DETERMINANTS OF MANUFACTURING INDUSTRIES IN ATTRACTING FDI TOWARD NORTH CENTRAL REGION OF VIETNAM

by

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Abstract

Foreign direct invest (FDI) has played key role in the economic development of a nation, region. Toward a developing economy as Vietnam, FDI can provide the fundamental capital, technology to improve the economic infrastructure and social welfare. This research performs an econometric analysis to determine the local FDI determinant of North Central in Vietnam, a region with several development potentials. Secondly, this research aiming to point out the comparative advantages of the researched region.

After referring previous researches, I created a suitable model to quantify the impact of host region characteristics in attracting FDI. Through which, the analysis result pointed out this region has abundant advantages in transportation infrastructure. And by enhancing the geographical position and the availability of transport infrastructure in order to upgrade the transport network, to encourage the trading activities, to exploit the market potential in local and neighbor region; the North Central Region can attract more inflow FDI into the manufacturing industry.

Acknowledgement

I am greatly indebted to all the professors in Development Economics Department in APU for supporting me complete this academic research. Especially thanks to my direct supervisor professor Kozo Otsuka, who has great knowledge in development economic and econometric field and has always guided me with enthusiasm in research ideas and directions. I am also feeling thankful to professor Yamamoto Susumu for teaching and giving me useful advices during our joint-research seminar; professor Kim Sang Ho for careful, thoughtful lectures during the class; and lastly professor Tsukada Shunso and professor Natsuda Kaoru for the academic instructions during my master course.

I am grateful to my family: my grandparents, my parents, my sister for always encourage me. Without their spirit encouraging, I cannot overcome several difficulties.

Words are not enough to express my thanks to my friend in APU. They always cheer for me from behind.

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GLOSSARY

FDI	Foreign direct investment.
GDP	Gross domestic product
GNI	Gross national income
NCRoV	North Central Region of Vietnam
US$	United States Dollar

CHAPTER 1: Introduction.

1. Research background.

1.1. Overview about FDI in Vietnam

In the last decade, the FDI flowing into developing countries has increased dramatically; from US$237.5 billion in 2005[1] to US$681 billion in 2014[2]. The amount of FDI in developing countries takes 55% over the global FDI in 2014 and it is predicted to continue increasing in next few years. At the same time, FDI flows to developing Asia is US$465 billion[2], meanwhile the inflow FDI of Vietnam is only about US$14.5 billion[3].

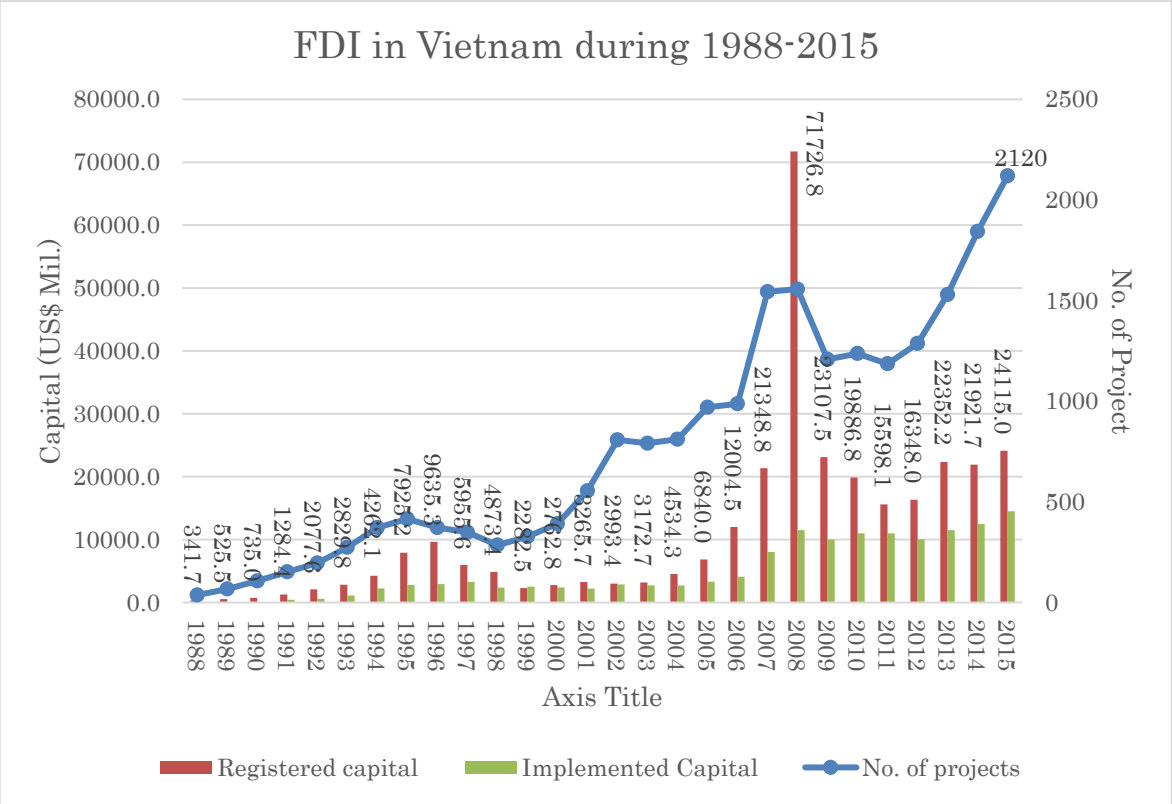

Figure 1. Chart 1.1: Inflow FDI of Vietnam from 1988 to 2015

[1] Global development finance 2006, p.54
[2] World investment report 2015, p.1-3
[3] Statistical Handbook of Vietnam 2015, p.90

The chart 1.1 demonstrated that since 2002 the inflow FDI in Vietnam had an increase trend not only in the number of projects but also in the registered capital. While the number of projects increased from 391 in 2000 to 2120 in 2015, the registered capital raised from US$2762.8 million to US$14500 million. In year 2008 the inflow FDI marked an outstanding number in registered capital (US$71726.8 million). However, the implemented capital in the same year was just US$11500.2 million. The implemented capital of FDI show a stable increasing trend overall.

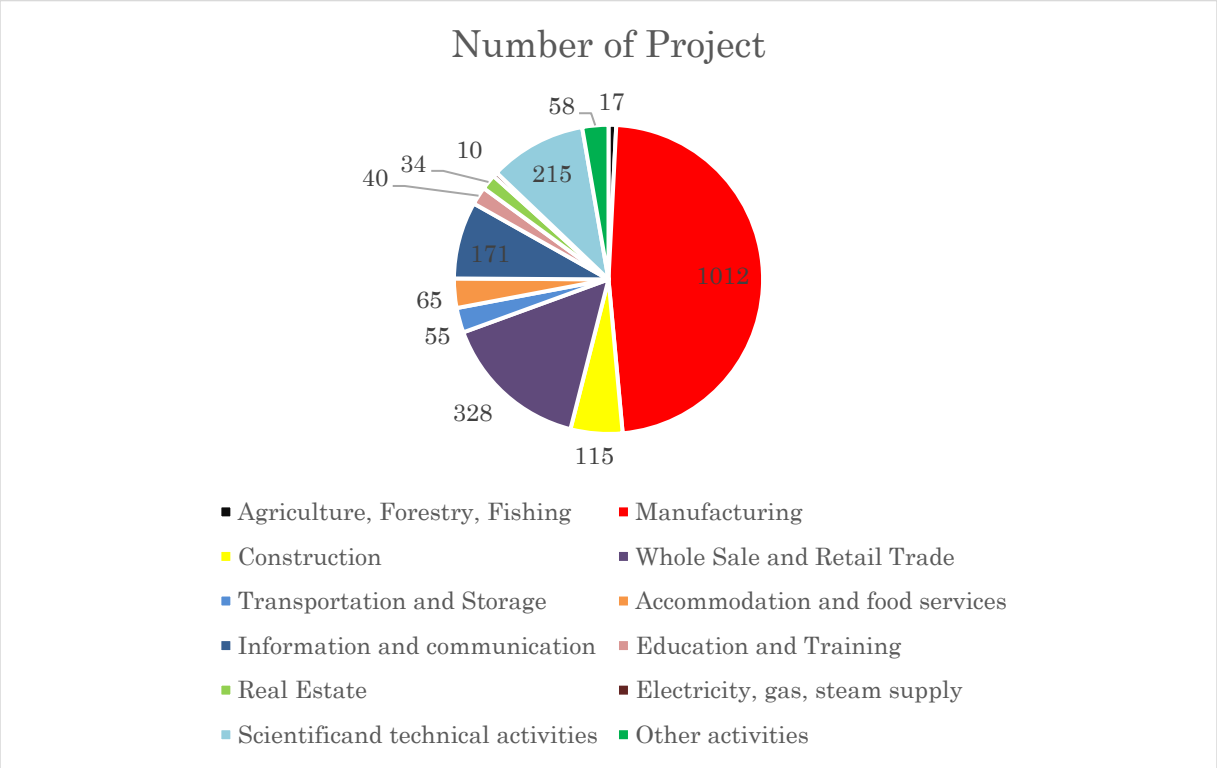

Figure 2. Chart 1.2: Number of FDI project of Vietnam by economic activity in 2015.

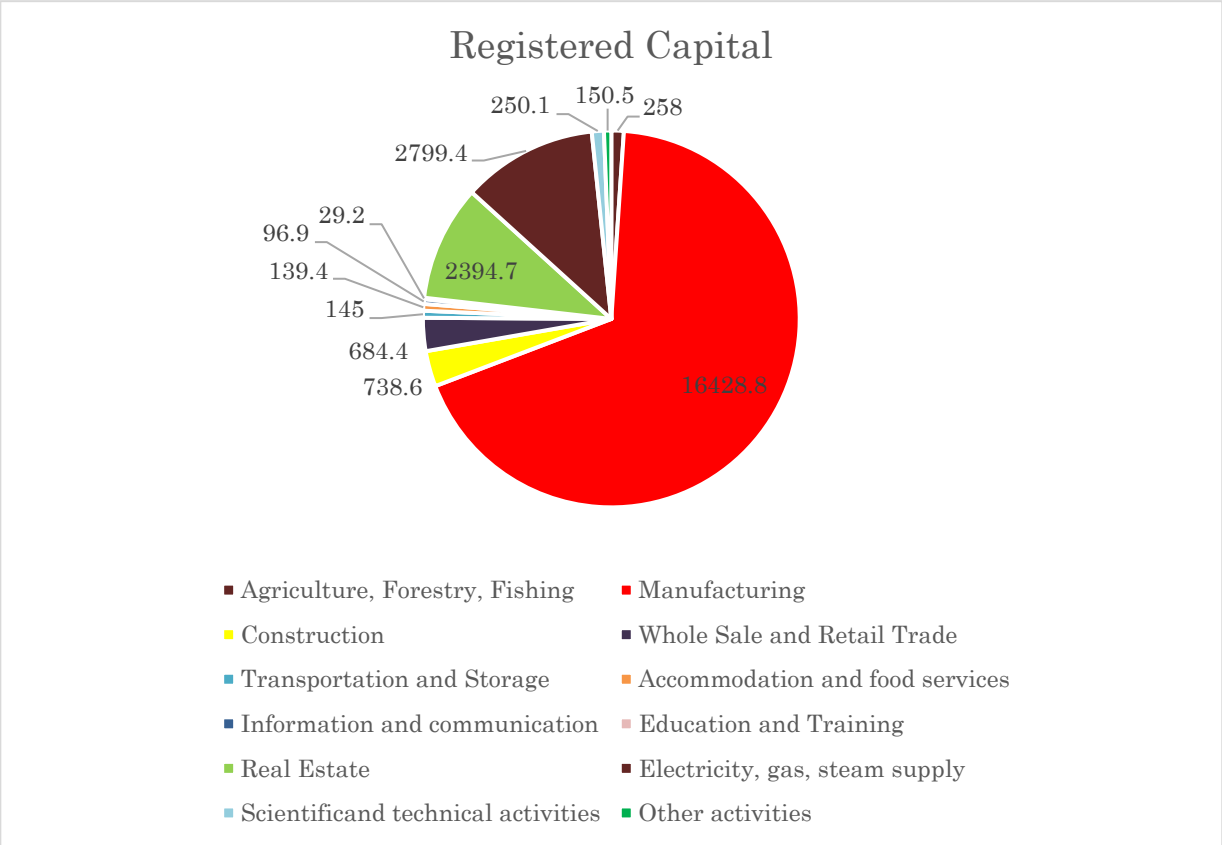

Figure 3. Chart 1.3: Registered FDI capital of Vietnam by economic activity in 2015.

