

ECONOMIC GROWTH AND FOREIGN DIRECT INVESTMENT IN VIETNAM: AN EMPIRICAL ANALYSIS

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Abstract

The linkages of foreign direct investment (FDI) to economic growth have been an issue of intense argument for a long time. Although this debate has provided rich insights into the relationship between FDI and growth in developing countries, there is very little empirical analysis of the issue in Vietnam compared to other developing countries, especially in applying a simultaneous equation model to test the relationship between FDI and economic growth. Our findings show that FDI and economic growth are important determinants of each other in Vietnam. Moreover, these findings emphasize that the impact of FDI on provincial economic growth is positive only when Vietnamese provinces have a certain threshold of financial development, human capital stock, research and development, and technology.

1. Introduction

Foreign Direct Investment (FDI) inflows into Vietnam since 1988 have been regarded as a very impressive phenomenon of the economic transition from a centrally planned economy to a market oriented economy (Kokko et al., 2003). Since the reform policy known as Doi Moi was implemented in 1986, annual FDI inflows into Vietnam have increased dramatically from USD 0.32 billion in 1988 to nearly USD 4.0 billion in 2005, with an annual growth rate of 28 percent (GSO, 2006). During this period, FDI inflows have played a very important role, not only in providing investment capital but also in stimulating export activities, as well as introducing new labour and management skills, transferring technologies and generating job opportunities.

FDI inflows not only into Vietnam but also into many other developing countries take advantage of the comparative advantage of these countries with respect to cheap labour and natural resources. As a result of FDI inflows, many developing countries, especially Asian newly industrializing countries (NICs), have experienced great advances in their economic development.

However theoretically as well as practically, there are still inconclusive arguments for and against the role of FDI inflows in enhancing economic growth in a country. Whether FDI inflows are beneficial or not to economic growth, and what governments should do to attract and use FDI inflows effectively, are still a matter of considerable debate.

The central question of the paper is whether a two-way linkage between FDI and economic growth in Vietnam exists. Thus, this paper seeks to analyze FDI inflows into Vietnam and to investigate their effect on provincial economic growth. An analysis of FDI and its effect on provincial economic growth is important to help Vietnam enjoy further economic development. The paper is organized as follows. Introduction is presented in Section 1. Section 2 reviews the literature. Section 3 presents the empirical specification. Data and econometric technique are illustrated in Section 4. In the next section, we discuss and analysis estimation results. Finally, Section 6 concludes.

2. Literature review

In the endogenous growth theories, Lucas (1988, 1990), Romer (1986, 1987) and Mankiw (1992) amended the exogenous growth model, especially the Solow growth model, by including the growth driving factors of human capital as well as physical capital to explain the presence of FDI in developing countries. Based on their models that are viewed as the endogenous growth models, the effect of FDI on economic growth can be through technology diffusion. Technology diffusion plays a central role in promoting economic growth. The theories highlight the dependence of the long run economic growth rate on the state of domestic technology relative to that of the rest of the world. Technology diffusion can take place through a variety of channels that involve in the transmission of ideas and new technology. One of the channels is through for developing country to access advanced technologies. FDI by multinational corporations is viewed as a major channel for the access to advanced technologies by developing countries. MNCs with advanced technologies are a substantial part of the world's R&D investment. Findlay (1978) illustrates that FDI increases the rate of technological progress in the host country through a "contagion" effect from the more advanced technology, management practices, etc. used by the foreign firms. Be-

sides, FDI can contribute significantly to human capital such as managerial skills and research and development (R&D). MNCs can have a positive impact on human capital in host countries through the training courses they provide to their subsidiaries' local workers. The training courses influence most levels of employees from those with simple skills to those presenting advanced technical and managerial skills. Research and development activities financed by MNCs also contribute to human capital in host countries and thus enable their economies to grow in the long term (Blomstrom and Kokko 1998; Balasubramanyam et al. 1996). On the other hand, the Eclectic Theory of FDI, which was developed by Dunning (1988), provides an alternative tool to analyze the relationship between FDI and economic growth. Based on location advantages, many empirical studies have found that economic growth is an important determinant of FDI. Chakrabarti (2001) pointed out that higher economic growth results in greater FDI inflows as it is a measure of the attractiveness of the host countries. Moore (1993) argued that as economic growth rises, FDI inflows into host countries tend to be encouraged.

