies is still an obstacle. Therefore, it is pivotal to have a mechanism to implement and control the effectiveness of industrial policies at the regional and provincial level.

8. CONCLUSION

There are three contributions of the dissertation in this field. First of all, the author of the dissertation reviews literature and puts forward the theoretical framework to analyse the impact of absorptive capacity at the provincial level. Secondly, the dissertation constructs the new measurement of absorptive capacity at the firm level. Thirdly, this absorptive capacity at the domestic level is then constructed as one dimension of absorptive capacity at the provincial level. It implies that the connection from absorptive capacity at the firm level and

absorptive capacity at the provincial level is identified and tested in the case of Vietnam.

The dissertation combines econometric techniques and Delphi method to create the above three contributions. At the firm level, the dissertation estimates persistent efficiency as one component of technical efficiency from Cobb-Douglas production function. The threshold regression model is applied for 19,971 observations from 2007 to 2015 to give the following findings. The presence of FDI firms has brought positive spill-over effects on the performance of the domestic firms through two channels: horizontal effect and backward linkage. Importantly, the mediating role of absorptive capacity only found in the link from the horizontal effect to the performance of the domestic firms. Additionally, the dissertation finds that there are two thresholds of absorptive capacity (γ_2 and γ_1) in the case of Vietnam. More importantly, the dissertation finds the positive backward linkage from FDI but the interaction term between absorptive capacity and backward is not statistically significant. It implies that although the positive externalities from backward linkage occur, the absorptive capacity of domestic firms cannot boost it. And it is a reason for the weak linkage between FDI firms and domestic firms across industries.

At the provincial level, the random effect model is applied for the sample of 63 provinces in Vietnam from 2007 to 2015. Firstly, it is found that FDI has a positive impact on provincial GDP. Moreover, the mediating role of six components is tested by creating the interaction terms between those and FDI. The results from the regression model show that among six dimensions there are four dimensions which have positive impacts on the link from FDI to provincial GDP per cap. They are Openness, Human Capital, Infrastructure and Absorptive capacity of domestic firms. Finally, based on the magnitude of coefficients, the empirical model indicates that the most important dimension is Infrastructure, the second one is Openness and Human capital and Absorptive capacity of domestic firms are the next ones.

Turning to Delphi method, the author of the dissertation invited 8 members into the panel including 4 researchers, 2 policy makers and 2 persons from State Ministries. The Delphi method includes four rounds. After four rounds, there is a consensus among members that the most important dimension is the Absorptive capacity of domestic firms, the second one is Infrastructure which is followed by Human capital. The least important ones are Openness and Financial development. Unfortunately, the role of Institutions is not reached the consensus after the fourth round.

Based on empirical results and Delphi method, the dissertation can create a list of prioritized dimensions of absorptive capacity in Vietnam. On the top of the list is Infrastructure which is then followed by Absorptive capacity of domestic firms, Human capital, Openness and Financial development. Generally, the list of prioritized dimension is created after combing results of quantitative and

qualitative methods. The final result of the dissertation is reliable and robust. Based on the final list of prioritized dimension, the author put forward some policy implications for Vietnam to improve the absorptive capacity in the future. It is suggested that in the short and medium-term, Vietnam should focus more on the top three dimensions on the list which are Infrastructure, Absorptive capacity of domestic firms and Human capital.

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