Chart 1.2 and 1.3 present the inflow FDI in year 2015 by type of economic activity. In which, the manufacturing industry took lead in both number of projects and registered capital; 1012 projects and US$ 16428.8 million respectively. Especially, in term of registered capital, manufacturing activities accounted about two third over the total amount. Each projects in manufacturing activities received US$ 16.23 million. An explanation for this is because Vietnam is a developing economy, which is still in the early stage of economic development. Therefore, the industrial and manufacturing activities in this nation are encouraged to develop. Moreover, Vietnam is having comparative advantage in manufacturing industry, especially light manufacturing industry.

The two charts also showed that some activities although received a small number

of FDI projects such as: real estate; electric, gas, steam supply; but the registered capital is quite large: US$ 70.43 million and US$ 279.94 million per project respectively. While, despite the number of projects invested in scientific and technical field is second most (215 projects), the actual capital is planned to use in these activities is just US$ 150.5 million, about US$ 0.7 million.

After observing the general situation of FDI in Vietnam, I came up with the question: What are the determinants of inflow FDI in Vietnam?

1.2. Overview about research area

In this research, I will answer this question by focusing on the case of North-central Region of Vietnam (NCRoV). North-central Region of Vietnam, also called North Central Coast, is geographical located in the south of Red River Delta Region and in the north of the South Central Coast Region. Which means this region is lying between Northern area of Vietnam and South Central region. While the western side of NCRoV is Laos Country, which links with this region through several border gate listed as: Na Meo, Nam Can, Cau Treo, Cha Lo, Lao Bao. On the eastern side of NCRoV is the East Sea (South China Sea), which directly connect to Pacific Ocean. NCRoV include 6 provinces lying from north to south as the order: Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue.

In my point, this region has many advantages in developing economy, which can be listed:

- Strategic geographic location: NCRoV is the connection between Northern region and Southern region of Vietnam, two main economic regions. With the national road passing through this region and that allows a large amount

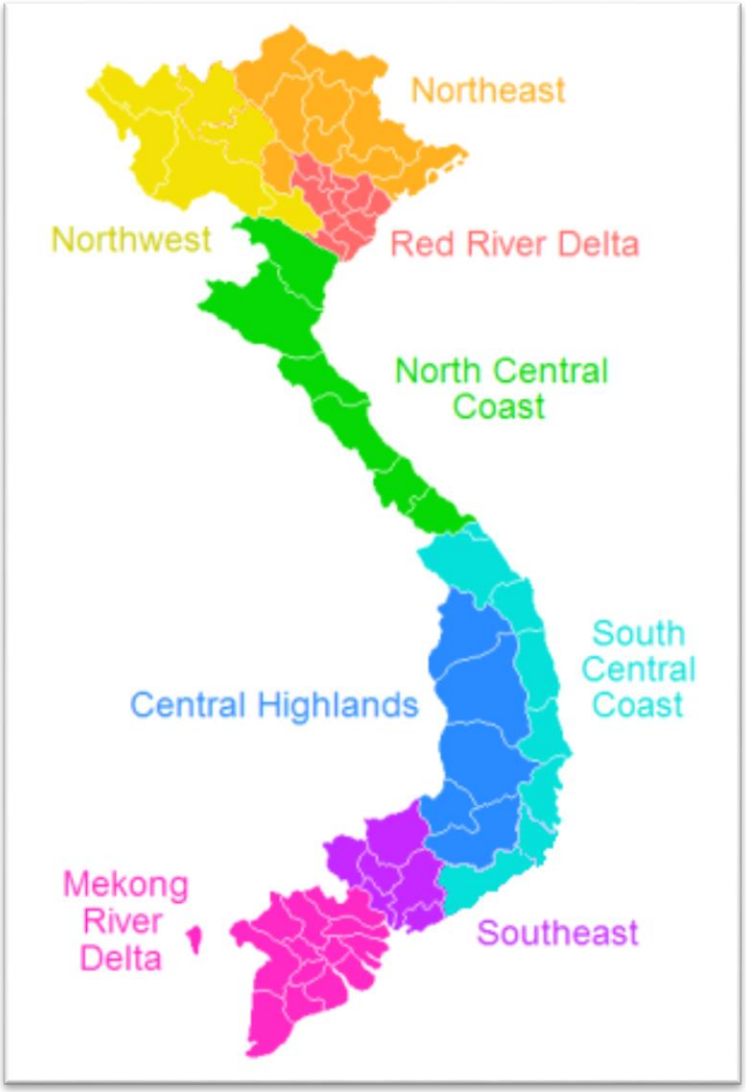

Figure 4. Regional map of Vietnam.

Retrieved from:

https://en.wikipedia.org/wiki/Subdivisions_of_Vietnam#/media/File:VietnameseRegions.png

of goods transported from and through NCRoV to other region of Vietnam. Besides, border gates with Lao on the west side of NCRoV is supporting trading activities with this neighbor country and also Thailand, while the east side of this region is a long coastline with many suitable places to construct a national port.

- Natural resources: Even though the mineral resources in NCRoV are not numerous in type and amount as Northern region, the mineral reserves in this area is still quite significant. Moreover, NCRoV also has advantages in forest and sea resources.
- Labor force: the working labor in NCRoV is well-trained.
- Other strong point: there are two World Heritages located in NCRoV and two others are also found in neighbor province. This make NCRoV become a tourist attraction area.

In a report of world bank, Hoang S. D. and his research team used SWOT method to pointed out some strength and weakness of NCRoV, which is summarized as the below table[4]:

Table 1: Summarized strength and weakness of North Central region.

Strength – Potentials	Opportunity – Potentials	Weakness - Limitations
- Already owned some national port and 1 international airport.	- Received large investment in some most essential constructions.	- The physical infrastructure is insufficient, scattered.

[4] Hoang S.D. et al. (2009). *Vietnam - Analysis, assessment for potential development of the central regional clusters to prepare master planning of socio-economic development in the context of economic integration*. Washington, DC: World Bank.

- Rich potential natural resources. - Abundant human resource, stable society.	- Vibrant international economic integration.	- Economic growth mainly depends on foreign investment. - Low labor productivity.

Moreover, there are researches about the potential of forming a corridor between 3 countries: Vietnam, Laos, Thailand; in order to encourage the trading activities among these countries.

Although FDI plays essential role in the economic development of the region, the amount of FDI flowing into this area up till now is only small scale (9.9% of total registered capital of FDI)[5].

[5] Statistical Handbook of Vietnam 2014, p.116

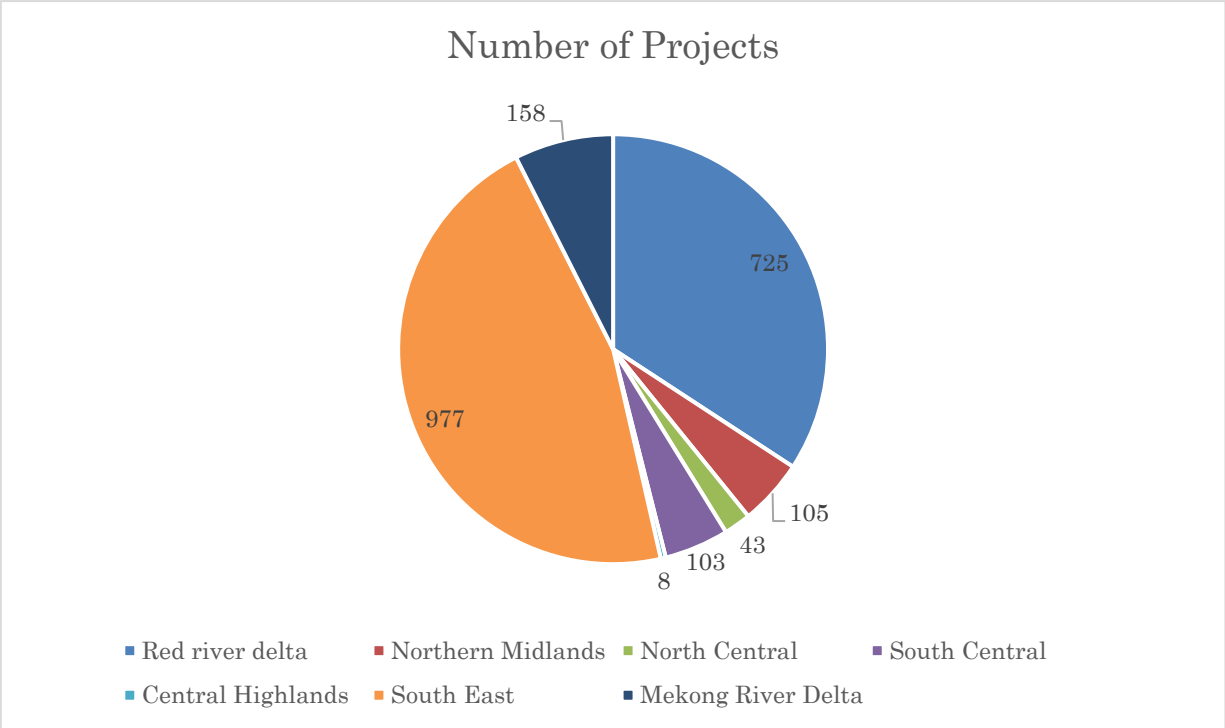

Figure 6. Chart 1.4: Number of FDI projects of Vietnam by 7 regions in 2015.

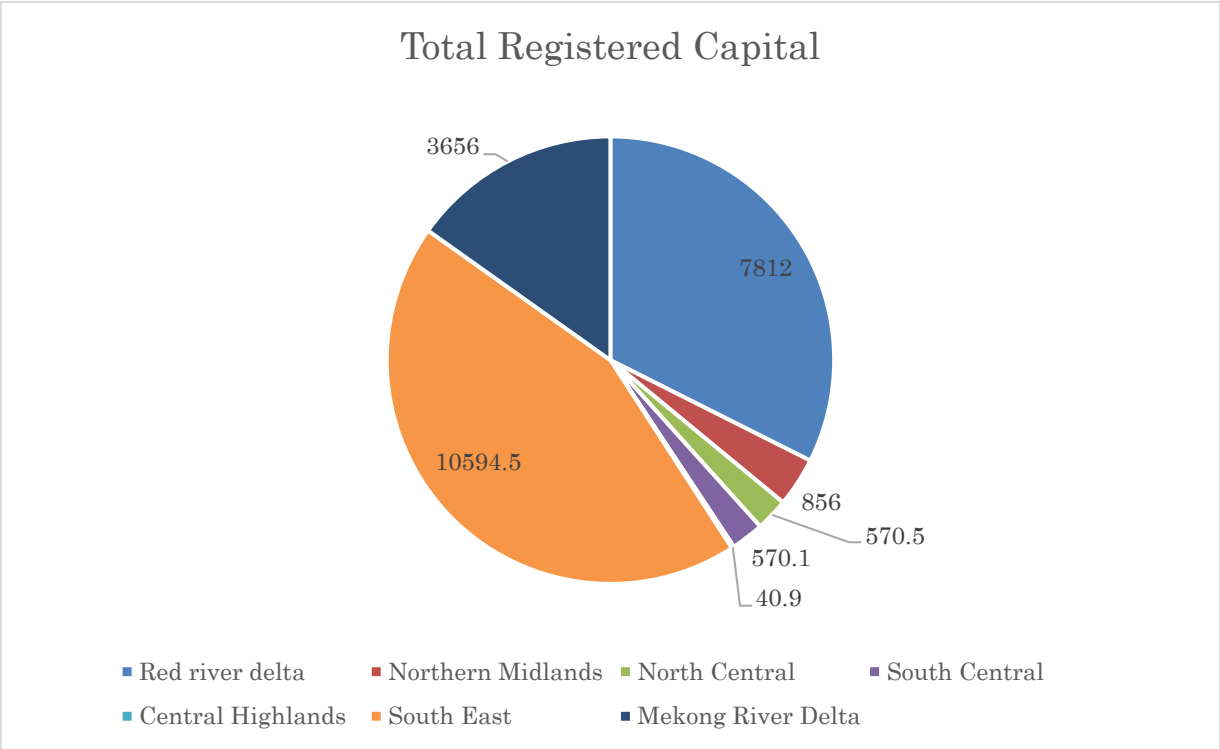

Figure 5. Chart 1.5: Registered FDI capital of Vietnam by 7 regions in 2015.