Recently, empirical studies have used the endogenous growth models to investigate the impact of FDI on economic growth in host developing countries at the macro-level. In an empirical study, Borensztein et al. (1998) examine the influence of FDI on economic growth in 69 developing countries over two periods, 1970-1979 and 1980-1989. In the endogenous growth model in which economic growth is determined by FDI, human capital, government expenditure, domestic investment, inflation rate, and institutions, they use two stage least squares (2SLS) estimator to deal with endogeneity problems and found that FDI inflows positively influence economic growth. In addition, they also point out that the relationship between FDI and domestic investment in these countries was complementary.

De Mello (1999) estimated the impact of FDI on capital accumulation, and output and total factor productivity growth in a recipient economy. By using time series and panel data evidence of a sample of OECD and non-OECD countries over the period 1970-1990, de Mello indicated that FDI boost economic growth in the long run through technological progress and knowledge spillovers. However, de Mello emphasized that FDI led growth depends on the degree of complementarity and substitution between FDI and domestic investment.

By using a panel data for 18 countries in Latin America over the period 1970-1999, Bengoa and Sancher-Robles (2003) pointed out that the impact of FDI on economic growth are positive only when host countries had adequate human capital, economic stability, and liberalized markets. Similarly, using a sample of 84 countries, Wang and Wong (2004) indicated that FDI promotes economic

growth only when host countries have an adequate level of human capital. Alfaro et al. (2002), using cross country data for the period 1975-1995, showed that FDI plays an important role in contributing to economic growth. However, countries with well-developed financial markets gain significantly from FDI. This means that countries with better financial systems can exploit FDI more efficiently. As a result, FDI can contribute more to economic growth in these countries. This finding is supported by Hermes and Lensink (2003) using a panel data of 67 developing countries for the period 1970-1995 and by Aghion et al. (2006) using a sample of 118 countries over the period from 1960 to 2000. Moreover, they also emphasize that less developed countries should first reform their domestic financial system before liberalizing the capital account to allow for enlarged FDI inflows. As a result, an increase in FDI is important to enhance economic growth in these countries.

Tsai (1994) employed a simultaneous system of equations to test a two-way linkages between FDI and economic growth for 62 countries in the period of 1975-1978 and for 51 countries in the period of 1983-1986. He found that two-way linkages are existed between FDI and growth in the 1980s. In an empirical study, Berthelemy and Demurger (2000) used a simultaneous equation model estimation based on a sample of 24 Chinese provinces from 1985 to 1996 to test the relationship between foreign direct investment and economic growth. They found that FDI inflows played an important role in promoting provincial economic growth in China over the period 1985-1996. Moreover, they stressed the importance of the potential for future growth in foreign investment decisions. Bende-Nabende et al. (2001) also investigated whether FDI caused economic growth of the ASEAN-5 economies over the period 1970-1996, and, if that was so, whether economic growth had a significant effect in attracting FDI to region. Their findings showed that FDI promoted economic growth most effectively through human capital factor and through learning by doing effects, and in turn economic growth influenced FDI.

Using a panel of data for 84 countries over the period 1970-1999, Li and Liu (2005) applied single equation and simultaneous equation system to examine the endogenous relationship between FDI and economic growth and found that endogeneity between FDI and economic growth does not exist for the whole sample period. Only from the mid-1980s, FDI and economic growth become significantly complementary to each othered and form an increasing endogenous relationship. Moreover, they showed that FDI not only directly promotes economic growth by itself but also indirectly does so via its interaction terms. In their paper, Li and Liu illustrated that there is a strong positive interaction effect of FDI with human capital and a strong negative interaction effect of FDI with

the technology gap on economic growth in developing countries. The empirical result from the paper also confirms that human capital and technology-absorptive ability are very important for FDI to positively promote economic growth in developing countries.

Although these studies provide evidence of the effect of FDI on economic growth in both developed and developing countries like Vietnam, there have been few quantitative studies considering the role of FDI in promoting regional economic growth, especially provincial economic growth. Moreover, the two-way linkage between FDI and economic growth in which FDI promotes economic growth and in turn economic growth is viewed as a tool to attract more FDI is limited. Thus, the study fills in the literature review by measuring the two-way linkage between FDI and economic growth in Vietnamese provinces. In addition, the study also investigates whether the impact of FDI on provincial economic growth are positive only when Vietnam had adequate human capital, technology, and liberalized markets.

3. Empirical specification

In an empirical study implemented by Hendry (2000), economic growth and FDI have been found to depend on many factors. The endogenous growth theory and the eclectic theory of FDI present assistance for the empirical specification that captures the linkage between economic growth and its determinants and FDI and its determinants. However, the determinants of economic growth and FDI possibly vary from country to country and from region to region. Based on the endogenous growth theory and the FDI location theory as well as empirical studies, the section summarizes the determinants of economic growth and FDI.

