CAUSALITY RELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT, TRADE AND ECONOMIC GROWTH IN VIETNAM

Thu Thi Hoang*
Faculty of Economics, Chulalongkorn University
Phayathai Road, Bangkok 10330, Thailand
Tel: (66) 846990730
thuhttn@yahoo.com

Abstract

Using quarterly time series data from 1988 to 2005, this paper examines the causality relationship between foreign direct investment, international trade and economic growth in Vietnam. In VAR model, the integration and cointegration analysis suggested that there is a long run relationship among the factors. The results of VECM causality test find bidirectional causality between foreign direct investment, export and economic growth, with unidirection of import to export and FDI. The paper concludes that FDI invested in Vietnam was attracted by its economic growth and its foreign trade strategy. Moreover, FDI and trade are two important factors that enhance the affect of economic growth in Vietnam.

Keywords: foreign direct investment, trade, economic growth, Granger causality and Vietnam

* I deeply thank to my advisor, Associate Professor Paitoon Wiboonchutikula, for the guidance offered to me in preparation of this paper, bringing it to a successful conclusion.

1. Introduction

Since the launch of market-oriented economic reforms in 1986 (the so called "Doi Moi" or renovation), Vietnam has been among the fastest growing countries in the Southeast Asia with the active participation of foreign investors in all fields of the economy. The Vietnamese government has quickly jointed competition for foreign direct investment into regional and global markets by restructuring of the domestic economy; and opening up of the economy to the external trade and investment to increase its economy. For some recent years, Vietnam's GDP growth rate is average 7.5% annually, total trade in 2005 is 23.5 times compared to 1986 and the total registered capital of FDI in Vietnam in 2001-2005 is about 13 times of that in 1988-2000 period.

Even though Vietnam has showing the sign of increasing in all FDI, trade and economic growth, none of previous researches try to examine the causality relationship between those factors due to lack of data for analysis.

This paper aims to investigate the causality relationship between foreign direct investment, international trade and economic growth in Vietnam by Vector Auto Regression (VAR) method. The next part summarizes the facts of FDI, trade and economic growth in Vietnam since its renovation in 1986. After reviewing some empirical literature about the relationship of FDI and trade and growth, the paper sets a model to test the FDI, trade and economic growth relationship. Then, the empirical results of Vietnam's case study could be presented in part V. Conclusions is in final part.

2. FDI, trade and economic growth in Vietnam

Vietnam has been in transition from a centrally planned to a market oriented economy since December 1986. From that time until now, Vietnam had seen remarkable economic achievements in growing gross domestic product (GDP), GDP per capita, foreign direct investment and important trade and economic agreements signed with major partners.

2.1. Economic growth

Vietnam's economic growth rates were dramatically increasing since 1986 (table 1). From a low economic growth rate of 2.8% in 1986, the annual growth rate of Vietnam has increased to 6% in 1988 and increased to over 9% in both 1995 and 1996.The first decreased in the growth rate was in 1989 and 1990 due to the beginning collapse of the Socialism system of Soviet Union and Eastern Europe. From 4.4% of average GDP growth rate in 1986-1990, it was increased dramatically up to 8.18% in 1991-1995. This resulted in increasing per capita income from $100 in 1987 to over $300 in 1996 (Ben, 1999). However, due to effectiveness of Asian financial crisis in 1997-1998, the GDP growth rates were declined to 5.8% in 1998 and lowest rate at 4.8% in 1999. The economy was successfully recovery after the crisis and developed at 7.48% of growth rate at the five-year plan 2001-2005. Overcoming several difficulties and challenges, with 8.4% of economic growth in 2005, Vietnam has finished the year of 2005 with highest growth rate during the first five years of the 21 century. This achievement and the stable develop of the society showed the chosen renovation of Vietnamese leader going in the right goals, contents and implemented measures at macro level to ensure growth and overcome the crisis.

Vietnam economy has been transformed towards increasing in the industry and service and decreasing in the agriculture, forestry and fishery since 1986. Table 1 shows that agriculture, forestry and fishing factor was accounted for 49% of total GDP output during 1981-1985, and it continuously decreased until 22.29% in 2001-2005. Industry and services sectors are more important share in GDP by counting for 39.44% and 38.27% in the first half of the 21 century, increased nearly 12% share in industry and 15% share in services compared to the period before Doi Moi 1986.

