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FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH NEXUS: REGIONAL AND INTER-REGIONAL APPROACH FROM VIETNAM

Author Details: Nam Hoang Nguyen

Faculty of Business Management, Hanoi University of Industry

Email: nguyenhoangnam@hau.edu.vn

Anh Viet Le

Center for International Cooperation, Hanoi University of Industry

Email: levietanh@hau.edu.vn

Abstract

The purpose of the paper is to investigate the impact of FDI on regional and inter-regional economic growth for the period 2000-2018 in Vietnam by using the difference Generalized Method of Moments (GMM) and the Pooled Mean Group (PMG). The empirical results show that FDI only positively impacts on economic growth in the Red River Delta while it is not significant in two others. Moreover, FDI just enhances economic growth in inter-regional in the South but not significant in the North and the Central. The paper suggest to exploit FDI by local characteristics, exploit human resources, promote science and technology and adjust investment projects towards serving economic growth. Recurrent expenditures should be kept on a regular basis and directed towards regular expenditures that affect growth as education, science, environment and health care.

Keywords: FDI inward; regional linkages; inter-regional linkages; economic growth

1. INTRODUCTION

Vietnam's economy has been booming since the opening of renovation reform in 1986. The Vietnamese Government has been implementing macroeconomic and institutional reform policies to attract FDI resource around the world. The result brought Vietnam from low-income to middle-income country improving people's living standard and reducing impressively the rates of poverty. This shows that FDI together with macroeconomic and institutional factors has helped to promote economic activities that bring about practical benefits for the people.

Economic regions in Vietnam are different in terms of economic growth and living standards. The key economic regions in the South as the provinces in the Southeast and the North as those in the Red River Delta have higher living standards and growth rates than the rest. Each region applies a different policy to attract FDI, sometimes it competes with each other to make use of FDI advantages for economic development. There are 7 different regions in Vietnamese economy. The main content of the paper is to clarify more clearly the role of FDI for economic growth in each region. More interestingly, it also investigates the impact of FDI on economic growth under the circumstance of inter-regional level. There are 3 inter-regional linkages in Vietnam. Specifically, the inter-regional linkage in the North includes Red River Delta and Northern Mountainous Midlands; the inter-regional linkage in the Center embraces Northern Central Coast and Central Highlands; and the inter-regional linkage in the South involves Southeast & Mekong River Delta.

Some papers conclude that FDI inflows impact positively on economic growth in Vietnamese economy (Sajid Anwar & Lan Phi Nguyen, 2010; Long et al., 2018). However, there is no paper so far investigating the nexus between FDI and economic growth in inter-region in both the short-run and long-run. Thus, this paper will make efforts to fill in the gap. By the Arellano-Bond GMM and PMG methods, the paper analyzes the impact of FDI on regional and inter-regional economic growths in Vietnam for the period 2000-2018. The results will offer insights on

the role of FDI in the process of economic development. From that, it creates bases to map out appropriate policy not only to attract more FDI but also to use more effectively in the coming years.

Apart from the introduction section, the structure of the paper includes section 2 describes data and variables; section 3 presents experimental results; section 4 discusses the estimation results and section 5 makes some conclusions.

2. LITERATURE REVIEW

There are many studies on the impact of FDI on host economies. The diversity of studies is expressed through the use of data types, from time-serial to cross-sectional and panel data. However, few studies on the effects of FDI on the region and inter-regions, mainly conducted in former socialist countries, where there often exists a larger gap between rich and poor (Jin et al., 2016). The paper will briefly review some empirical studies, in which paying special attention to the cases of China, Russia because it is similar to the case of Vietnam. Specifically, these economies are moving to market-oriented economies from central-planning ones.

Kuiyin Cheung, Ping Lin (2004) examined the spillover effects of FDI on innovation in China: evidence from provincial data for the period 1995-2000, with FE and RE estimates. The result indicates the positive impact of FDI on domestic technology in regions in China.

Svetlana Ledyeva and Mikael Linden (2006) studied the links between FDI and regional economic growth in Russia. By using the Solow-Swan model (1956) and difference GMM method, for the data of 1996-2003 period, they found that there is no link between FDI and economic growth at the regional level in Russia.

Jimmy Ran et al. (2007) find out how FDI affects China. Empirical evidence from 19 industries and 30 provinces in China shows that FDI does not bring growth. Specifically, some provinces get positive effects from FDI (east and coastal localities) while others do not (west and central). The results show that disparities in development in China's regions as well as government policies are not appropriate to tap the positive impact on the growth of FDI inflows.