3.1. Determinants of Economic Growth

Theoretically and practically, FDI can accumulate capital and bring advanced technology, and advanced managerial and labour skills which affect positively on the economy. Recent empirical growth studies have provided investigations of these determinants of economic growth.

Human capital: In endogenous growth theory, human capital has been recognized as an essential determinant of economic growth. Mankiw et al. (1992), Barro and Sala-i-Martin (2004), and Benhabib and Spiegel (1994) have long stressed the importance of human capital to growth in both developed and developing countries. Benhabib and Spiegel (1994) pointed out that human capital is a factor affecting productivity growth, as suggested by endogenous

growth theory. The authors used the school enrollment as a proxy for human capital.

Learning by doing: Another determinant of economic growth is learning by doing. Arrow (1962), Romer (1986), and Stokey (1991) emphasized the importance of learning by doing in promoting economic growth in the long term. In their endogenous growth models, Grossman and Helpman (1990) emphasized that learning by doing can have a positive effect on growth during economic transition, as well as in the long term. Bende-Nabende et al. (2001) found that technological learning by doing can stimulate economic growth in the ASEAN-5 economies in the period 1970-1996. In their research, they used annual manufacturing value added as a percentage ratio of GDP to be a proxy for learning by doing.

Exports: The endogenous growth theory pioneered by Romer (1986) and Lucas (1988) has provided persuasive evidence for the proposition that exports affect positively growth in a country. Grossman and Helpman (1991), and Barro and Sala-i-Martin (2004) argued that a more open trade regime to the rest of the world leads to a greater ability to absorb technological progress and export goods that stimulates economic growth. Exports mostly are measured as the ratio of exports over GDP in recent empirical studies. Grossman and Helpman (1990), and Rodrik (1992) have pointed out that exports can potentially create growth-accelerating forces.

Macroeconomic stability: Macroeconomic stability is one important determinant of economic growth. In researches by Tobin (1965), Stockman (1981), Friedman (1977), Sidrauski (1967), Gomme (1993), and Fischer (1993) the inflation rate was used as an indicator of macroeconomic stability. Another macroeconomic stability factor is the real exchange rate. Real exchange rate volatility is defined as an indicator for poor macroeconomic policies that lead to real exchange rate misalignment and influence growth (Husain et al., 2005; Kamin and Rogers, 2000). Thus, the effect of the real exchange rate on economic growth is negative.

Financial development: Barro (1991) pointed out that financial development has a significant positive impact on economic growth. King and Levine (1993) found that higher levels of domestic investment are positively related to faster economic growth. Hermes and Lensink (2003) argued that private investment influences growth through the level of technology, especially which related to upgrading existing or adopting new technologies, based either on a demonstration effect, a competition effect, or a linkage effect. Thus, an economy needs to develop its domestic financial system.

Public investment: Most public investment in developing countries could negatively influence economic growth. Durham (2004) argued that public investment is financed by increasing taxes; it could further raise distortions in the economy and increase input costs. This leads to a negative impact on expected output growth. However, public investment can also positively affect output growth by investing more in infrastructure and human capital. Blankenau and Simpson (2004) showed that governments play an essential role in human capital accumulation by providing funds for formal schooling. Public education expenditures directly affect human capital accumulation and consequently influence long-term growth. Thus, a positive effect of public investment on economic growth is expected.

Other determinants: Recent studies implemented by Sachs (2003), and Presbitero (2005) stated that geography plays a direct and essential role in promoting economic growth through many channels including human health, agricultural productivity, physical location, and proximity and ownership of natural resources. Presbitero (2005) argued that geographical conditions, especially climate and natural endowment, could directly influence the level of current income through the availability of natural resources as well as enabling to access international trade and commercial routes. On the other hand, geography also influences the disease ecology such as malaria and other tropical diseases, which hamper social and economic growth in different ways.

3.2. Determinants of FDI

Market size: market size is one of the most important determinants of explaining the location of FDI. Market size is defined as the level of development of the economy, usually measured by per capita GDP. Moreover, the perception by MNCs of market size is more closely correlated to the growth rate of the market. Empirical studies have examined both income and economic growth and find that higher income can attract more FDI inflows into host countries by increasing the market size and purchasing power in such countries. Kravis and Lipsey (1982) demonstrated a positive influence of market size in host nations on the location decision of U.S. MNCs in the 1960s. Based on the cross-sectional data of 135 countries for the year 1994, Chakrakarti (2001) found that the market size of a host country, measured by GDP per capita, had the strong explanatory power determining its FDI inflows.