2. Research purposes.

My research aims to resolve one main question and one sub-questions. First, this paper will find out which are the factors having positive effects to inward FDI. Also in this section, I will try to identify the most important determinant or specific determinant. The paper in the same time answer another problem: which are the factors having negative effects to inward FDI? NCRoV is known as having prospective in attracting investment in comparison with other regions in Vietnam, but there are only a few researches about advantages and disadvantages of this area toward inflow investment. Therefore, this research is necessary for providing a clear view of these factors to both local government and investors. The sub-question that the paper aims to solve is: In compare with other region, which determinant is the advantage point of NCRoV? The purpose of my research is not only identifying the positive factors but also proposing a plan to enhance identified factors. This will help NCRoV in competition of attracting FDI with other domestic and international regions.

Doing this research is important for several reasons. Firstly, as I mentioned above, although the NCRoV has many potentials, the FDI flowing into this area remains low in both number of projects and capital. And to the best of my knowledge, despite the fact that NCRoV is an important economic area, there is no recent international research concern about this problem of this area. Secondly, since FDI contributes a lot to economic development, it is necessary to know the determinants of FDI flowing into NCRoV. Lastly, because other countries and regions also compete to get FDI, a plan for enhancing the advantages of area is needed. This plan also has practical value in contribution to developing economy.

CHAPTER 2: Literature review.

1. Theory about developing economies and manufacturing industries.

1.1. Perspectives about developing economies.

There are many ways to identify whether an economy is developing economy or not. The most common way is based on the level of development, which can be estimated by average income per capita. According to the definition of World Bank[6], developing economy are nations having Gross National Income (GNI) per capita below $US 12475. This GNI per capita is calculated by using World Bank Atlas Method. Sharing the same perspective with this definition, Hayami Y. and Godo Y. (2005) used Gross Domestic Product (GDP) per capita to identify a developing economy. According to two authors, GDP per capita represent the level of economic development by measuring the level of domestic market-based production activities[7].

Another way to define a developing economy is assessing its owned human capital. Human capital is recognized as important factor of economic development. Better human capital lead to higher productivity, which is supposed to enhance economic activities of one nation. At the same time, resident with higher income level tend to spend in educational and health care activities, which help improving human capital quality. In the same study, Hayami Y. and Godo Y. approached this idea by using the Human Development Index (HDI). The HDI is measured by United Nations Development Programme through 3 indexes: life expectancy index, education index and GNI. However, there is no detail number of HDI to classify the development status of a

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[6] The analytical classification of the world's economies by World Bank on 1st July 2016.

[7] Yujiro H. & Yoshihisa G. (2005). *Development economics: From the Poverty to the Weath of Nations* , p.36

country.

On the other hand, there are some perspectives about definition of developing economy base on changes in industrial structure of one country. While the economic structure of developed countries shows that service industry sector accounted the most in GDP shares, the economic structure of developing countries has a change in the sector accounting most in total share as shifting from agricultural sector to industrial sector. Since the developing economies is overcoming the economic development stage, the industrialization is strongly promoted. Hayami Y. and Godo Y. (2005), after observing a sample of 16 countries including both developed and developing country share similar conclusion. Moreover, two authors explained that developing economies have many comparative advantages in industrial sector. They also concluded that the manufacturing industry, especially manufactured exports share the same trend and have a close relative with industrial sector in developing economies.

Besides, there are other criteria to define a developing economy such as: national debt, inflation rate, population, natural resources, etc. However, I suppose that these above perspectives are the most common and exact way to identify a developing economy since it is being used by nations and famous international organizations all over the world.

1.2. Relationship between developing economies and manufacturing industries.

Manufacturing industry is one of the most important sector in the economy of developing countries. Since the capital, labor force productivity and industrial production management accumulate during the industrialization stage, economic

development stage[8]; and these three factors are also fundamental to development of manufacturing industry. At the same time, the manufacturing sector is assessed as basis for exports in developing economies. Developing manufacturing industry as initial stage to support domestic demand is a fundamental step in export-oriented plan. Moreover, as same as industrial sector, manufacturing activities in developing countries have several comparative advantages: high reserve of natural resources, abundant labor force, low cost in production and transportation. Therefore, the foreign investment tends to flow into manufacturing industry, especially primary manufacturing and light manufacturing, to find the efficiency. This is how manufacturing plays an important role and contribute to economic development of developing countries.

2. Determinants of foreign direct investment.

Much research has been done in different developing countries to identify the determinants of inflow FDI to these regions. These studies made out many different conclusions but also have not come to an agreement on which is the most important determinant for developing country. From what I read, these conclusions can be divided into three main groups of determinants: Political determinant, economic and socio-economic determinant and other specific determinant.

2.1. Political determinant:

There are many researches mentioning that political factor as a key role in attracting inflow FDI to developing countries, because the political factor has both positive and negative effect on investment.

The first political factor is FDI related policies of the host country. Shah Tarzi

[8] Hayami Y. & Godo Y. (2005), , p.36

concluded in his research that if the host country makes policies to create favorable environment and conditions for investment, the amount of FDI will increase[9]. Also in same research, Shah Tarzi supposed that the policy made by government to protect domestic industries will discourage the inward FDI, because it will limit the ability to foreign investor to expand their business[9]. On a different research, Hess also agreed that the more open policies made by government to facilitate investment the more investors invest in that country[10]. Another point affect the foreign investors mentioned by Shah Tarzi is the bureaucratic procedure, which should be shortened through policy to encourage the investment[9]. However, the study of Asiedu shows that policies that have been successful in one region will probably not produce the same result in other regions[11]. In general, by applying suitable policy with current state of the region to encourage investors, the local government can attract more inward FDI, for example lowering tax rate or providing infrastructure.

Another condition mentioned in many studies as political factor is political regime, circumstance of local government. In term of political circumstance, many researchers chose political stability as the main factor. According to Vadlamannati et al, the political stability affect positive to the amount of inflow FDI[12]. The better the political stability of one country is the more FDI flows into that country. Barthel after investigating the case of Ghana also concludes that the level of political stability in Ghana plays a key

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[9] Shah Tarzi. (2005). Foreign direct investment flows into developing countries: Impact of location and government policy. *The Journal of Social, Political, and Economic Studies,* p.514-515

[10] Hess, M. L. (2008). Doorways to development: Foreign direct investment policies in developing countries.

[11] Asiedu, E. (2002). On the determinants of foreign direct investment to developing countries: Is africa different?

[12] Vadlamannati, K. C., Tamazian, A., & Irala, L. R. (2009). Determinants of foreign direct investment and volatility in south east asian economies. *Journal of the Asia Pacific Economy, 14*(3), p.250-251

role in attracting FDI to that country[13]. To quantify this factor, researchers can perform it in dummy variable as what Vadlamannati and his team did[12]; or express under a scale such as Likert scale. In contrast, also about political stability, some researcher decided to estimate the relationship between FDI and turmoil risk; Faran M. (2014).At the same time, while most of researchers share the same conclusion about the positive effect of political stability, there are two different steam of ideas about the effect of political regime to FDI. First one is the democratic government create positive impact toward FDI. This first argument is agreed by Hess in the same study. On the other hand, there are studies supposing that democratic government affect negative to FDI because of slowly policies applying[12].

Lastly, the openness level or policy of one country is also identified in several studies as important factor to FDI. Study by Büthe shows that the more in number of international trade agreement that one country has, the more inflow FDI increase[14]. Other studies by Hess (2008), by Ramjee Singh (2008), by Ng'ang'a (2005) also conclude that if host country has open economy the amount of inward FDI will tend to increase.

In conclusion, based on the references I read, I agree that there are 3 most important political factors influence to FDI: Host nation FDI policies; political statement of host country government; openness level of host nation.

2.2. Economic and socio-economic determinant:

Although political factor is important, I agree with other researchers that economic

[13] Barthel, F., Busse, M., &Osei, R. (2011). The characteristics and determinants of FDI in ghana.
[14] Büthe, T., & Milner, H. V. (2008). The politics of foreign direct investment into developing countries: Increasing FDI through international trade agreements?

and socio-economic factors also show important role in bringing back FDI for developing countries. Moreover, since I decided to perform a quantitative analysis research focusing on manufacturing field, I prefer to observe and study about some economic and socio-economic factors, which are expected to have significant influence to attract FDI into manufacturing industries of the researched region.

First factor mentioned in most of researches about economic determinants of FDI is macroeconomic condition of host nation. For investigating this factor, many researchers choose to use the data set of GDP growth rate and income per capita to express how well an economy is operating. These two variables show the degree of economic growth, which is supposed to have positive relationship with FDI in study of Ramjee Singh (2008), Kok (2009) and Liang (2010). While, Elfakhani and Mackie (2013) chose to use balance of trade to identify whether an economy is strong or not, in which trade surplus express a strong economy and encourage inflow FDI. And in the same study, Elfakhani and Mackie (2013) also introduced another variable to assess the overall economic circumstance: inflation rate. As Majeed and Ahmad (2009) assumed, high inflation rate indicate one country's macroeconomic instability. In short, FDI is likely to flow into country having better economic performance.

Since FDI can be classified into 3 type: natural resource seeking FDI, market seeking FDI and efficiency seeking FDI, market of host region is certainly an important factor in attracting FDI. Market-related factors, market size or market potential, show significant positive effect toward FDI in several researches. While researchers of these studies; Vogiatzoglou (2007), Vadlamannati (2009), Majeed and Ahmad (2009); showed that developing countries have potential in expanding market size, which attract inflow FDI. As investors tend to choose country having large market size to invest into. Market

size in many researches is usually measured by GDP of the researched area. At the same time, market size also can be measured by population of host region; Changwatchai (2010). Because this value reflects the demand and purchasing power of the market. However, some researchers, Liang (2010), supposed population will create negative impact to inflow FDI. While, Nurudeen et al (2011) through an OLS analysis found that market size measured by GDP have negative impact on FDI in Nigeria. In another research, Nwaogu (2012) chose market potential as one main determinant and showed that this factor has some significant impact to the FDI inflow. In which, he extended the OLS model with SAR model to form an equation[15]:

$$lnFDI_{it} = \alpha + \rho \sum_{j=1}^{N} W_{ij} lnFDI_{jt} + \beta MktPotential_{jt} + \delta HostVariables_{it} + \mu_{it}$$

In this equation, market potential of the host country is one main factor, which is calculated by the author by using another specific equation. While the host variables are other economic and socio-economic factor, which also have influence on FDI such as: population, GDP per capita, trade cost, etc.