Wei K. (2008) researched on FDI and economic growth in China's regions in the period 1979-2003 by using OLS and GMM. The results showed that: (i) rapid economic growth in China has been supported by a large FDI inflows; (ii) FDI has helped domestic firms to improve their competitiveness and productivity; (iii) FDI is not the cause for the increase in inequality among regions in China. Therefore, FDI should be encouraged especially within the region to promote growth and reduce regional inequality.

Jiang Jianming and Masaru Ichihashi (2011) examined the impact of FDI on the localities of Jiangxi province-China, data from 91 localities of Jiangxi province in 2002-2009 period. The results indicated that the impact of FDI on economic growth can be largely explained by the labor input. However, due to the imbalance in regional development in Jiangxi province, the impact of stronger FDI in coastal areas while other localities impacting FDI on economic growth significantly. FDI impacts on different factors in different locations as GDP per capita in Northeast and labor factor in Southeast.

Fei Yu and Wang Jiang (2013) build panel smooth transition regression (PSTR) model to examine the non-linear effects of FDI on regional economic growth in China. The empirical results show that there is a non-linear and smooth transition feature between FDI and economic growth in China, explaining reasonably the difference economic effects of regions.

William Sheng Liu and Frank WogbeAgbola (2014) examined the effects of FDI on regional economic growth in electronic industry in China for the period 1989-2009. By estimating endogenous growth model for electronic industry, they showed that FDI enhances economic growth in the coastal regions while the impact is mixed in the central and western regions. Specifically, some determinants as human capital, fixed asset and export accelerate economic growth while unemployment and research and development (R&D) impede growth.

Ichiro Iwasaki and Keiki Sukanuma (2015) estimate the effect of FDI on total factor productivity (TFP) in Russian regions. The empirical results strongly suggest the remarkable role of FDI in the regional economic development in Russia. Additionally, they found that the positive effect of FDI on TFP may increase in the regions that received larger amounts of foreign capital.

Park Jaegon (2018) investigated the impact of inward FDI on regional economic growth in Korea. The empirical results showed that FDI positively impacts on regional economic growth and productivity, specifically in Seoul

capital. Interestingly, outward FDI weighs negatively on regional growth and productivity. Therefore, the paper suggests to argue the necessity of utilizing a global perspective in regional policymaking.

Most recently, Paula Gutiérrez et al. (2019) investigate the impacts of FDI on regional economic growth in Spain in the period 1996-2013. By using Spatial Durbin Model, they found that FDI enhances economic growth. Interestingly, they used the term “headquarter effect” to describe the popular phenomena in Spain, namely FDI is not always registered where it is effectively made but in the region in which the firm’s headquarters is located. The empirical results showed that only when the headquarters effect is properly addressed do spatial spillovers arise.

In Vietnam, Sajid Anwar and Lan Phi Nguyen (2010) found that there is two-way links between FDI and regional economic growth by using GMM method for the data of 61 provinces in the period 1996-2005.

Mai (2010) examines the role of FDI on regional economic growth in Vietnam. The author found that the infrastructure, the quality of the labour force and the size of the local market are the most important factors deciding the regional allocation of FDI flows. In turn, government tax incentives have not made any significant impact on attracting FDI flows to poor and remote provinces.

Chien et al. (2012) examined the impact of FDI on economic growth across Vietnam and cities ranked according to socio-economic conditions. Based on data from 63 provinces in Vietnam and using FE estimates, the author pointed out that FDI positively impact on Vietnam’s economic growth in the period 2000-2010. Accordingly, the impact is stronger in provinces or cities having better socio-economic conditions than those with lower socio-economic conditions. In addition, the impact of FDI on economic growth by regions in Vietnam showed that only four of the six regions of FDI positively effect on economic growth: Northern Mountainous Midlands, Central Highlands, Southeast and the Mekong delta.

Chien and Linh (2013) evaluated the relationship between FDI and economic growth in Vietnam by using data from 63 provinces in the period 2000-2010 and applying the FE estimation method. They found that there is a two-way positive relationship between FDI and GDP. At regional level, the findings showed that only five out of six regions of Viet Nam have a causal relationship particularly with the interaction becoming stronger and more active in isolated areas where the socio-economic condition is still difficult. This conclusion contrasts with previous studies.