Infrastructure development: Clearly, the better the infrastructure in the host country, the more attractive it is to the MNCs. In fact, foreign investors seek host countries which have the international-standard infrastructure facilities to invest in because efficient infrastructure helps them reduce transaction costs. In

empirical studies, an infrastructure variable proxied by expenditure on road transport (Hill and Munday, 1992), per capita usage of energy (Mudambi, 1995), telephones per thousand population (Asiedu, 2002), railway transport (Bengoa and Sanchez-Robles, 2003), and a general transportation/urbanization index (Glickman and Woodward, 1988), has been found to have a positive and significant coefficient on FDI.

Labour market: The level of the attractiveness of developing countries in attracting FDI depends on the labour market of the host countries in terms of labour cost, availability, and productivity. The economists emphasize the role of cheap labour in determining the location of FDI because it is in line with developing countries' comparative advantage. Moore (1993) and Lucas (1993) suggested that as host country labour costs rise, FDI inflows into host countries tend to be discouraged. In contrast, the more labour that is available in the host countries, the more attractive it is to the foreign investors. The empirical studies implemented by Biswas (2002), and Brainard (1997) find that high labour costs of host countries lower FDI inflows into such countries.

The level of openness: Some economists argue that the level of openness that will attract more FDI depends on the nature of FDI. If it is a market-seeking investment where horizontal FDI is undertaken to get behind trade barriers, a decrease in the level of openness (more trade restrictions) will increase horizontal FDI. However, vertical FDI that is viewed as a non-market-seeking investment may prefer to locate in more open economies (less trade barriers). Balasubramanyam and Salisu (1991), Jackson and Markowski (1995), and Chakrabarti (2001), by using a variable proxied by export volume to estimate its impact of openness on FDI inflows into the host countries, prove that after such countries open their door to the outside world, the FDI inflows have not stopped growing. They have found a positive impact of exports on FDI.

Other determinants: The role of the government in the host country is an important determinant of the location decision for FDI by MNCs. The government's role is defined as maintaining the economic and political stability, promoting investment, developing infrastructure and human capital, and creating a liberalized and competitive economic environment through its macroeconomic tools such as monetary and fiscal policies. In fact, government policies in terms of tax incentives and trade policies play an important role in attracting more FDI into host countries. Some governments try to attract FDI by giving special tax incentives or land rent at cheap prices. Thus, the impact of fiscal incentives on FDI should be positive.

Based on the above discussion on theoretical and empirical studies of the

economic growth and FDI, a system of equations is formed in which the economic growth rate (g) is determined by FDI, government expenditure (SI), the ratio of exports to GDP (Xg), human capital (HC), financial development (DIg), the growth rate of labour (LA), learning by doing (LD), and the real exchange rate (RER). The FDI is determined by the economic growth rate (g), market size denoted by GDP per capita (Y), domestic investment (DI), exports (X), labour cost (WA), the skill of labour ($SKILL$), infrastructure (TEL), and the real exchange rate (RER). Thus, the system of equations can be written as follows:

$$g_{it} = \alpha_0 + \alpha_1 FDI_{it} + \alpha_2 SI_{it} + \alpha_3 Xg_{it} + \alpha_4 HC_{it} + \alpha_5 DIg_{it} + \alpha_6 LA_{it} + \alpha_7 LD_{it} + \alpha_8 RER_{it} + \varepsilon_{it}(1)$$

$$FDI_{it} = \beta_0 + \beta_1 g_{it} + \beta_2 Y_{it} + \beta_3 DI_{it} + \beta_4 X_{it} + \beta_5 SKILL_{it} + \beta_6 WA_{it} + \beta_7 TEL_{it} + \beta_8 RER_{it} + \varepsilon_{it}(2)$$

In which i denotes province, t denotes time period (years from 1996-2005).

The expected signs of the coefficients are illustrated in table 1. The dependent variables are in the top row and the independent variables are in the first column.

4. Data and econometric techniques

4.1. Data

This analysis is based on an annual dataset for 61 provinces of Vietnam over the period 1996-2005. Most of the data are collected from the General Statistics Office (GSO), the Ministry of Planning and Investment (MPI), the Ministry of Labour-Invalids and Social Affairs (MLISA), and the Ministry of Industry (MOI). Unfortunately, the data for provinces on relevant variables for the period 1986-1995 is not available. Thus, the study only examines the linkage of FDI to economic growth over the period 1996-2005. Table 2 shows the definition of each variable in the system of equations.

4.2. Econometric Techniques

As mentioned above, in many empirical studies on the relationship between FDI and economic growth, such one-way linkage between FDI and economic is not enough and meaningful. This occurs if economic growth is determined by FDI and FDI is in turn determined by economic growth. In short, there is a two-way linkage between FDI and economic growth; it is better to use a simultaneous equation model to investigate the two-way linkage between FDI and economic growth. For simultaneous equations models consisting of two equations, estimates from ordinary least squares (OLS) methods are biased and even inconsistent (Green, 2000; Gujarati, 2003).