Beside market size, physical infrastructure is also concerned by investors. How good the infrastructure of one country is; will affect positive to inward FDI. For instance, FDI will flow into the country having good transport system. Several studies about FDI in China mentioned about transportation infrastructure as one of the determinants: Mao (2003), Liang (2010) and Zhou (2011). While Mao (2003) used total kilometers of railway and highway to dedicate the transport infrastructure; Liang used the total length of paved road; Zhou used highway density and railway density. On the

[15] Nwaogu, U. G. (2012). Essays on spatial analysis of foreign direct investment and economic growth determinants in developing countries. (Ph.D., Western Michigan University), p.26

other side, Shah Tarzi also mentioned that some countries establish special economic zones, which provide well-infrastructure to encourage FDI[9].

In addition, many researchers in their studies agree that natural resources and human resources of developing countries are their advantages in competing for inflow FDI. Similar with market, to natural resource seeking FDI, the availability or reserve or natural resource in one nation is the most important determinant. Such as Okafor after analyzing panel data concludes that the availability of crude oil and natural gas in Sub-Sahara region encourage US FDI[16]. On the other hand, there are different conclusions about the effect of human capital. Okafor in same study wrote that the labor factor of Sub-Sahara region discourage the FDI infow[16], because the labor force in this area is low-skilled labor. In contrast, Vadlamannati concluded that labor factor with high efficiency is the major determinant of FDI in South Asia[12]. Some criteria to measure human capital are education level and health status. In which, education level is often indicated through: literacy rate or number; percentage of people reaching some certain education level such as secondary school, high school. The higher in literacy rate of one country is believed to have some effect in increasing the amount of inflow FDI, study by Vadlamannati (2008). While health status is often expressed through expectancy. Health status of residents directly affects to the productivity of labor force so it is also concerned by investors.

2.3. Other specific determinant:

Beside political determinants and economic determinants, in some region there is the existence of some specific determinants, which also have significantly effect on FDI.

[16]Okafor, G. (2015). Locational determinants of us outward fdi into sub-saharanafrica.

The factor is mentioned and researched most is geographical location factor. While in the case of South China[17], the geographical location contributes to attracting FDI; the geographical position of Sub-Sahara is concluded to discourage FDI flowing into this region[11]. In addition, the culture of one country is also a determinant to inflow FDI. In the same study about South China region, culture is mentioned as a factor affect positively to FDI[17].

Other studies also mention some specific factor having positive effect to inward FDI. As in study of Kok and Ersoy (2009), telecommunication is the major determinant to FDI. While in study of Okafor (2015), the number of internet user also produces positive effect to FDI.

3. Studies about FDI in Vietnam

In the situation that Vietnam is becoming a FDI attracting country and the trend of inflow FDI in this nation is keeping increasing more, there are more and more researches about FDI in Vietnam. Most of it are studies about relationship between FDI and socio-economic factor of Vietnam. In which, a number of these studies is about the impact of FDI toward the socio-economic circumstance. While the rest research about the socio-economic characteristics of Vietnam as the FDI attracting determinants. The below mentioned researches are following the latter topic.

In 2007, Nguyen and Nguyen perform a research to overview about regional FDI determinants of Vietnam in the period before the year 2007. The analysis model used by two authors is specified as follow[18]:

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[17]Zhang, L. (1994). Location-specific advantages and manufacturing direct foreign investment in south china.

[18] Nguyen, N. A., & Nguyen, T. (2007). *Foreign direct investment in vietnam: An overview and*

$$FDI = f(Market\ factors, Labor\ factors, Infrastructure, Government\ Policy)$$

In which, market factors, labor factors, infrastructure and government policy are four groups of factors supposed to be key determinants by authors. Market is measured through criteria such as: population size, density and growth; GDP per capita; GDP growth rate. While availability, wage rate and quality are variables of workforce concerned by this research. For infrastructure determinants, authors assumed that transportation network, telephone and production facility are important in attracting FDI. With the last factor group, government policy used a specific index called Provincial competitiveness index to demonstrate the local governance. This research then concluded that the FDI in Vietnam before 2007 is supposed to be market-seeking type. Another conclusion is only labor factor and infrastructure factor showed significant impact toward FDI.

In another research in 2014, Hoang and Goujon applied a spatial econometric analysis to identify the provincial determinants of FDI in Vietnam. To be exact they perform a spatial error model equation as follow[19]:

$$\begin{aligned} \mathrm{FDI_i} = \alpha_0 + \alpha_1 \mathrm{host\ variables} + \alpha_2 \mathrm{neighbouring\ market\ potential_i} \\ + \alpha_3 \mathrm{neighbouring\ human\ capital_i} \\ + \alpha_4 \mathrm{neighbouring\ infrastructure_i} + \alpha_5 \mathrm{neighbouring\ agglomeration_i} \\ + \lambda . \mathrm{W} . \varepsilon_i + u_i \end{aligned}$$

Hoang and Goujon not only consider variables of host region only but also

analysis the determinants of spatial distribution across provinces, p.31.

[19] Hoang, H. H., & Goujon, M. (2014). Determinants of foreign direct investment in vietnamese provinces: A spatial econometric analysis, p.109.

variables of neighbor region. In each determinant, the authors measured value and similar for host and neighboring regions respectively. For instance, researchers used local GDP to measure the host market size, while using the total GDP of neighbor provinces for neighboring market. In conclusion, this research stated that both the market size and infrastructure of host and neighbor province have positive impact in attracting FDI. The same happen with human capital factor (labor cost, labor productivity) in both regions. Therefore, the authors suggest the local government to cooperate in regional level to develop infrastructure and skilled labor force as a good plan to attract FDI.

4. Hypothesis

- Labor Force: The availability of labor force is expected to have positive effect toward inflow FDI, especially high-skilled labor force. Which means the more in amount of labor force and high-skilled labor force lead to the more inflowing FDI into host region.
- Transportation infrastructure: The availability of national port and transportation infrastructure will attract more FDI invest into host province.
- Market: In one region, the larger the market size is and the higher the market potential is, the more FDI invested into that region.
- Neighbor characteristics: the FDI in neighbor province and market potential in neighbor province are expected to create a competition in attracting FDI with host province. Which means the more the FDI of neighbor province is; or the higher the neighbor market potential is, the less FDI flow into host province. And also the neighbor market size is expected to increase the FDI attracting of host province.

CHAPTER 3: Methodology.

1. Analytical framework.

The methodology I will use in this research is a regression analysis model, which is based on the spatial econometric model.

Hoang H. H. and Goujon M. (2014) used spatial econometric analysis model in their research about determinants of FDI in Vietnam on provincial level. In the same study, the authors mentioned about two basic model of spatial econometric: spatial auto-regression model and spatial error model. While they then used the spatial error model as their methodology model. However, in both 2 spatial model equations, there are two similar factor appeared. The first one is autoregressive parameter (ρ), which is used to measure how FDI in neighbor provinces affect to FDI of hosted province. This value has a value range from -1 to 1. The second factor is a weight matrix of first-order contiguous neighbors, which is used to express the influence of the distance between host province and neighbors. And in this research the weight matrix is calculated by using a function of inverse distance[20]. About the analyzed variables, Hoang and Goujon paid more attention to the factors of neighbor provinces. The authors used one variable in the equation to represent the group of FDI determinants in host province (host variables). While on the other hand, 4 variables were mentioned in the equation to express the neighbors determinants: market potential, human capital, infrastructure, agglomeration

In another research, Esiyok B. and Ugur M. (2015) also used spatial econometric model to perform the similar research about FDI in Vietnamese provinces. Once again, in their equation they used the autoregressive coefficient (ρ) with the value lying

[20] Hoang, H. H., & Goujon, M. (2014). Determinants of foreign direct investment in vietnamese provinces: A spatial econometric analysis, p.118

between -1 and 1 and the weight matrix based on distances between provinces to measure the exogenous affect toward FDI of host province. However, to select the neighbor provinces for the weight matrix, the two authors applied 4 different specifications: the nearest province; three nearest provinces; all provinces within a radius of 186 km from capital of host province; all provinces within a radius of 350 km from capital of host province. The researchers used these selections to verify the spatial dependence and to check the relationship of indirect, feedback effects with certain distance.

2. Analysis model.

In my research model, I imitate the above model to form this equation:

$$\begin{aligned} \boldsymbol{FDI_i = \alpha + \alpha_1 LaborForce + \alpha_2 UniversityEducation} \\ \boldsymbol{+ \alpha_3 ProfessionalSecondaryEducation + \alpha_4 NationalPort} \\ \boldsymbol{+ \alpha_5 VolumeOfFrieght(Road) + \alpha_6 VolumeOfFreight(Waterway)} \\ \boldsymbol{+ \alpha_7 PopulationIncrease + \alpha_8 AverageIncome + \beta_1 NeighborFDI} \\ \boldsymbol{+ \beta_2 NeighborMarketSize + \beta_3\ NeighborAverageIncome + \ \varepsilon} \end{aligned}$$

In which, the FDI_i is the dependent variable. While α_1, α_2, α_3,…β_1, β_2, β_3 are the coefficients of the variables. "α" is the constant value and ε is the error.

Unlike previous research model I do not use weight matrix. Since for selecting neighbor provinces, I observe the data of two neighbor provinces sharing the border with host province in the northern side and southern side. The reason for this decision is I supposed that the province sharing border with host province will have a direct and strongest impact to the inflow FDI to host province. Esiyok B. and Ugur M. (2015) also found out in their research that the effective of neighbor provinces factors is the most

significant when the distance is the nearest. Moreover, I want to measure the direct effects of the neighbor province FDI and market characteristic toward the inflow FDI of host province, so I put these factors as independent variables.

A limitations of this model is although the economic related FDI encouraging policy is a concerned factor, I do not add it in the model. Since there is no available precise recorded data, statistics about FDI supporting policy or number of FDI policy performed in each year by province. Moreover, the provincial FDI policies are quite similar or in some province the local government just applies the national policy. Therefore, there is no significant in different of the policy impact on provincial level.

I will do the econometric analysis with 2 data sets on program Stata 12.0 to find out the coefficient and significance of variables. The first data set is used to find out the FDI determinants of provinces in researched region. While the second data set is analyzed to identify the FDI determinant in other regions of Vietnam. In each analysis, both random effects model and fixed effects model is run to find the most suitable one. Finally to determine which of the two models is more suitable, I apply the Hausman specification test, which is demonstrated as[21]:

$$H = (b_1 - b_0)'\big(Var(b_0) - Var(b_1)\big)^{\dagger}(b_1 - b_0)$$

3. Data description.

All the data for each below variables is provided by the General Statistics Office of Vietnam (GSO) from year 2007 to year 2015. And the data is grouped into 2 data sets. The first one (data set 1) includes data of 6 provinces of the NCRoV: Thanh Hoa, Nghe

[21] Greene, William H. (2012). *Econometric Analysis* (7th ed.). Pearson. pp. 379–380,420.

An, Ha Tinh, Quang Binh, Quang Tri, Thua Thien Hue. While the second one (data set 2) contains data of 6 other regions beside the NCRoV: Red River Delta, Northern midlands, Southern Central, Central highlands, South East, Mekong River Delta. It means these two data sets are both displayed in panel data form.