Table 1. Growth and structure change of GDP (%)

Period	Share of GDP			Growth rate			
	Agriculture, forestry and fishery	Industry	Services	GDP	Agriculture, forestry and fishery	Industry	Services
1981-85	49.04	27.80	23.16	6.46	5.38	9.18	-
1986-90	41.15	25.36	33.49	4.44	2.72	4.82	5.84
1991-95	31.78	27.52	40.70	8.18	4.12	14.02	8.60
1996-2000	25.85	33.10	41.05	6.98	4.40	12.64	5.72
2001-05	22.29	39.44	38.27	7.48	3.84	10.24	7.04
1986-2005	**30.27**	**31.26**	**38.38**	**6.77**	**3.77**	**9.43**	**6.80**

Source: Vietnam statistical Yearbook 1990-2005

Although the annual value added of agriculture sector over the past years is about 4.5%, the agriculture sector was decreased its affect to the country's outcome. It accounted for 38% of GDP in 1986, 27% in 1995 and only 21% in 2005. In contract, the proportion of the industry and construction rose from 26.88% in 1986 to 36.73% in 2000 and to 41.03% in 2005. The service sector was also increased from 33.06% in 1986 up to 38.08% in 2005 as presented in the figure 7. The structural change could be explained by the restructuring of ownership and international trade structure. The decline of state owned industries enterprise along with the growth of foreign owned and non state sector is affecting the structure of industry and could be one of the main drivers of the productivity improvement (Pham and Nguyen, 2005). Numbers of state owned enterprises (SOEs) were reduced from 12000 in 1990 to about 6000 by April 1995 and to 4845 enterprises at the end of 2003 (GSO, 2003). Moreover, the increased import-export value gradually and reducing trade deficit were the other reasons to explain the change in economic structure.

2.2. International trade

Table 2 shows that in that time Vietnam international trade has increased significantly. Vietnamese total trade grew from $2.94 billion in 1986 to $69.11 billion in 2005, which is up by 23.5 times compared to 1986. The average of total trade from 1986-2005 is 20.7 billion USD. The total value and growth rate in each period is quite high. In the period of 1996-2000, total value of trade tripled compared to that of the previous period, reaching approximate more than 100 billion USD, even though the average growth rate is lower than 1991-1995. The period of 2001-2005 having total trade value is doubled that of the 1996-2000 period.

Table 2: Vietnam's international trade performance (1986-2005)

	Total trade		**Exports**		**Imports**		**Trade balance**
	Value (Bill. $US)	**Growth rate (%)**	**Value (Bill. $US)**	**Growth rate (%)**	**Value (Bill. $US)**	**Growth rate (%)**	**Value (Bill. $US)**
1986-1990	19.72	15.1	7.03	28.0	12.69	8.2	-5.65
1991-1995	39.94	21.4	17.16	17.8	22.78	24.3	-5.63
1996-2000	113.44	17.2	51.83	21.6	61.61	13.9	-9.79
2001-2005	240.67	18.2	110.62	17.5	130.15	18.8	-19.53
1986	2.94		0.79		2.16		-1.37
1990	5.16	14.29	2.40	23.54	2.75	7.27	-0.35
1995	13.60	37.69	5.45	34.40	8.16	39.99	-2.71
2000	30.12	29.36	14.48	25.48	15.64	33.17	-1.15
2001	31.25	3.74	15.03	3.77	16.22	3.72	-1.19
2002	36.45	16.66	16.71	11.16	19.75	21.75	-3.04
2003	45.41	24.56	20.15	20.61	25.26	27.91	-5.11
2004	58.46	28.75	26.50	31.54	31.95	26.52	-5.45
2005	69.11	18.22	32.23	21.60	36.88	15.42	-4.65

Source: Statistical yearbook 1994 -2005

From 1986 to 2005, annual average growth rate of export is 21.22% per year. Export value in 2005 was 40.8 times of 1986, from $0.79 billion in 1986 to $32.23 billion in 2005.The share of exports in total trade increase steadily from 35.7% in the 1986-1990 up to 46% in the 2001-2005 period. The annual average growth rate of imports in 1986-2005 is 16.1% per year. Import value over 2005 was only counted for 17.1 times that of the year 1986, increased from $2.16 billion to $36.88 billion USD. The average growth rate of imports in 1991-1995 is the highest (24.3%), compared to other periods, although the import values only equals to 1/5 of the one in 2001-2005 period.