Table 1. The expected direction of the relationship between the dependent and independent variables

	Dependent Variables	
	g	FDI
g	n.a	+
FDI	+	n.a
SI	+/-	n.a
Xg	+	n.a
HC	+	n.a
Dig	+	n.a
LA	+	n.a
LD	+	n.a
RER	-	+
Y	n.a	+
DI	n.a	+
X	n.a	+
SKILL	n.a	+
WA	n.a	-
TEL	n.a	+

Note: + and – represent results that are expected to be positively and negatively statistically significant respectively. n.a.: not applicable.

Therefore, there are three statistical techniques for a pooled time series and cross-sectional dataset: two stage least squares (2SLS), three stage least squares (3SLS), and the generalized method of moments (GMM) to test the causal relationship between economic growth and FDI. However, we decided to report the results we obtained using the GMM model for several reasons. First of all, while the parameter estimates remained similar in magnitude and sign, the GMM estimation results in the paper are generally found to be statistically more robust. Second, the GMM method provides consistent and efficient estimates in the presence of arbitrary heteroskedasticity (Greene, 1997). Moreover, most of the diagnostic tests we discuss in the paper can be cast in a GMM framework.

In the paper, we examine the key issue underlying the estimated relationships between FDI and economic growth. This analysis is based on a panel dataset for 61 provinces of Vietnam over the period 1996-2005. The results for the relationship analysis will be discussed in the next section.

After completing model estimations, we performed some statistical tests to make sure that the developed models are robust. First, given the simultaneous equations model, a J statistic of Hansen test is performed to test the over-identification in GMM. Thus, a null hypothesis of correct model specification and valid over-identifying restrictions is tested. In the simultaneous equations, we use instrumental variables including SI, Xg, HC, Dig, LA, LD, RER, Y, DI, X, WA, SKILL, TEL, and RER.

Second, a Durbin-Wu-Hausman test is performed to test the endogeneity. A null hypothesis is rejected, suggesting that OLS estimates might be biased and inconsistent and OLS is not the appropriated technique to be used in the study. Moreover, it also suggests that the endogenous variable's effect on the estimates is meaningful, and instrumental variables techniques are required.

The third test was for homoscedasticity, a Pagan-Hall statistic test for heteroskedasticity can be used. A null hypothesis of homoscedasticity is rejected, suggesting that the GMM technique is consistent and efficient in the presence of arbitrary heteroskedasticity. After implementing most of the diagnostic tests (see Tables of 3, 4, 5, and 6), the GMM technique is consistent and unbiased in the study.

5. Estimation result and analysis

The results are shown in Tables 3 and 4. The results reflect that FDI is an important determinant of the provincial economic growth in Vietnam. The estimated coefficient of the FDI in column (1) of Table 3 is significant at the 1 percent level in the GMM. It also indicates that, other things remaining constant, one thousand of Vietnamese dong (VND) increase in FDI per capita in Vietnam would bring about a 0.000054 percent increase in the provincial economic growth.

Other important determinants of economic growth in Vietnam are exports, government expenditure, financial development, the growth of labour, learning by doing, human capital, and real exchange rate. The ratio of exports to GDP is significant at the 1 percent level in the GMM estimate. The growth of labour force is significant at the 1 percent level. The estimated coefficient of government expenditure in equation (1) is not statistically significant in the GMM estimate.

Table 2. Variable Definitions and Data Sources

Abbreviations	Variable definition	SOURCE
G	Provincial economic growth rate (annual %)	GSO
Y	GDP per capita (expressed in thousands of VND at constant prices)	GSO
FDI	FDI per capita (expressed in thousands of VND at constant prices)	MPI
SI	The ratio of annual government expenditure to GDP	GSO
X	Exports of goods and services per capita (expressed in thousands of VND at constant prices)	GSO
XG	Ratio of exports to GDP	GSO
HC	Number of University and College students per thousand persons	GSO
DIG	The ratio of gross domestic investment to GDP	GSO
DI	Gross domestic investment per capita (expressed in thousands of VND at constant prices)	GSO
TEL	Telephones per thousand persons	
LD	Learning by doing (annual manufacturing value added as a percentage ratio of GDP is used as a proxy)	GSO MOI
RER	Real exchange rate	
SKIL	The percentage of skilled labours in the total labour force	GSO
WA	Monthly average wage of employee (expressed in thousands of VND at constant prices)	MLISA
LA	The growth rate of labour (annual %)	MLISA
DUMM	Dummy=1 if cities and provinces in the key economic regions	
Y	=0 otherwise	MLISA Own calculation

The estimated coefficient of learning by doing on the economic growth in Vietnam for the period 1996-2005 is statistically significant at 1 percent level, and its sign is consistent with expectations. Vietnam's significant results for learning by doing probably reflect the assembly-type of production activities it specializes in. In addition, Vietnamese labour force is benefiting from knowledge spillovers at work, improving its productivity, and hence stimulating economic growth.