The practice shows that regional research is interesting as each region owns different advantages and plays an alternative role in the comprehensive of national economy. Thus, this issue is still to study further to describe more clearly about the dynamic comparative advantages of each region. It will helps policy-makers to map out appropriate regulations to ensure long term sustainable economic growth.

3. DATA AND VARIABLES

The paper develops the empirical model based on the past literature. The model is presented in equation (1) to investigate the impact of FDI inflows and other factors on economic growth in Vietnam:

$$Y_{it} = \beta_0 + \beta_1 Y_{it-1} + \beta_2 X_{it} + \beta_3 CONTROL_{it} + \varepsilon_{it} \quad (1)$$

In which:

i is province or city, the paper collects data of 50 provinces or cities out of 63 ones in Vietnam.

t is the time, from the year 2000 to 2018.

Y is economic growth, derived from real GDP per capita of the province or city. This variable’s unit is measured in million domestic currency at the based-year 2000. The first-order difference of Y approximately equals to the growth rate. With equation (1), converting the Y_{it-1} variable to the left-hand side the paper obtains the first-degree difference of Y . Most empirical studies on the impact of FDI on economic growth applies this variable as a proxy for economic growth (Adeolu, 2007; Wu Jyun-Yi and Hsu Chih-Chiang, 2008; ElboiashiHosein Ali, 2011).

X_{it} is a set of variables in the Cobb-Douglas model, while FDI is measured in million USD then private investment is measured in billion domestic currency at the based-year 2000 and labor force is represented by a number of people.

$CONTROL_{it}$ is a set of control variables, including:

- (i) Some fiscal variables (tax revenues, public investment and recurrent expenditure)
- (ii) Variables reflect local characteristics (geography, wealth of the locality)

The paper bases on urban and economic features to derive the geographical characteristics of the locality.

Accordingly, based on government regulations, there are some types of locality as special type, city directly under central-government, provinces in the key economic zone and other cases. With its geographic characteristics, it helps to exploit the regional dimension of FDI inflows for economic growth.

The paper employs the rate of revenue distribution to the central budget as a proxy for measuring the level of development and the wealth of the locality. This control variable helps to exploit the regional features of FDI inflows and the wealth of the locality in relation to economic growth.

(iii) Other control variables (infrastructure, trade openness, consumer price index, and technology gap)

Based on the theory and results of the past empirical studies on the impact of FDI on economic growth, the paper determines the expected marks of the variables in the model as following:

Table 1: Expected marks of the variables

Criteria	Variables	Expected marks
Variables in Cobb-Douglas function	PRI – Private Investment	+
	FDI – Foreign Direct Investment	+
	LF – Labor Force	+
	TR – Tax Revenue	+/-
	PUI – Public Investment	+/-
	REXP – Recurrent Expenditure	+/-
Control variables	TELE - Telecommunication	+
	OPEN – Openness of an economy	+
	CPI – Consumer Price Index	+/-
	GAP – Technological Gap	+
	GEO – Geographic features	+
	WEALTH – Prosperity of each province or city	+

The paper examines the impact of FDI and some control variables on economic growth in the region as well as on inter-regional linkages in Vietnam. Panel data is collected for regional space from 50 provinces of Vietnam during period 2000-2018 officially provided by General Statistical Office. Since then, the paper has been experimented for three regions, namely the Red River Delta, the North Mountains & Midland and the North Central Coast.

Socio-economic regions have geographic proximity, supportive conditions and co-development. At the same time, it relies on state regulations for the development of inter-regions and data bases for research, the paper has been experimented for three inter-regions linkages, namely in the North, the Central and the South.

The paper realizes from the fact that FDI tends to focus on the localities owning more favorable conditions on the geography and modernized level such as Hanoi capital or Ho Chi Minh city. Therefore, the paper will add some instrument variables to test the characteristics of FDI inflows into Vietnam in more detailed. These instrument variables are following:

WEALTH: this variable measures the prosperity of each province or city. The paper relies on the ratio of regulating from local revenues to the central budget to derive the wealth of the localities. Specifically, the rate of local revenue regulation on central budget over 60% will be encoded as 4; from 50% to 60% as 3; from 10% to 50% as 2; up to 10% as 1 and the rest of encoding 0 (Mai, 2010).