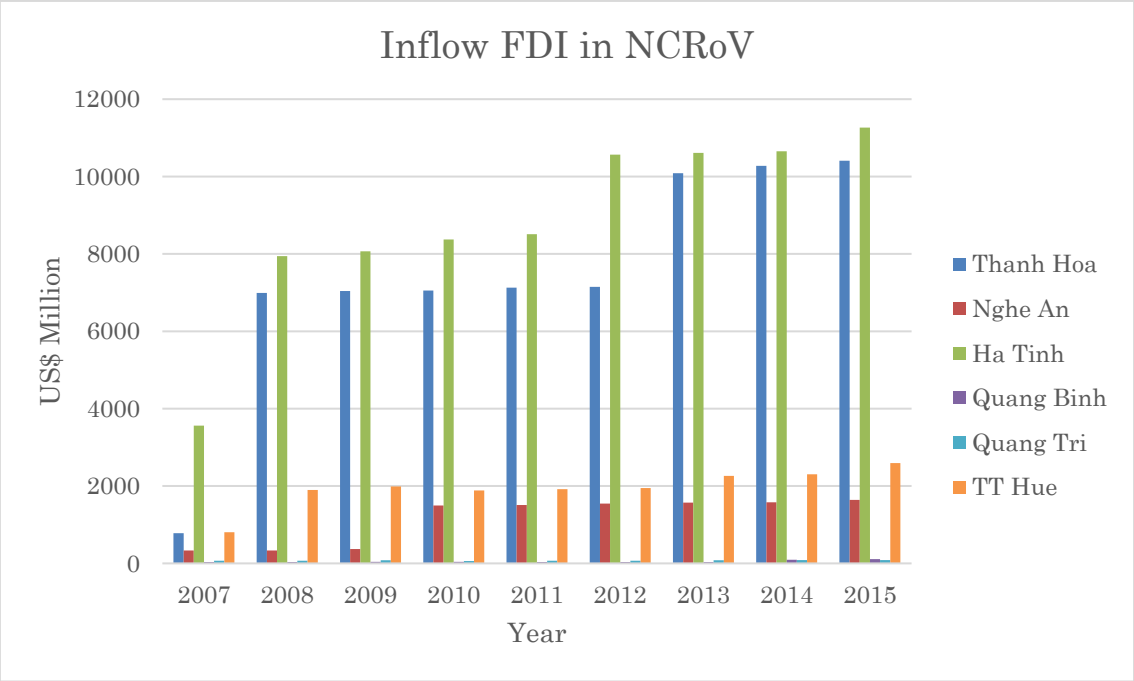

Figure 7. Chart 3.1 Registered FDI in North Central Region (2007-2015)

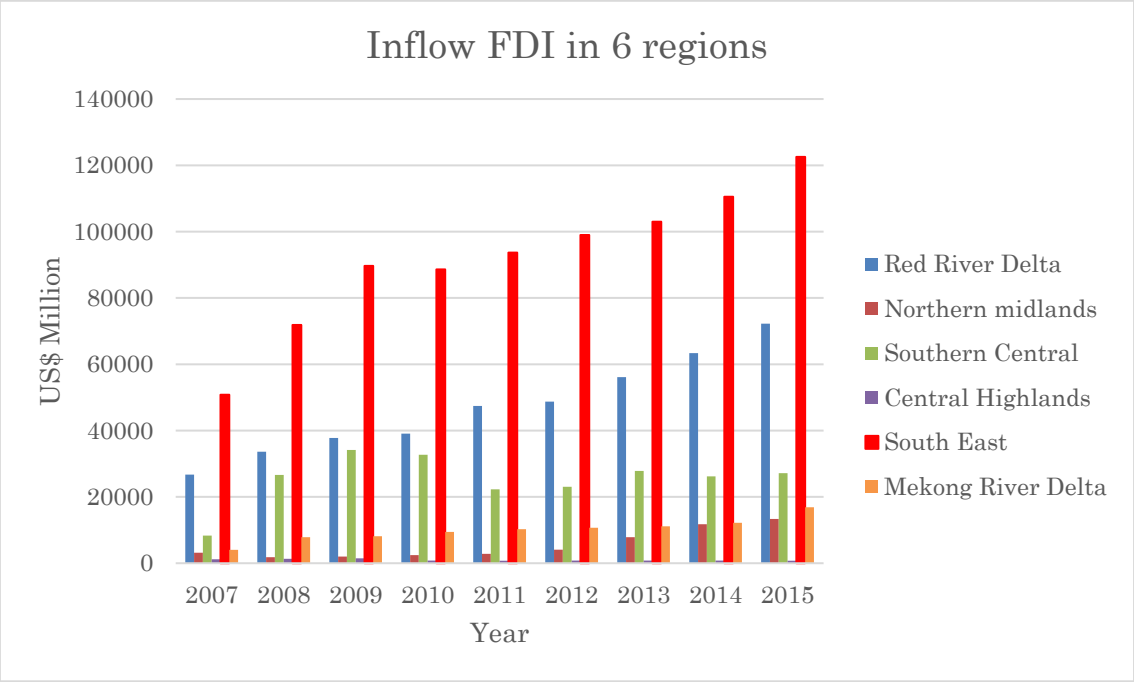

Figure 8. Chart 3.2 Registered FDI in 6 other regions (2007-2015)

As dependent variable, I use the inflow FDI of researched area (FDI_i), which is measured by the accumulation of registered capital till the observed year in US dollar. Also, in a side analysis, I used the logged value of inflow FDI instead of normal one.

Table 2: List of analyzed variable

Variable	Equation symbol	Unit/Value
Inflow FDI	FDI	US$ million
Host province variables		
Labor force	LabForce	Thousand people
University Education	UniEdu	Person
Professional Secondary Education	PSS	Person
National Port	NatPort	Own/Not Own

Volume of freight by road	VoFR	Thousand tons
Volume of freight by waterway	VoFW	Thousand tons
Population increase	PopIncr	Thousand people
Average Income	AvgInc	US$
Neighbor Provinces Variables		
FDI	NeFDI	Million US$
Market size	NeMarSize	Thousand people
Average Income	NeAvgInc	US$

Table 3. Summary of variables in Data Set 1

Variable	Mean	Standard Dev.	Min	Max	Observations
FDI	3251.28	3872.75	34.7	11265	54
LabForce	1002.00	700.24	306.4	2238.3	54
UniEdu	23725.89	26708.21	984	97154	54
PSS	6247.389	4590.377	601	18569	54
VoFR	14397.67	11319.97	2950	49497.4	54
VoFW	1355.06	2207.17	56	8282.4	54
PopIncr	7.67	9.80	-10.63	42.52	54
AvgInc	678.88	243.49	296.36	1234.16	54
NeFDI	2741.66	1945.09	948.6	8019.2	54
NeMarSize	2959.88	1225.36	1441.6	4773.4	54
NeAvgInc	774.49	288.75	298.23	1499.43	54

Table 4. Summary of variables in Data Set 2

Variable	Mean	Standard Dev.	Min	Max	Observations
FDI	30225	33710.34	772.8	122544.5	54
LabForce	7512.98	2940.93	2624.7	12032.6	54
UniEdu	311206.3	284635.8	40859	942567	54
PSS	83008.76	64531.99	11531	237419	54
VoFR	80983.87	63524.57	10813.7	265066.6	54
VoFW	28080.71	29944.53	19.7	99322.9	54
PopIncr	147.85	112.87	-6.9	465.4	54
AvgInc	996.6	467.51	355.78	2340.65	54
NeFDI	35435.69	33214.2	2620.85	122544.5	54
NeMarSize	13053.99	3872.48	7511.55	20912.2	54
NeAvgInc	1046.25	489.76	334.81	2340.65	54

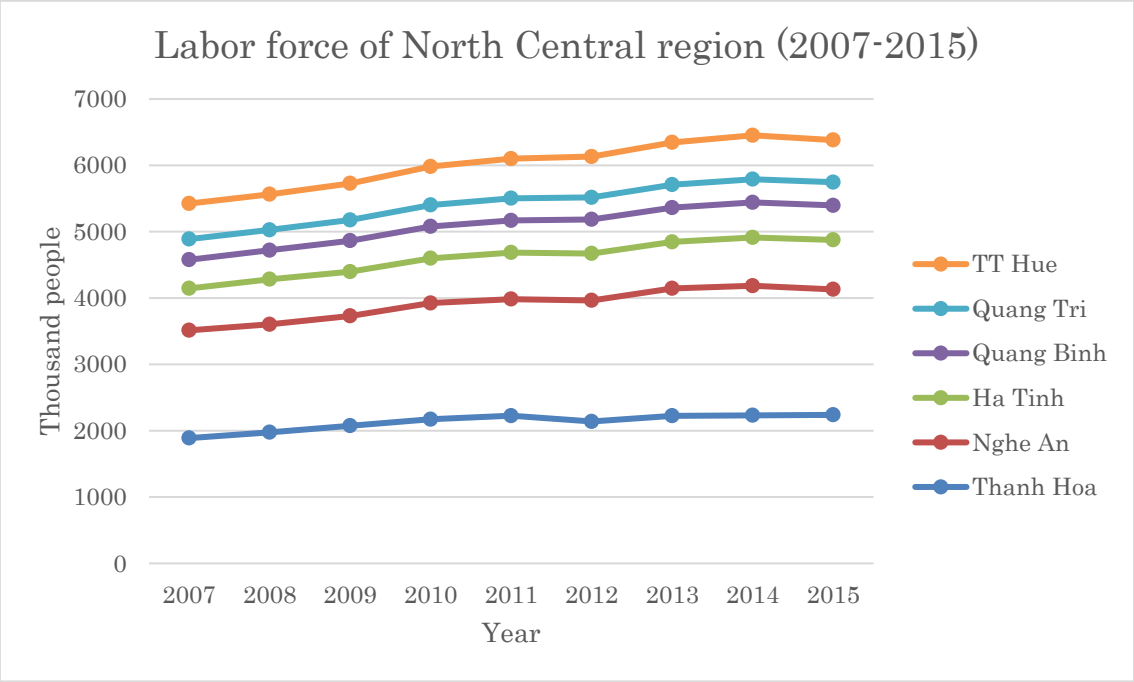

Figure 9. Chart 3.3 Labor force of North Central Region (2007-2015)

Labor force variable I use in this research is the amount of labor force in each province quantified by the GSO. According to the definition of GSO, the labor force includes the employed persons aged 15 and over and the unemployed persons, as defined by GSO in the reference period (7 days prior to the time point of observation)[22]. As this definition, the labor force represents the availability of labor in the observed province. In term of labor, the investor concerns about 3 main factors: labor cost, quantity and quality. However, since the differences in wages between provinces are low, I suppose to ignore the labor cost influence in domestic level. I then analyze two other factors, in which quantity one showed by variable ***labor force***. While the quality factor is expressed by two below variables.

[22] Statistical year book of GSO.

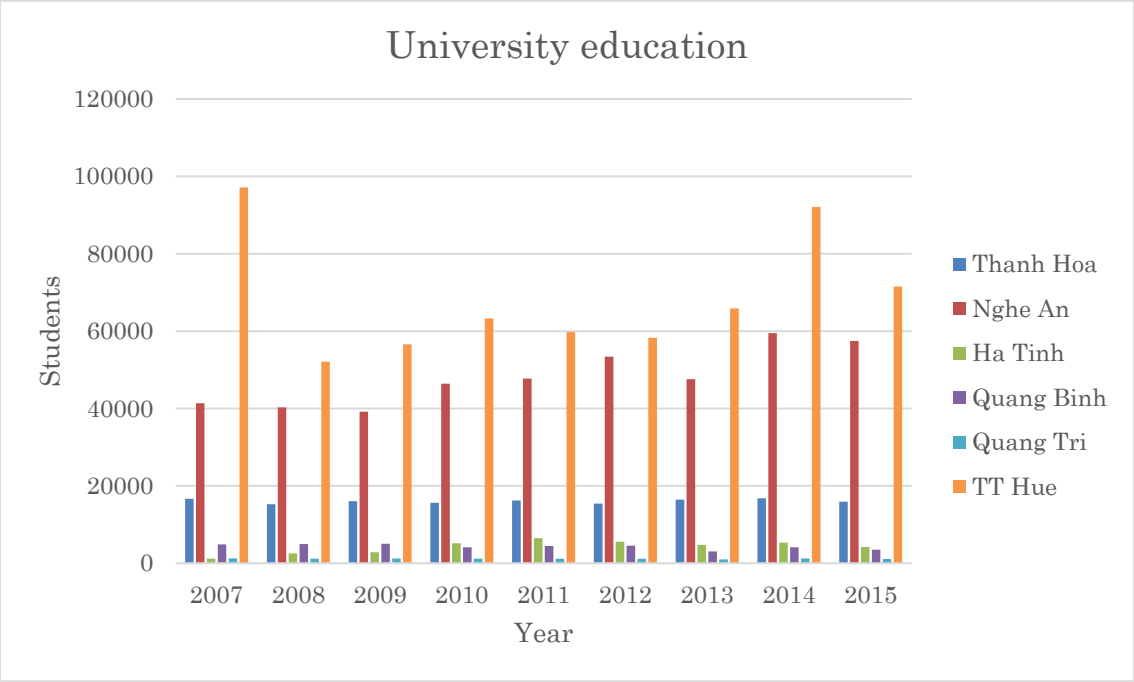

Figure 10. Chart 3.4 Number of University students in North Central region (2007-2015)

University education demonstrates the amount of student attending universities in each province. The GSO calculates this value by summing all the number of student of all universities located in the observation time. The reason I chose this value to express the quality of labor force because university students are the persons who already finished general education program. They have the ability to adopt advanced knowledge and technique so they can be trained to become the high-skilled labor force. I suppose that the investor will concern about this group of people if they want to apply high technology in production.