The estimated coefficient of real exchange rate has an expected negative sign, and it is significant at the 1 percent level in the GMM estimate. The coefficients of human capital and financial development on the economic growth in Vietnam over the period 1996-2005 are statistically significant at the 5 percent level and their signs are positive in the GMM estimation.

Table 4 shows that the estimated coefficient of the economic growth in FDI equation is statistically significant at the 5 percent level in GMM estimate. Its sign is positive and consistent with the expectation. The estimated coefficient on economic growth indicates that, other things remaining constant, a 1 percent increase in economic growth would raise FDI per capita by VND 993,000. It seems that higher economic growth in Vietnam indeed reflects a good signal about the Vietnamese economy to foreign investors. It also shows an increasingly larger market size for investment in Vietnam. GDP per capita, which is used as a measure of market size, has a positive and significant coefficient at the 1 percent level in the GMM estimation. The estimated coefficient of domestic investment is positive and statistically significant at the 1 percent level, implying that the linkage between FDI and domestic investment is complementary. The coefficient of exports is consistent with the expectation and statistically significant at the 1 percent level in the GMM estimation. The skill of the labour force is an important determinant of FDI in Vietnam. The estimated coefficient of skilled labour on FDI is positive and statistically significant at the 1 percent level in the GMM estimation. The negative coefficient of the labour cost is significant at the 1 percent level, reflecting that higher labour costs in Vietnam are associated with lower FDI inflows. The estimated impact of infrastructure on FDI is positive and statistically significant at the 1 percent level in the GMM estimation. A depreciation of real exchange rate in Vietnam tends to raise FDI inflows into Vietnam as the estimated coefficient of real exchange rate is positive and statistically significant at the 1 percent level in the GMM estimation.

The geographical distribution of FDI in Vietnam is characterized by its concentration in the key economic cities and provinces in the South such as Ho Chi Minh City, Dong Nai, Binh Duong, and Baria Vung Tau, and in the North such as Hanoi, Hai Duong, Vinh Phuc, Hai Phong, and Quang Ninh. Thus, we extended the model for the period 1996-2005 by introducing a dummy variable for provinces in the key regions including Red River Delta and South East where have the highest inflows of FDI. Table 2 shows the definition of the variable. It is expected that cities and provinces in the key economic regions with better infrastructure, skilled workers, and higher income tend to attract more FDI and grow faster. Table 3 and 4 show the results. The regional dummy variable has a positive sign in both the economic growth and FDI equations. In the economic

Table 3. Econometric Results of equation (1) for the period 1996-2005

Economic growth equation (1)	(1)	(2)
FDI (FDI)	0.000054 (4.80)*	0.000049 (3.99)*
Exports (Xg)	0.243119 (1.95)**	0.245129 (1.92)**
Government Expenditure (SI)	0.068351 (0.29)	0.417532 (0.41)
Financial Development (Dig)	1.256011 (2.93)*	1.184253 (2.71)*
Labour Growth (LA)	0.157515 (2.58)*	0.408601 (2.88)*
Learning by Doing (LD)	0.018336 (3.05)*	0.017551 (3.08)*
Human Capital (HC)	0.038917 (2.64)*	0.037175 (2.58)*
Real Exchange Rate (RER)	-0.094108 (-4.27)*	-0.136351 (-4.82)*
Regional Dummy (DUMMY)		0.391238 (1.13)
Constant	18.706020 (6.34)*	19.005950 (6.46)*
Hansen test (p-value)	0.15	0.29
Durbin-Wu-Hausman test (p-value)	0.00	0.05
Pagan-Hall test (p-value)	0.01	0.02
Observations	563	563

Notes: (i) Robust t-statistics in parentheses; (ii) *** significant at 10%, ** significant at 5%, and * significant at 1%

growth equation, it is not significant in the GMM estimation. In the FDI equation, the variable is very significant at the 1 percent level in the GMM estimation. All other coefficients of both economic growth and FDI equations tend to follow a similar magnitude, sign, and significance level in this specification. The results show that cities and provinces in the key economic regions such as Red River Delta and South East where have better infrastructure and skilled employees, higher growth, and larger market size attract more FDI inflows.