GEO: this variable reflects local geographic features. In fact, some previous studies measure this variable by dummy one. However, by the difference GMM method, the regression results will be biased because it will be eliminated when differentiating dummy variable. Hence, the paper bases on the urban characteristics of the provinces in Vietnam to make classification. Specifically, some special urban cities will be encoded as 4, cities directly under central government are 3, key economic provinces are 2 and the remaining one is 1 (Mai, 2010).

Δ FDI: this variable measures the difference of local FDI in comparison with the national average. Δ FDI reveals how local FDI is compared to the national average. From localized measurement variables, it helps to exploit more in depth the nexus between FDI inflows and economic growth rate. For that reason, the paper integrates some integrated variables such as $(WEALTH*\Delta FDI)$ and $(WEALTH*GEO*\Delta FDI)$ to put into empirical model.

$WEALTH*\Delta FDI$: this variable reflects the FDI inflow which is attracted by the prosperity of each locality.

WEALTH*GEO* Δ FDI: this variable reflects the FDI inflow which is attracted by both the prosperity and the modernized level of each locality.

4. EMPIRICAL RESULTS

Results of the correlation tests between regions and inter-regions show that most pairs of variables are statistically significant at smaller or equal to 5%. According to Evans (1996), the acceptable correlation coefficient was less than 0.8. As such the majority of variable pairs were satisfied in the empirical model. Besides, regions and inter-regions linkages also exist for pairs of variables with high correlation coefficients. Specifically, there are infrastructure and growth variables in the Red River Delta. The fact in the North Mountains & Midland and the North is that the private investment, technology gap and infrastructure variables link to growth. A pair of infrastructure and private investment variables has high correlation coefficients in the Central. And in the South, there exists two pairs of variables with high correlation coefficients, namely technology gap-growth and infrastructure-private investment. Overall, all the variables in the research model ensure statistically significant estimations.

4.1. The impact of FDI on regional economic growth

The results show that FDI and control variables differently effects on economic growth in Vietnam's regions. Specifically, in Red River Delta, FDI and private investment and trade openness impact economic growth statistically significant at 10% while human resource effect at 5% and the impacts of infrastructure and technological gap meaning at 1%. Surprisingly, public investment is not statistical significant. In fact, loss and waste in public investment lasted for many years, limiting investment efficiency, causing budget deficit and increasing national public debt. "Group interests" together with poor management have led to corruption and waste, the most obvious consequence of which is making public investment a burden on the economy. Estimated results in the Northern Mountains & Midland indicate economic growth in this region unstably. The results reveal that only infrastructure and technological gap variables have positive impact on economic growth, statistical significance at rates of 1% and 5% respectively. The North Central Coast show economic growth based on the most controlling factors. The factors that have a significant positive impact on growth are: private investment, infrastructure, technology gap (at 1% significance), human resources (at 10% significance) and negative impact of recurrent expenditure factor (at 1% significance) and consumer price index (at 5% significance).

Table 2: Regression results by the difference GMM

Variables	Red River Delta		North Mountains & Midlands		North Central Coast	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
GDP (-1)	0.409268	0.000***	0.68332	0.000***	0.695323	0.000***
PRI	0.073121	0.072*	0.099414	0.602	0.039798	0.003***
FDI	0.019642	0.069*	-0.004802	0.391	-0.006189	0.451
LF	1.186751	0.031**	-0.019715	0.886	0.298443	0.079*
PUI	0.089866	0.602	0.018637	0.779	0.004661	0.243
TR	0.041522	0.645	0.059917	0.514	0.125463	0.166
REXP	-0.385671	0.869	0.0612143	0.588	-1.212284	0.001***
TELE	0.058975	0.003***	0.059998	0.006***	0.059941	0.000***
OPEN	0.019988	0.081*	-0.003122	0.589	0.005196	0.688
CPI	-0.078965	0.412	0.088792	0.291	-0.257682	0.018**
GAP	0.468713	0.000***	0.583620	0.015**	0.499875	0.004***
WEALTH * Δ FDI	NA	NA	0.006815	0.291	0.004889	0.281
WEALTH *GEO* Δ FDI	0.002422	0.791	NA	NA	-0.001888	0.778
Obs.	174		154		191	
Sargan test	0.198		0.292		0.168	
AR(2)	0.682		0.184		0.121	

Note: The asterisks *, ** and *** denote the statistical significance at the 10, 5 and 1 percent levels, respectively.