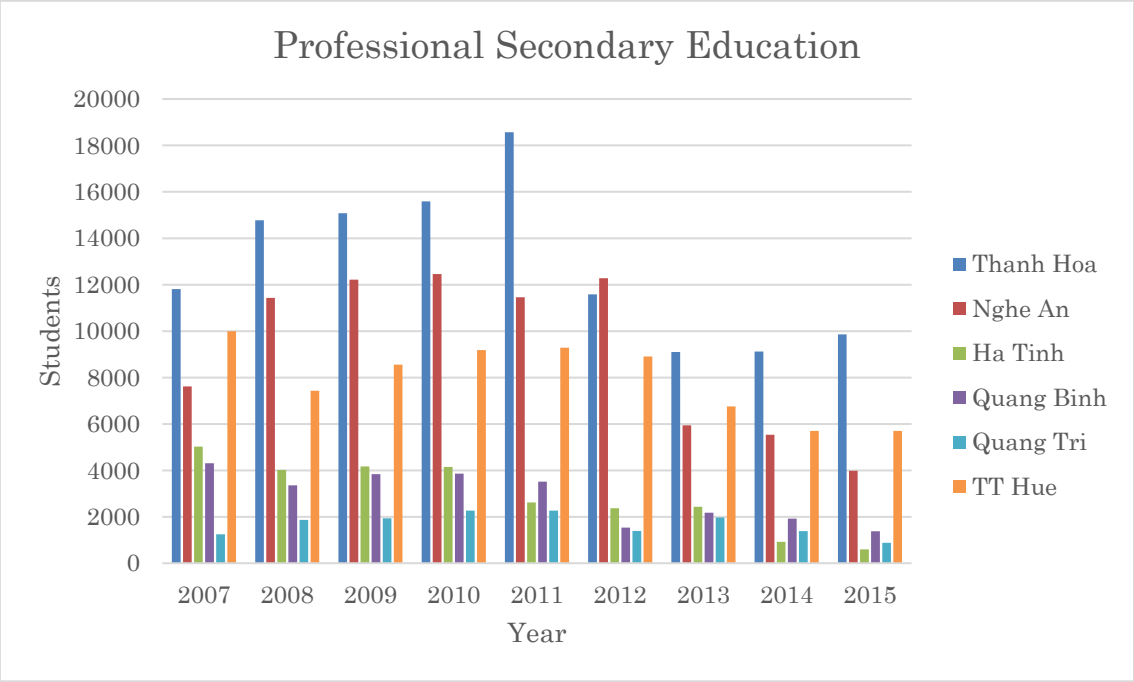

Figure 11. Chart 3.5 Number of Professional Secondary School students in NCRoV (2007-2015)

Professional secondary education is the total students are being trained at professional secondary schools (PSS) in the area of observed province. Indifferent with university student, the student finishing trainings at PSS just barely meet the standard requirement as a labor. Therefore, this can be seen as the basic labor force of the economy. Because not all the production activities are performed by the high-skilled, this group is also necessary.

National Port expressed the availability of national port in the observed province. This variable will be presented under the form of dummy variable, in which the value will be 1 if the host province owns a national port and 0 otherwise. The list of availability nation port is formed base on list of port classification of Vietnam included in the government decision No.16/2008QD-TTg published by Prime Minister of Vietnam. Another Government document (No.11/2016/TT-BQP) introduced about the characteristic of the national port as: Being available to receive international waterway

transportation; Having ability to receive ships with tonnage of 3000 tons or more; the quantity of goods passed through is over 1 million tons per year. After joining WTO in 2007, Vietnam is trying to become an open economy and follow the export orientation. And owning a national port allows the host province to connect with abroad countries and to perform international trade. In my viewpoint, the availability of national port of a province represents the ability of international interaction. Therefore, the investors will concern about this condition of the host province if they aim to export the goods. As the below table show, the North Central region has a high rate in the availability of national port when 4 out 6 provinces owning a national port.

Table 5 List of national port of Vietnam

Name of National Port	Name of Province / Municipality owning port
Cam Pha Port	Quang Ninh Province
Hon Gai Port	Quang Ninh Province
Hai Phong Port	Hai Phong Municipality
Nghi Son Port	Thanh Hoa Province
Cua Lo Port	Nghe An Province
Vung Ang Port	Ha Tinh Province
Chan May Port	Thua Thien Hue Province
Da Nang Port	Da Nang Municipality
Dung Quat Port	Quang Ngai Province
Quy Nhon Port	Binh Dinh Province
Van Phong Port	Khanh Hoa Province
Nha Trang Port	Khanh Hoa Province
Ba Ngoi Port	Khanh Hoa Province
Ho Chi Minh City Port	Ho Chi Minh City
Vung Tau Port	Ba Ria – Vung Tau Province
Dong Nai Port	Dong Nai Province
Can Tho Port	Can Tho Province

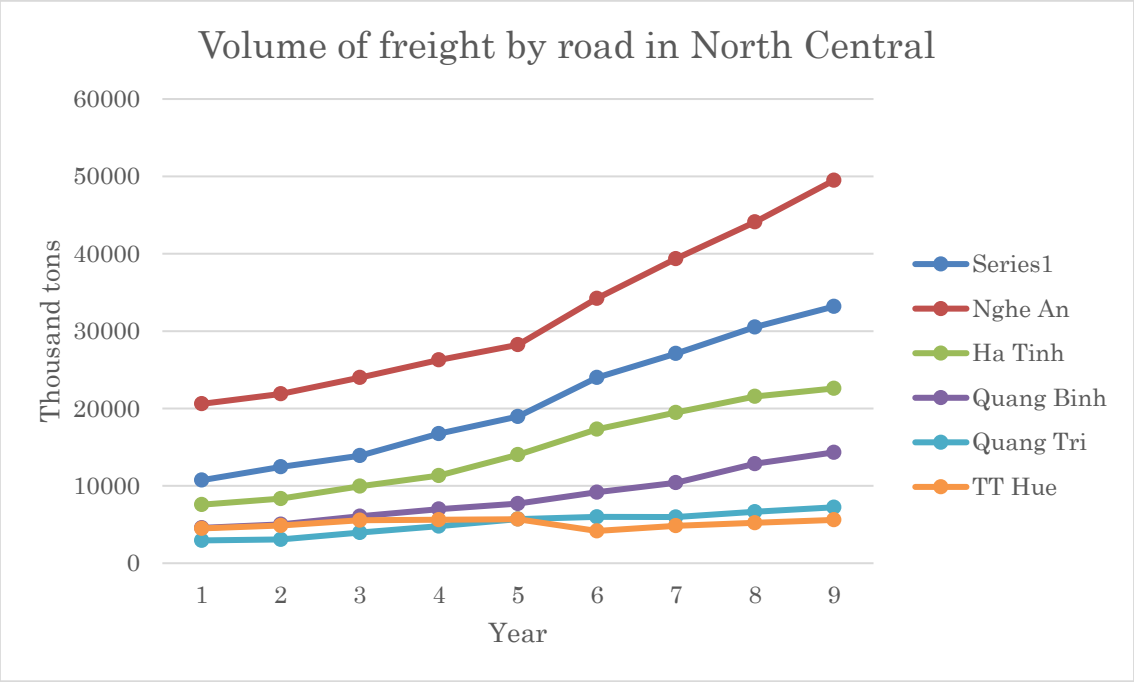

Figure 12. Chart 3.6 Volume of freight by road in North Central region (2007-2015)

Volume of freight by road captures the quantity of goods transported by one province in 1 year through the road way. Beside the availability of owning one fundamental infrastructure as nation port, I use this variable to assess the statement of road way transportation system; availability of transportation route by road; of the host province. With a good transportation system with enough physical infrastructure such as: storage, road route; can support the trading activities, so this can be showed partly through the amount of goods transported by the local. The volume of freight by road in researched region show same increase trend from 2007 to 2015 except Thua Thien Hue Province.

Volume of freight by waterway has the same meaning with the one by road but this variable measures the value of waterway route. This variable also shows the level and rate of port usage by host province.

Population increase is calculated by using the provincial population in the next year minus the population in the observed year. This value shows the population increasing level of the host province in actual number and also the trend of population change in the local. The market size is concluded to have an important influence toward the FDI in many studies. Therefore, I use this value to assess the development potential of the host market size. Which is I supposed that will impact the decision to start invest of investors.

Average income describes the income level of each province in one year. I calculate this value by using the monthly income per capita data and then convert the values unit from Vietnam Dong to US Dollar with the exchange rate respectively. This variable has 2 meanings: the potential demand or potential purchasing power of local market and the economic statement of the host province. Because the income per capita will directly affect the demand of local residents, high income per capita can increase the buying demand among the habitants. In addition, one economy with high GDP will result to high income per capita and vice versa.

Neighbor Provinces variables include three factors: *FDI in neighbor provinces, neighbor market size* and *average income of neighbor provinces*. For all these three factors I collect the data of two neighbor provinces sharing same border with host region and calculate the average value. As for FDI, the data is the average of inflow FDI of two neighbor provinces. While for the market size of neighbor regions, I chose to use the average population of 2 neighbor provinces instead of population increasing. The reason for this choice is this support the assumption that the investors concern more about the current potential of outward market development rather than the future development potential of neighbor market. In term of technique, this also avoid the high

correlation between the market size variable of host province and neighbor provinces.

	LabForce	PSS	VoFR	VoFW	PopIncr	AvgInc	NeFDI
LabForce	1.0000						
PSS	0.7630	1.0000					
VoFR	0.7710	0.2936	1.0000				
VoFW	0.7964	0.6164	0.4376	1.0000			
PopIncr	0.5239	0.2201	0.7680	0.2808	1.0000		
AvgInc	-0.0677	-0.2709	0.2126	-0.0327	0.3996	1.0000	
NeFDI	0.5756	0.3675	0.7644	0.0386	0.6840	0.0878	1.0000
NeMarSize	0.7829	0.4152	0.8205	0.4356	0.4051	-0.1568	0.6484
NeAvgInc	-0.0533	-0.1579	0.1019	0.0594	0.3614	0.9450	0.0265

	NeMarS~e	NeAvgInc
NeMarSize	1.0000	
NeAvgInc	-0.2390	1.0000

Figure 13 Correlation of independent variables in data set 1

(source: data processed by author in STATA 12)

CHAPTER 4: Findings and Discussion

1. Empirical result.

The regression analysis result for data set 1 in random-effect model is demonstrated in figure 14. The R square coefficient is 0.9267 meaning that 92.67% of the variation in the dependent variable (FDI) is explained by the independent variables of the model. The Prob>chi2 of the model equal 0 so we can say the coefficients in the model are certainly different than 0. Among the independent variables: *PSS; VoFR; VoFW; PopIncr; AvgInc; NeMarSize; NeAvgInc* and *OwnPort* variable show positive coefficient. However, only *VoFW; NeMarSize* and *OwnPort* are significant since the p-values are smaller than 0.05 (0.000; 0.000 and 0.000 respectively). Especially, the *OwnPort* variable has very strong significant coefficient (4255.72). The *PSS* variable has 0.185 p-value so if we choose an alpha of 0.20 level, this variable is also quite significant. On the other hand, the *LabForce, NeFDI* variable show significant negative effects with p-value also approximately equal 0.