Recent empirical studies argue that impacts of FDI on economic growth depend on the existence of adequate absorptive capacity in the host countries. Thus, Table 5 illustrates the impacts of FDI on provincial economic growth in Vietnam via absorptive capability. As can be seen in Table 5, the estimated coefficient of the interaction between FDI and Human capital is positive and statistically significant at the 5 percent level but the coefficient of FDI in column (1) of Table 5 is negative and not statistically significant. This reflects that the impacts of FDI on provincial economic growth in Vietnam are positive only when Vietnamese provinces have a certain threshold of human capital. Similarly, the estimated coefficient of the interaction between FDI and financial development in column (2) of Table 5 is negative and statistically significant at the 5 percent level. The negative coefficient implies that a certain level of financial market development is an important prerequisite for FDI to have a positive effect on provincial growth.

Further Analysis of the Relationship between FDI, Economic Growth, Technology Gap, and Research and Development (R&D)

The endogenous growth theories also point out that expenditure on research and development and technology gap in the host countries affect importantly the capability to absorb the externalities from FDI. Thus, we further investigate the effect of the role of R&D, which is used as one alternative indicator of human capital, and technology gap on provincial economic growth in Vietnam as well as their effects on FDI via the absorptive capacity. In equation (1), we add two variables of R&D, and technology gap. R&D variable used in equation (1) is the ratio of investment in R&D to GDP, and technology gap variable is the percentage difference between the average growth of foreign sector and that of province in Vietnam. We expect the coefficient of R&D variable is positive and its technology gap variable is negative.

Column (1) of Table 6 indicates that the coefficient of R&D is positive and statistically significant at the 10 percent level. This means that investment in R&D contributes positively to provincial economic growth in Vietnam in the period 1996-2005. Besides, the estimated coefficient of technology gap is negative

and significant at the 1 percent level. The result confirms that provinces with lower technology gap will grow faster in terms of technology. We also investigate the effects of FDI on economic growth via absorptive capability. We find that the estimated coefficient of the interaction between FDI and R&D is negative and statistically significant at the 5 percent level. It again confirms that a certain level of investment in R&D is an important prerequisite for FDI to have a positive effect on economic growth. The coefficient of the interaction between FDI and technology gap is negative and statistically significant at the 1 percent level. This proves that the impact of FDI on provincial economic growth is positive only when Vietnamese provinces have a certain threshold of technology.

Table 4. Econometric Results of equation (2) for the period 1996-2005

FDI equation (2)	(1)	(2)
Economic Growth (g)	992.8359 (2.73)*	802.3072 (2.34)**
Market Size (Y)	1.451904 (11.32)*	1.460676 (12.53)*
Domestic Investment (DI)	0.050031 (5.71)*	0.052338 (6.64)*
Exports (X)	0.934665 (7.00)*	0.934665 (7.47)*
The Skill of Labour (SKILL)	141.1244 (2.70)*	120.3292 (2.44)**
Labour Cost (WA)	-5.460528 (-4.64)*	-4.867383 (-4.41)*
Infrastructure (TEL)	49.79898 (6.62)*	47.9732 (4.90)*
Real Exchange Rate (RER)	161.6789 (3.05)*	145.9019 (3.05)*
Regional Dummy (DUMMY)		1179.619 (3.05)*
Constant	-34870.23 (-3.86)*	-31513.77 (-3.83)*
Hansen test (p-value)	0.13	0.12
Durbin-Wu-Hausman test (p-value)	0.00	0.00
Pagan-Hall test (p-value)	0.01	0.01
Observations	543	543

Notes: (i) Robust t-statistics in parentheses; (ii) *** significant at 10%, ** significant at 5%, and * significant at 1%

Table 5. Impact of FDI on Provincial Economic Growth in Vietnam via Absorptive Capacity

Economic growth equation (1)	(1)	(2)
FDI (FDI)	-0.000089 (-1.83)	0.000084 (4.53)*
Exports (Xg)	0.264740 (2.16)**	0.334157 (2.22)**
Government Expenditure (SI)	-0.390307 (-0.69)	-0.569683 (-0.57)
Financial Development (Dig)	1.419888 (3.30)*	1.747579 (3.89)*
Labour Growth (LA)	0.165762 (2.69)*	0.167893 (2.73)*
Learning by Doing (LD)	0.020171 (3.42)*	0.018908 (3.01)*
Human Capital (HC)	0.028890 (1.90)**	0.036969 (2.50)*
Real Exchange Rate (RER)	-0.096025 (-4.39)*	-0.094292 (-4.30)*
FDI*Human Capital	0.000004 (2.25)**	
FDI*Financial Development		-0.000059 (-2.22)**
Constant	19.19335 (6.54)*	18.59838 (6.34)*
Hansen test (p-value)	0.21	0.34
Durbin-Wu-Hausman test (p-value)	0.01	0.00
Pagan-Hall test (p-value)	0.00	0.01
Observations	563	563