In the Red River Delta, in the long term, some variables as FDI, human resources and technological gap are statistically significant for growth at 1% while public investment factor affect in turn also statistical significance at 1% level. In the short term, some variables are statistically significant as FDI, public investment, technology gap and infrastructure but the error correction is not statistically significant. It means that the short-term economic growth is not stable and does not reach equilibrium due to the shocks. In the North Mountains & Midland, economic growth demonstrates the long-term co-integration of private investment, human resources, public investment and technological gap at a 1% statistical significance level. Meanwhile, the technological gap and infrastructure variables are positively affect economic growth, the error correction reached a value of +0.05 indicates a slide out of the long-term equilibrium. For the North Central Coast, the co-integration of variables for economic growth rather sustainably. It reveals through in the long term all variables are statistically significant at 1%. Some variables as private investment, FDI, human resources, technological level affect positively economic growth. In turn, the impact of public investment is negative showing the ineffectiveness of this variable in this region. In short-term, some variables that are statistically significant to economic growth include public investment, technology gap and recurrent expenditure.

The results in Table 3 show strong co-integration in economic growth in Vietnam's regions and indicate the ineffectiveness of public investment resources as well. In the short-run, the error correction is only statistically significant in the Northern Mountainous Midlands but with a positive sign and a small value (0.05) meaning it is out of equilibrium. Actually, the estimated results are appropriate for the fact of developing countries like Vietnam.

Table 3: Regression results by the PMG method

Dependent variable: GDP						
Panel A: Long-run coefficients						
Independent variables	Red River Delta		North Mountains & Midlands		North Central Coast	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
PRI	0.028962	0.492	0.173382	0.000***	0.079661	0.000***
FDI	0.066911	0.000***	0.019377	0.146	0.027362	0.000***
LF	2.142753	0.002***	3.669924	0.005***	1.963411	0.000***
PUI	-2.751662	0.000***	0.513322	0.000***	-0.091361	0.002***
GAP	0.446332	0.003***	2.164352	0.000***	1.822553	0.000***
Panel B: Short-run coefficients						
Error Correction	-0.061233	0.174	0.14625	0.048**	-0.159242	0.148
Δ PRI	0.017786	0.312	0.005112	0.816	0.029854	0.225
Δ FDI	-0.016623	0.005**	0.000717	0.829	-0.005882	0.366
Δ LF	0.586879	0.599	0.311424	0.146	-0.416623	0.199
Δ PUI	-0.269691	0.041**	0.168979	0.191	0.332215	0.031**
Δ GAP	0.884232	0.000***	1.635142	0.000***	0.773123	0.021**
TR	0.021457	0.579	0.031628	0.899	0.091688	0.365
REXP	NA	NA	NA	NA	0.272345	0.053*
TELE	0.018126	0.048**	0.009842	0.081*	0.036812	0.316
Cons.	0.13528	0.916	18.3162	0.029**	-9.370122	0.514
Obs.		191		172		224
Log Likelihood		-224.5038		-245.7129		-255.8906

Note: The asterisks *, ** and *** denote the statistical significance at the 10, 5 and 1 percent levels, respectively. NA means not available.

As such, FDI impacts positively on the Red River Delta and North Central Coast regions in the long-term in some aspects. First, FDI is increasingly proving to play an important role in supplementing investment capital in the provinces and cities of the region, meeting the investment needs of social development, promoting economic growth and contributing to the transformation of economic structure. The FDI sector has strongly influenced the growth and economic restructuring of localities in the region. Second, FDI has created many new industries and strengthened the capacity of many industries in the provinces. FDI creates the diversity and increases the level of sophistication and

complexity in the country's products, making important contributions to promoting and expanding export markets, transforming the structure of export products, step by step bringing Vietnam into the global production network and value chain. Third, through attracting FDI, the province in the region has absorbed modern technical technologies and advanced governance experience. Additionally, FDI along with new business methods have created competition in the domestic market, promoting domestic enterprises to innovate technology and improve product quality. Fourth, FDI creates spillover effects to other economic sectors in the economy through the linkage between foreign-invested enterprises and domestic enterprises. The efficiency of foreign-invested enterprises is improved through the number of enterprises increasing investment capital and expanding production scale. In turn, FDI impacts on economic growth of North Mountains & Midlands region is not statistical significant. So far, this region still has many difficulties such as remote geographical location, undeveloped transportation in some provinces, economic space is still divided by administrative boundaries, etc. The lack of the linkage and support between localities in economic development is also one of the reason why this region as a whole is not attractive to foreign investors compared to other regions.