I then run the fixed-effect model, which is reported in figure 15, for data set 1. The R square coefficient of this model is not really high, only 0.2974. So I run the Hausman specification test, which is showed result in figure 16. According to the result of Hausman's test, the prob>chi2 is 0.1010, which is larger than 0.05. Then I decided to choose to use the random-efffect model as the more suitable model.

Beside the main regression analysis, which is resulted as figure 14, I also run some side regression analysis with special condition. In first case, I changed PSS variable by UniEdu or added UniEdu variable into data set; then run sequentially random effect model. The results are showed respectively in figure 17 and figure 18. Because both these two variable express the education level of researched region, I try to observe

again with each of two variables. With the *UniEdu* variable, the result of the model does not change much except the *VoFR* variable's coefficient becomes less significant (0.432); and the *PopIncr* variable turns into quite significant coefficient (0.118 p-value). Different with *PSS* variable, the *UniEdu* variable show quite significant (0.1 p-value) with negative coefficient (-0.036). When adding the *UniEdu* variable, the *VoFR* variable is changed to have quite significant (0.183 p-value) with an alpha of 0.20 level .

The second side regression analysis case is examing the model with the combination of 2 variables *VoFR* and *VoFW*;. I sum up the value of variable *VoFR* and *VoFW* to form variable *VoF* (Volume of Freight). In the result showed in figure 19, the R square coefficient decrease to 0.9117. However, the coefficient of *NeAvgInc* variable becomes significant (0.003 p-value), and have positive impact (8.35) on inflow FDI. The coefficients of *PSS* and *AvgInc* variables also decrease and become quite significant (0.111 and 0.061 respectively), while the impact of *PSS* remains positive, the impact of *AvgInc* becomes negative. The new variables *VoF* shows significant positive effect on dependent variable (0.21 coefficient with 0.006 p-value).

In last side regression analysis, I use logged value of FDI instead of normal value. The results is presented in figure 20. The R-square of the model increased to 0.9632 while the *VoFW* and *OwnPort* variables still show significant positive effects.

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: provincenum                     Number of groups   =         6

R-sq:  within  = 0.5388                         Obs per group: min =         9
       between = 0.9973                                        avg =       9.0
       overall = 0.9267                                        max =         9

                                                Wald chi2(10)      =    543.69
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FDI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LabForce	-7.724378	1.621039	-4.77	0.000	-10.90156	-4.5472
PSS	.1648274	.1244352	1.32	0.185	-.0790611	.4087159
VoFR	.0945023	.0750545	1.26	0.208	-.0526018	.2416065
VoFW	1.334798	.3243709	4.12	0.000	.6990423	1.970553
PopIncr	41.17012	37.52456	1.10	0.273	-32.37667	114.7169
AvgInc	1.726632	3.600929	0.48	0.632	-5.331059	8.784322
NeFDI	-1.237284	.2961219	-4.18	0.000	-1.817672	-.6568955
NeAvgInc	1.303276	3.224775	0.40	0.686	-5.017166	7.623719
NeMarSize	3.267694	.4418333	7.40	0.000	2.401716	4.133671
OwnPort	4255.718	743.8815	5.72	0.000	2797.737	5713.699
_cons	-4783.053	1148.332	-4.17	0.000	-7033.743	-2532.364
sigma_u	0					
sigma_e	1049.0606					
rho	0	(fraction of variance due to u_i)				

Figure 14. Random-effect model regression result of Data Set 1

(source: data processed by author in STATA 12)

```
Fixed-effects (within) regression               Number of obs      =        54
Group variable: provincenum                     Number of groups   =         6

R-sq:  within  = 0.6383                         Obs per group: min =         9
       between = 0.3261                                        avg =       9.0
       overall = 0.2974                                        max =         9

                                                F(9,39)            =      7.65
corr(u_i, Xb)  = -0.9828                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         FDI |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    LabForce |   4.082529   4.975953     0.82   0.417    -5.982286    14.14734
         PSS |    .215001   .1166897     1.84   0.073    -.0210262    .4510282
        VoFR |   .1004721   .0720235     1.39   0.171    -.0452092    .2461534
        VoFW |   .5786594   .3682379     1.57   0.124    -.1661721    1.323491
     PopIncr |  -3.957795   41.52578    -0.10   0.925    -87.95162    80.03603
      AvgInc |   2.741042   3.717046     0.74   0.465    -4.777393    10.25948
       NeFDI |  -1.003762   .4433532    -2.26   0.029    -1.900529   -.1069959
    NeAvgInc |  -2.538184   3.311259    -0.77   0.448    -9.235838    4.159469
   NeMarSize |   12.57785   7.346852     1.71   0.095    -2.282566    27.43826
     OwnPort |          0  (omitted)
       _cons |  -38831.02   21915.66    -1.77   0.084    -83159.63    5497.595
-------------+----------------------------------------------------------------
     sigma_u |  18338.495
     sigma_e |  1049.0606
         rho |  .99673822   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(5, 39) =    10.85               Prob > F = 0.0000
```

Figure 15. Fixed-effect model result of Data Set 1

(source: data processed by author in STATA 12)

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LabForce	4.082529	-7.724378	11.80691	4.704502
PSS	.215001	.1648274	.0501737	.
VoFR	.1004721	.0945023	.0059698	.
VoFW	.5786594	1.334798	-.7561382	.1743063
PopIncr	-3.957795	41.17012	-45.12791	17.78477
AvgInc	2.741042	1.726632	1.01441	.9218144
NeFDI	-1.003762	-1.237284	.2335213	.3299604
NeAvgInc	-2.538184	1.303276	-3.841461	.7518408
NeMarSize	12.57785	3.267694	9.310152	7.333555

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

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 14.65
Prob>chi2 = 0.1010
(V_b-V_B is not positive definite)

Figure 16. Hausman specification test for Data Set 1

(source: data processed by author in STATA 12)

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: provincenum                     Number of groups   =         6

R-sq:  within  = 0.5370                         Obs per group: min =         9
       between = 0.9983                                        avg =       9.0
       overall = 0.9282                                        max =         9

                                                Wald chi2(10)      =    556.22
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FDI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LabForce	-5.213432	1.358308	-3.84	0.000	-7.875668	-2.551197
UniEdu	-.0359906	.0218592	-1.65	0.100	-.078834	.0068527
VoFR	.046383	.0590071	0.79	0.432	-.0692688	.1620349
VoFW	1.109846	.3482606	3.19	0.001	.4272681	1.792424
PopIncr	56.72399	36.24631	1.56	0.118	-14.31748	127.7655
AvgInc	2.931654	3.455787	0.85	0.396	-3.841564	9.704872
NeFDI	-.9176894	.3105264	-2.96	0.003	-1.52631	-.3090689
NeMarSize	1.981659	.7404979	2.68	0.007	.53031	3.433008
NeAvgInc	-.2837127	3.010242	-0.09	0.925	-6.183678	5.616252
OwnPort	6465.465	1135.509	5.69	0.000	4239.909	8691.022
_cons	-2716.493	1294.68	-2.10	0.036	-5254.019	-178.9664
sigma_u	0					
sigma_e	1082.0951					
rho	0	(fraction of variance due to u_i)				

Figure 17. Random-effect model result of Data Set 1 (changed PSS by UniEdu)

(source: data processed by author in STATA 12)

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: provincenum                     Number of groups   =         6

R-sq:  within  = 0.5533                         Obs per group: min =         9
       between = 0.9979                                        avg =       9.0
       overall = 0.9305                                        max =         9

                                                Wald chi2(11)      =    561.95
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FDI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LabForce	-6.549052	1.778317	-3.68	0.000	-10.03449	-3.063614
UniEdu	-.0330019	.0219261	-1.51	0.132	-.0759762	.0099725
PSS	.1429329	.1235033	1.16	0.247	-.0991291	.3849949
VoFR	.0984556	.0740206	1.33	0.183	-.046622	.2435332
VoFW	1.130396	.3473484	3.25	0.001	.4496054	1.811186
PopIncr	46.55873	37.15718	1.25	0.210	-26.268	119.3855
AvgInc	1.920327	3.551417	0.54	0.589	-5.040322	8.880976
NeFDI	-1.027309	.3234858	-3.18	0.001	-1.661329	-.3932883
NeMarSize	2.287392	.7834734	2.92	0.004	.7518127	3.822972
NeAvgInc	.963904	3.186334	0.30	0.762	-5.281196	7.209004
OwnPort	5808.361	1265.566	4.59	0.000	3327.897	8288.825
_cons	-3450.266	1437.032	-2.40	0.016	-6266.798	-633.735
sigma_u	0					
sigma_e	1054.3959					
rho	0	(fraction of variance due to u_i)				

Figure 18. Random-effect result of Data Set 1 (added UniEdu variable)

(source: data processed by author in STATA 12)

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: provincenum                     Number of groups   =         6

R-sq:  within  = 0.4544                         Obs per group: min =         9
       between = 0.9899                                        avg =       9.0
       overall = 0.9052                                        max =         9

                                                Wald chi2(9)       =    420.17
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FDI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LabForce	-4.481755	1.505915	-2.98	0.003	-7.433295	-1.530215
PSS	.2211279	.1387573	1.59	0.111	-.0508313	.4930872
VoF	.2082635	.0763105	2.73	0.006	.0586977	.3578294
PopIncr	31.50839	42.07623	0.75	0.454	-50.9595	113.9763
AvgInc	-6.025902	3.219769	-1.87	0.061	-12.33653	.2847284
NeFDI	-2.147149	.1669739	-12.86	0.000	-2.474412	-1.819886
NeMarSize	3.088758	.4934941	6.26	0.000	2.121528	4.055989
NeAvgInc	8.348009	2.858526	2.92	0.003	2.745402	13.95062
OwnPort	3354.096	786.1065	4.27	0.000	1813.356	4894.836
_cons	-4777.661	1291.019	-3.70	0.000	-7308.011	-2247.311
sigma_u	0					
sigma_e	1055.635					
rho	0	(fraction of variance due to u_i)				

Figure 19. Random effect result of Data Set 1 (changed to VoF)

(source: data processed by author in STATA 12)

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: provincenum                     Number of groups   =         6

R-sq:  within  = 0.4380                         Obs per group: min =         9
       between = 0.9975                                        avg =       9.0
       overall = 0.9632                                        max =         9

                                                Wald chi2(11)      =   1099.17
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         FDI |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    LabForce |  -.0006453   .0003026    -2.13   0.033    -.0012384   -.0000523
      UniEdu |  -.0000116   3.69e-06    -3.15   0.002    -.0000189   -4.39e-06
         PSS |   .0000164   .0000208     0.79   0.430    -.0000243    .0000571
        VoFR |   3.06e-06   .0000119     0.26   0.798    -.0000203    .0000264
        VoFW |   .0001166   .0000539     2.16   0.031     .0000109    .0002223
     PopIncr |   .0096501   .0063348     1.52   0.128    -.0027659     .022066
      AvgInc |  -.0001183   .0006545    -0.18   0.857     -.001401    .0011645
       NeFDI |  -.2093332   .3295196    -0.64   0.525    -.8551798    .4365134
   NeMarSize |   .0000806   .0001397     0.58   0.564    -.0001931    .0003543
    NeAvgInc |    .000625   .0006076     1.03   0.304    -.0005659    .0018159
     OwnPort |   2.190818     .20197    10.85   0.000     1.794964    2.586672
       _cons |   2.079053   .8977574     2.32   0.021     .3194806    3.838625
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  .14237667
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Figure 20. Random effect regression result of Data Set 1 (with logged FDI)