Notes: (i) Robust t-statistics in parentheses; (ii) *** significant at 10%, ** significant at 5%, and * significant at 1%

6. Conclusion

In conclusion, the paper sought to examine the relationship between FDI and economic growth in Vietnam by using a simultaneous system of equations for a panel dataset of 61 Vietnamese provinces over period 1996-2005. The empirical results provide a clear answer to the question as to whether a two-way linkage between FDI and economic growth in Vietnam exists. Based on the statistical evidence, this paper has demonstrated that FDI and economic growth are important determinants of each other in Vietnam. The results also have various implications for both Vietnamese central and local governments seeking to attract FDI.

First, FDI has a positive and statistically significant impact on provincial economic growth in Vietnam over period 1996-2005, and provincial economic growth in Vietnam is viewed as an important factor to lure FDI inflows into Vietnamese provinces. This stresses the importance of the potential for future growth in the decision of foreign investors to commit funds to Vietnam. Second, the relationship between exports and FDI is complementary. The finding is consistent with the fact that FDI in Vietnam is mainly concentrated on export-oriented manufacturing activities. Third, the results provide new evidence on the role of skilled workers and infrastructure in attracting FDI inflows into Vietnam. Thus, a successful FDI policy has to coincide with an increase in GDP, human capital accumulation, and infrastructure through investing more in the transportation and telecommunication systems, enhancing the quality of education, and facilitating the implementation of projects. Fourth, the finding shows that human capital and investment on R&D are important determinants of provincial economic growth in Vietnam. The result for human capital also emphasizes that human capital can contribute to economic growth by facilitating the adoption of foreign technologies in Vietnam. Fifth, the significant impact of exports on economic growth is positive and statistically significant in the GMM estimation. This implies that the integration of Vietnam into the region has brought in benefits such as stimulating trade flows between Vietnam and its trade partners. Finally, FDI inflows into Vietnam only influence positively provincial economic growth only when Vietnam has certain thresholds of human capital, investment in R&D, technology, and financial development.

Through the analyses of the impact of FDI on economic growth in Vietnam, we can see the success of the Vietnamese government in promulgating the Law on Foreign Investment since 1987. Under the Doi Moi period, FDI has contributed significantly to the high rate of economic growth in Vietnam. Moreover, Vietnamese provinces also gained benefits from FDI in order to stimulate their economic growth. Clearly, whichever route of analysis is taken, there is still much work to be done. However, we believe the piece of research has laid some important foundations.

Table 6. Economic Growth and FDI: Using Research and Development and Technology Gap

Economic growth equation (1)	(1)	(2)	(3)
FDI (FDI)	0.000028 (2.81)*	0.000053 (3.19)*	-0.000006 (-0.05)
Exports (Xg)	0.139887 (1.28)	0.148923 (1.25)	0.133530 (1.23)
Government Expenditure (SI)	-1.592068 (-1.99)**	-1.628443 (-2.04)**	-1.574779 (-2.00)**
Financial Development (Dig)	0.957675 (2.42)*	1.033599 (2.66)*	0.999145 (2.62)*
Labour Growth (LA)	0.124454 (2.31)**	0.120881 (2.25)**	0.127988 (2.43)*
Learning by Doing (LD)	0.018639 (3.73)*	0.018457 (3.27)*	0.021126 (4.47)*
Research and Development (R&D)	0.153391 (1.64)***	0.167511 (1.83)***	0.169995 (1.86)***
Technology Gap	-2.178576 (-3.83)*	-2.210997 (-4.00)*	-1.442873 (-2.70)*
Real Exchange Rate (RER)	-0.064482 (-3.65)*	-0.063214 (-3.25)*	-0.056075 (-3.23)*
FDI*R&D		-0.000025 (-2.01)**	
FDI*Technology Gap			-0.000225 (-4.07)*
Constant	17.05742 (7.33)*	16.87612 (7.21)*	15.74285 (6.88)*
Hansen test (p-value)	0.19	0.19	0.25
Durbin-Wu-Hausman test (p-value)	0.00	0.01	0.00
Pagan-Hall test (p-value)	0.04	0.00	0.00
Observations	563	563	563

Notes: (i) Robust t-statistics in parentheses; (ii) *** significant at 10%, ** significant at 5%, and * significant at 1%

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