4.2. The impact of FDI on inter-regional economic growth

Inter-regional linkages in Vietnam create comparative advantage in economic growth. Inter-regional linkage in the North shows a positive effect of factors on economic growth as human resources, taxation, statistically significant at 10%; FDI by urban characteristics, at 5% significance; infrastructure and technology gap, at 1% significance. Inter-regional linkage in the Central, economic growth performance depends on the positive impacts of private investment, human resources, public investment, infrastructure, and technology gap. At the same time, recurrent spending and the consumer price index have a negative impact on the growth process. Inter-regional linkage in the South, growth rate exhibits sustainability by the significant impact of positive observed variables as private investment, FDI, human resources, infrastructure and technology gap. Meanwhile, tax revenues and trade openings negatively impact on growth.

Table 4: Regression results by the difference GMM

Variables	Red River Delta & North Mountains & Midlands		North Central Coast & Central Highlands		South East & Mekong River Delta	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
GDP (-1)	0.698003	0.000***	0.652234	0.000***	0.357261	0.000***
PRI	0.011345	0.652	0.036221	0.092*	0.334152	0.000***
FDI	-0.007081	0.616	-0.007886	0.422	0.041882	0.006***
LF	0.483365	0.092*	0.071002	0.002***	0.762248	0.018**
PUI	-0.081003	0.363	0.091243	0.028**	-0.345921	0.307
TR	0.223605	0.059*	0.105673	0.258	-0.033532	0.041**
TELE	0.062445	0.002***	0.098712	0.000***	0.075422	0.029**
OPEN	-0.003156	0.727	0.009291	0.864	-0.061978	0.002***
CPI	0.046632	0.599	-0.321646	0.019**	0.188725	0.418
GAP	0.655282	0.000***	0.473216	0.038**	0.052588	0.031**
WEALTH *ΔFDI	0.032655	0.042**	0.008624	0.217	0.019135	0.446

WEALTH	-0.019735	0.224	0.002915	0.792	-0.006277	0.803
GEO Δ FDI						
Obs.	275		181		218	
Sargan test	0.172		0.235		0.184	
AR(2)	0.359		0.162		0.381	

Note: The asterisks *, ** and *** denote the statistical significance at the 10, 5 and 1 percent levels, respectively.

In addition, with the value of p is bigger than 10%, the paper concludes that there is no endogeneity and auto-correlation phenomenon in the model based on Sargan statistics and the Arellano-Bond test respectively. In order to exploit the long-term co-integration and short-term dynamics characteristics in Vietnam's inter-regional economic growth, the paper applies the PMG method and the estimation results are shown in Table 5.

Table 5: Regression results by the PMG method

Dependent variable: GDP						
Panel A: Long-run coefficients						
Independent variables	Red River Delta & North Mountains and Midlands		North Central Coast & Central Highlands		South East & Mekong River Delta	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
PRI	0.413356	0.001***	0.165442	0.004***	0.397743	0.000***
FDI	-0.021448	0.315	0.059221	0.009***	0.083325	0.001***
LF	2.883207	0.001***	1.826613	0.000***	0.193752	0.663
PUI	-4.881442	0.000***	0.315127	0.001***	-0.833261	0.000***
GAP	3.654989	0.001***	2.996673	0.000***	0.814325	0.001***
Panel B: Short-run coefficients						
Error Correction	0.039912	0.241	0.098933	0.004***	-0.081779	0.269
Δ PRI	0.009117	0.528	0.058825	0.000***	0.042837	0.081*
Δ FDI	-0.000214	0.912	0.004241	0.492	0.002318	0.816
Δ LF	0.251821	0.714	0.388216	0.217	-0.718452	0.041**
Δ PUI	-0.201876	0.159	0.176601	0.014***	0.019877	0.892
Δ GAP	1.357662	0.001***	1.228759	0.001***	0.828132	0.000***
TR	0.063263	0.318	0.081354	0.041**	0.193665	0.375
Δ REXP	NA	NA	NA	NA	-0.566842	0.247
Cons.	8.042357	0.007***	2.678959	0.019***	-8.729811	0.312
Obs.		329		217		243
Log Likelihood		-491.3208		-325.2274		-314.0182

Note: The asterisks *, ** and *** denote the statistical significance at the 10, 5 and 1 percent levels, respectively.