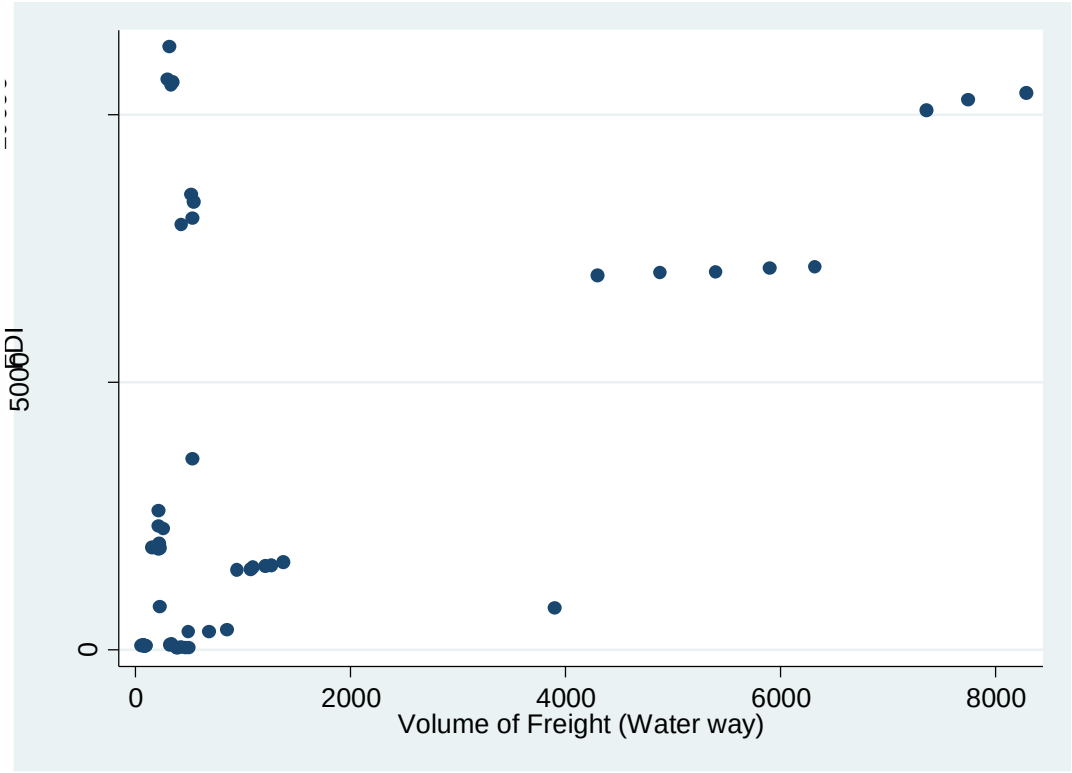

Figure 21. Scatter Plot of FDI and transportation by water variable

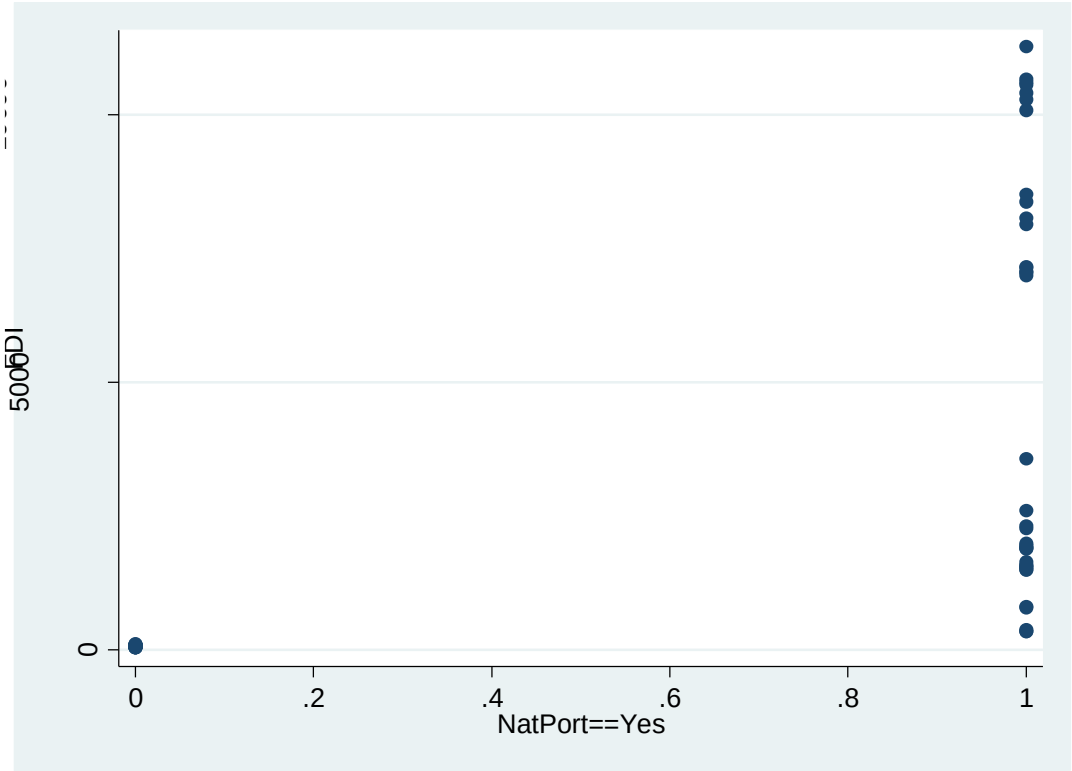

Figure 22. Scatter Plot of FDI and National Port

In next stage, I run the regression analysis for data set 2 in random-effect model. The result is demonstrated in the figure 20. The R square is 0.9606 so 96.06% of variation in the dependent variable in this data set can be explained by the independent variables of the model. However, only two variables, *PopIncr* and *AvgInc,* show significant positive effect to inflow FDI with the coefficient are 51.45 and 60.25; and the p-value are 0.022 and 0.00 (both smaller than 0.05) in the same order. The *NeMarSize* and *OwnPort* variable has quite significant positive impact since its p-value is 0.058 and 0.065 respectively. The *NeAvgInc* variable, in contrast, create significant negative effect to inflow FDI.

I also run a side analysis on the Data Set 2 with *VoF* variable. The result in figure 21 does not show much change except the *OwnPort* variable become significant (0.048 p-value).

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: RegionNum                       Number of groups   =         6

R-sq:  within  = 0.6350                         Obs per group: min =         9
       between = 0.9994                                        avg =       9.0
       overall = 0.9606                                        max =         9

                                                Wald chi2(11)      =   1023.83
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FDI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LabForce	-2.048964	2.773319	-0.74	0.460	-7.48457	3.386641
UniversityEducation	-.0029647	.0213239	-0.14	0.889	-.0447588	.0388294
PSS	.0690748	.05136	1.34	0.179	-.031589	.1697385
VoFR	-.0541099	.0856537	-0.63	0.528	-.221988	.1137683
VoFW	.0131011	.2268225	0.06	0.954	-.4314628	.457665
PopIncr	51.45168	22.50814	2.29	0.022	7.336544	95.56682
AvgInc	60.25315	6.938627	8.68	0.000	46.65369	73.85261
NeFDI	-.0324215	.2137652	-0.15	0.879	-.4513936	.3865506
NeMarSize	2.340325	1.23442	1.90	0.058	-.0790944	4.759744
NeAvgInc	-28.03522	8.713426	-3.22	0.001	-45.11322	-10.95722
OwnPort	20193.68	10950.47	1.84	0.065	-1268.85	41656.21
_cons	-36365.9	12609.17	-2.88	0.004	-61079.43	-11652.37
sigma_u	0					
sigma_e	5150.1399					
rho	0	(fraction of variance due to u_i)				

Figure 23. Random-effect result of Data Set 2 (other regions)

(source: data processed by author in STATA 12)

```
Random-effects GLS regression                   Number of obs      =        54
Group variable: RegionNum                       Number of groups   =         6

R-sq:  within  = 0.6349                         Obs per group: min =         9
       between = 0.9994                                        avg =       9.0
       overall = 0.9605                                        max =         9

                                                Wald chi2(10)      =   1046.70
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

FDI	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LabForce	-1.863513	2.635165	-0.71	0.479	-7.028342	3.301315
UniversityEducation	-.0022514	.0208851	-0.11	0.914	-.0431855	.0386826
PSS	.0697209	.0507252	1.37	0.169	-.0296986	.1691405
VoF	-.0395786	.0601878	-0.66	0.511	-.1575446	.0783874
PopIncr	51.992	22.14964	2.35	0.019	8.579496	95.4045
AvgInc	60.12355	6.84159	8.79	0.000	46.71428	73.53282
NeFDI	.0113898	.1113344	0.10	0.919	-.2068217	.2296013
NeMarSize	2.334983	1.220629	1.91	0.056	-.0574064	4.727372
NeAvgInc	-29.16278	7.270925	-4.01	0.000	-43.41353	-14.91203
OwnPort	20808.76	10531.86	1.98	0.048	166.6988	41450.82
_cons	-38396.14	9281.572	-4.14	0.000	-56587.69	-20204.59
sigma_u	0					
sigma_e	5523.9502					
rho	0	(fraction of variance due to u_i)				

Figure 24. Random-effect result of Data Set 2 (with VoF)

(source: data processed by author in STATA 12)

2. Result discussions

It is quite surprise that in several analysis performed, the *LabForce* is resulted to have significant negative impact toward inflow FDI. Though, this coefficient of *LabForce* is not significant in some specific case. A possible explanation for this is that the LabForce representing the availability of labor force in the researched region and the whole nation is not concerned by the foreign investors. The foreign investors are now tending to pay more attention toward the quality of labor force. Although the high education level labor force, university students, is not concerned by investors, the professional secondary students seem to receive slightly interest. The insignificant in this value may be caused by the reduction in value in recent years. Except the labor

force, the analysis results of other determinants are meeting the expectations. All the variables expressing the transportation infrastructure have significant positive effect in attracting FDI. Especially, owning a national port will create great impact on inward investing decision of foreign investors. And also at the same time, FDI capital tend to flow into market with higher development potential, in this case is higher purchasing power. The inflow of neighboring FDI, in contrast, shows significant negative effect toward host region's FDI. It means the previous investment decision can affect the current one, since the investors are more interested in investing into the region with larger invested FDI. While the market development potential in neighboring provinces shows positive impact. This also can be seen as an explanation for the positive effect of road transportation. As the road transportation is the main channel to connect trading activities among NCoV provinces.

With the analysis result of Data set 2, the positive effect of market size and market potential is even clearer. However, the availability of national port in other regions only have quite significant impact toward inflow FDI. A reason for this insignificant is the utilization level of nation port is not efficiency, since the volume of freight transported by waterway is still small in some region.

Lastly, when comparing the result of two data sets, I can say that the North Central region has advantage in term of transportation infrastructure in comparison with other regions. While, on the other side, the other regions have better market condition in attracting inflow FDI.

CHAPTER 5: Conclusion

I used the econometric model imitating spatial econometric model to analyze the FDI determinants in NCRoV during the period 2007-2015. The main results can be concluded as follow:

Firstly, the model is acceptable in reality and the model proves that the transportation infrastructure in the researched region attract FDI. Which means the FDI tend to flow into the province owning national port or good transport system. Or building a national port and sufficient transport system can increase the amount of FDI.

Secondly, although the market size of neighboring area can increase slightly the FDI of host province, the inflow FDI and market potential of neighboring provinces draw FDI of host region. The market potential in demand and purchasing power in any province can attract inflow FDI. So if neighboring province has stronger market potential, it can absorb, reduce the FDI of host region.

The third conclusion is even in national level, the North Central region still has advantage in transportation infrastructure. Or I can say, by improving, expanding, enhancing the current national ports, transportation system, the North Central region can receive more in the competition of attracting inflow FDI.

These above conclusions lead me to a suggestion in economic policy: Not only maintaining a good transportation network to connect between the manufacturing factory and national port, but also creating the transport network in regional level to encourage the trading activities. Besides, the local government should have policies to improve human capital such as increasing quality and quantity of professional secondary school; increasing income per capita. The potential transportation network

and trading activities is the comparative advantage of North Central region in attracting FDI.

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