The PMG regression results show a strong long-term co-integration in inter-regional linkages at 1% statistical significance. Inter-regional link in the North, long-term co-integration demonstrates the positive impact of private investment, human resources, technology and negative effect of public investment. Inter-regional link in the Central Highlands represents a positive and significant effect of all control variables. Meanwhile, inter-regional link in the South, except the negative impact of public investment and human resources is not statistically significant, all the remaining variables have a positive impact on economic growth.

4.3. Discussion on the characteristic of regional economic growth

Regional economic linkage is essentially the association between different economic identities in a region, based on economic interests in order to promote comparative advantages and create higher economic competitiveness for an area. Forms of regional economic linkages are expressed in terms of economic space by territory, commodity chain, and production organization. The guidelines and policies on regional development and regional linkage not

only create driving forces for economic development, but also help disadvantaged areas to well perform their functions of conserving resources, ecology, stabilizing security, politics and society.

For the Red River Delta alone, specificity is expressed separately in the observed variables and at the level of impact of the factors. In particular, when comparing regions separately, only in the Red River Delta FDI inflows and trade openness have a significant impact on economic growth. Accordingly, a 1% increase in FDI will stimulate the growth rate up by 0.01%, statistical significance at 10% level. This indicate this region has favorable conditions to exploit FDI capital to serve economic growth.

In the North Mountains& Midlands, the distinctiveness of the region is reflected in the impact of infrastructure and technology gap. Infrastructure has a positive impact on economic growth at a 1% significance level, which shows that infrastructure is important to the region's growth. Technological gap also has a positive impact on economic growth at 5% significance level. Estimates in this region also show that just few factors having influences on economic growth which may explain the lack of stability and durability in economic growth compared to other regions.

The North Central Coast, the factors that have significant impacts for this region when compared to other regions are the recurrent expenditure and CPI. Recurrent expenditure has a negative impact on economic growth at a 1% significance level so it is important to adjust in recurrent spending in this region to meet the growth needs. The CPI in this region also has a negative impact on growth at 5% significance level. In addition, the factors indicating the positive impact on economic growth at a 1% significance level includes private investment, infrastructure and technology gap. Human resources also have a positive impact on growth at 10% significance level.

For the inter-regional linkage in the North, the variation is expressed in the urbanized FDI factor. This means that FDI in cities with favorable urban characteristics will have positive impacts on growth such as Hanoi-special urban city or Haiphong portal city. In terms of impact, human resources have a positive and significant impact on growth, specifically 1% increase in human resources will lead to the 0.46% increase in economic growth at 10% significance level. The technology gap has a positive impact on economic growth at the ratio of 1% - 0.48%, statistical significance at a 1%. Besides, infrastructure and tax dynamics have a positive impact on growth rate.

For the inter-regional linkage in the Center, public investment impacts positively on economic growth (0.08%) at 5% significance; recurrent expenditure and economic shock have negative impacts, respectively -1.23% at a 1% significance and -0.22% at 5% significance levels. In turn, human resource and infrastructure affect positively growth rate statistically significance at a 1% level. Technological gap stimulates growth rate at 5% significance and private investment also contributes to positive economic performance at 10% statistical significance.

For the inter-regional linkage in the South, factors that characterize inter-regional integration in growth as FDI increases by 1% positively impact on growth rate by 0.03% at a 1% significance level. That affirms the role of FDI for growth process. Trade openness has a negative impact on growth at a significance level of 1%. This is explained the inter-region linkage and trade expansion does not promote positive effects. Other variables that have a positive impact on inter-regional economic growth in the South include private investment, human resources, both at a 1% significance levels; infrastructure and technology gap, both at 5% significance levels. Simultaneously, it distorts the negative impact tax on growth (-0.23%) at 5% statistical significance.

4.4. Discussion on the co-integration feature in regional economic growth

In the long-term, the co-integration in the Red River Delta expressed between economic growth and FDI representing a positive impact statistical significance at a 1% level, which indicates the importance of this source for the growth process in the region. Public investment affect negatively on growth rate at a 1% significance level, showing the ineffectiveness of public investment in this area. Technology gap and human resources actively contribute to the growth in this region at a significance level of 1%.

Compared to other regions, FDI in the Red River Delta has the strongest impact on economic growth which is relevant to the fact that this region has the best conditions to exploit FDI factor for growth. On the other hand, the short-term dynamics which represents the adjustment to long-term equilibrium indicate a lack of stability. It is demonstrated through the fact that the error correction is not statistical significance. In the short term, FDI inflows negatively impacts on growth at a significance level of 1% reflecting the new FDI projects that had a negative effect

on growth.

In the North Mountains & Midland, estimated results show that FDI inflows are not co-integrated in long-term economic growth. The remaining variables as human resources, private investment and technological gap positively impact on economic growth at a 1% significance level.

In the North Central Coast, the co-integration is strongest when compared to other regions between economic growth and observed variables in the long-term with high statistical significance at a 1%. Accordingly, the variables that have a positive effect are private investment, FDI inflows, human resources, technology gap. Conversely, public investment impacts negatively on the economic growth. Comparing to other regions, the co-integration is the strongest expressed in the human resource followed by the technology factors.

Because of the error correction is not statistically significant, thus, the short-term dynamics indicate a lack of sustainability. In the short-term, some variables affect positively growth as public investment and technology gap at 5% and recurrent expenditure at 10% significance levels.

Regarding inter-regional linkage in the North, the long-run co-integration is performed between economic growth and private investment, human resources and technological gaps. All three above factors have positive effects on the growth rate at a 1% statistical significance. Conversely, the public investment negatively impacts on economic growth at a 1% significance level. The short-term dynamic characteristics in Northern provinces show instability and deviation from equilibrium due to shocks because of positive and non-statistically significant error correction. Subsequently, the technology gap has positive effects on growth with a statistical significance of a 1% level.

On inter-regional linkage in the Central Highlands, the linkage between economic growth and all control variables. Concretely, all variables have a positive effect at a 1% significance level, showing strong co-integration in this region in the long-term. At the same time, the short-term dynamic characteristics is also deviated from the equilibrium. Some variables as private investment, public investment, technology gap and tax revenue positively impact on economic growth which is statistically significant at 1% level except the case of tax revenue at 5% significance level.

Over inter-regional linkage in the South, linkage in this region is expressed between economic growth and independent variables at a 1% significance level. Specifically, positive effects derived from private investment, FDI and technology gap variables while public investment has negative impact on economic growth. In addition, the human resource factor is not established when acting as a positive impact on growth. This can be explained by the fact that, because of the variation in human resources in both quantitative and qualitative aspects, the clear role of this factor affects growth is not established when linking the two regions. In addition, the economic growth in the provinces in the South linkage shows the unsustainable. The positively partial impacts and statistically significant effects are private investment at 10% significance, technology gap at a 1% significance. Conversely, human resources negatively impact on growth rate in the short-term at 5% significance.

5. CONCLUSION

The impacts of FDI and other independent factors on growth has been demonstrated in both theories and previous empirical studies. However, the extent of impact varies from one region or inter-region to another. In Vietnam, by the PMG method, the results show that the co-integration is expressed in three regions which are the Red River Delta, the North Mountains & Midlands and the North Central Coast and three inter-regional linkages including in the North, the Central and the South. Simultaneously, the difference GMM indicates that there are regional and inter-regional characteristics. Specifically, the effect of FDI on economic growth is strongest in the South. In addition, the results show the robustness of the model. That shows the consistency and durability of the data as well as the research model. Besides, other factors also have significant impacts on regional and inter-regional economic growth such as human resources, private investment, and infrastructure. The empirical results offer policy recommendations in order to exploit the characteristics in each region as follows:

First, in terms of awareness, it needs to consider the process of economic restructuring and regional growth model transformation as an important part of economic restructuring and national growth model transformation. This is a method to create spearheads and “growth holes” for sectors and fields of the economy in order to maximize the potential and advantages of regions and localities in the overall economy.

Second, building a regional coordination and governance mechanism. Formulating a regional economic

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integration strategy in the national development strategy, creating a basis for the formulation of master plans, plans, development programs, investment, governance, public services, industrial development, agriculture and services, etc... suitable for each region and inter-region effectively.

Third, for key economic regions, consideration should be given to promulgating policies to compete with regional and world economic centers; clearly stipulates that regional linkages must be in the direction of a knowledge economy and approach to the industrial revolution 4.0. Forming a number of economic linkage zones across national borders with a number of neighboring countries to increase effective economic cooperation.

For regions with difficult socio-economic conditions, it is necessary to map out policies to direct investment attraction to industries exploiting comparative advantages, suitable to natural and social conditions. Clarifying the functions of ecological conservation, cultural preservation, and political security assurance, so that there are overall integrated policies specific to the region to ensure the above functions.

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