The combination of export and import growth at different speeds has made the balance of trade more complicated. Trade deficits were nearly unchanged in 1986-1990 and 1991-1995 periods. This volume increases so quickly in the second half of the 1990s and in the first half of the 21 century. In 2001-2005, Vietnam trade deficit was almost double and fourfold compared to that of 1996-2000 and 1991-1995, respectively. However, the deficit ratio in each period compared to exports was strongly decreased, from 80.4% in 1986-

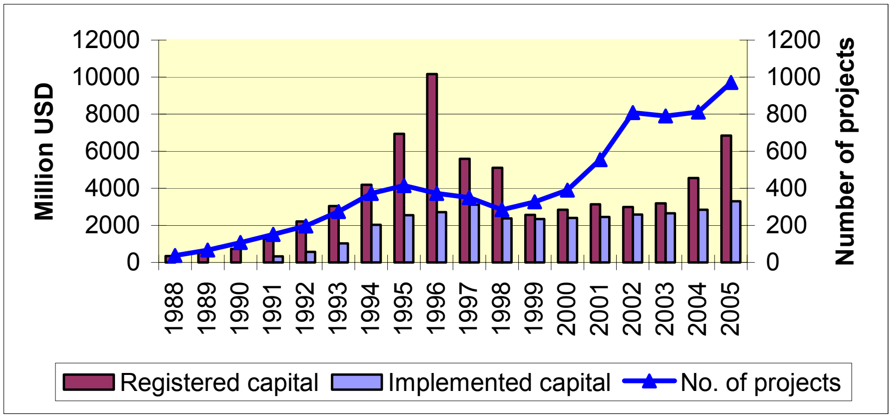
1990 to 17.4% in 2001-2005. This was resulted by the increasing of export's growth rate each year so much larger than that of imports. The trade deficit situation can be explained as follows. Firstly, Vietnam was continuously increasing its economic growth rates over the past year, so that it was also increasing the demand for materials of production. Moreover, the imported material's prices were strongly increased in some recent years to force Vietnam's import values increasing. Lastly, to develop the trade liberalization with the world countries, Vietnam was and will become a supporter for the world imports.

2.3. FDI performance

Since Doi Moi reforms were implemented in 1986, FDI has been seen as imperative to growing the Vietnamese economy and plays an important role for Vietnam's economy. The growth of FDI in Vietnam is one of the most dramatic consequences of Vietnam's change in economic policy from a planned economy towards a market oriented economy. According to Vietnam Statistical Yearbook 2005, there are 7279 FDI projects received investment licenses with total registered capital amounting to US$66244.4 million since 1988 up to December 2005 **(figure 1**). Even though the number of contracts in the five –year 2001-2005 are more than double of that in the five year 1996-2000, the registered capital in 2001-2005 period are still smaller than that in 1996-2000 period with amounted of US$5538.8 million. The registered capital in 1996 was got the highest amount during the time (US$10164.1 million) and accounted for 1/6 of total capital registered.

Figure 1 shows the overall trend of FDI inflows in Vietnam. The amount of registered capital for licensed projects increased rapidly in the first half of 1990s, peaked in 1996 at 10164.1 million US dollars and dropped sharply after that. Although it already increased in 2004 and 2005, the registered capital in 2005 was only $6839.8 million, equal to 67% of that in 1996. Compared to the dramatic increase in registered capital, implemented capital remained far lower. This situation shows that there are remain a number of unfavorable elements in the climate for foreign investment in Vietnam (Ha Huy Thanh, 1999). The table also presents numbers of FDI projects during that time and shows the biggest dissolved projects in 1998 due to Asian economic crisis began seriously impact on Vietnam.

For FDI flows, crucial legal changes were made in Decree 852 of January 1996 and the amended Foreign Investment Law. Decree 852 placed FDI coordination and planning under the direct control of the provincial People's Committee's Department of Planning and Investment (DPI). The Foreign Investment Law allowed provinces to sign smaller FDI projects (below $10 million) directly. Not coincidentally, the average size of individual FDI projects has dropped considerably since 1996 despite the fact that the absolute number of projects increased.



Source: General Statistics Office (GSO) and Ministry of Planning and Investment (MPI)

Figure 1: Vietnam's FDI inflows, 1988-2005

3. Briefly overview of recent literature

There are could have some groups of literature discuss about the relationship of FDI, trade and economic growth.

Growth theories provide the theoretical framework for analysis of economic growth and foreign direct investment which viewed as a technology factor. In theoretical, both Solow-type standard neoclassical growth models and new endogenous growth models show the positive relationship of foreign direct investment and economic growth. Empirically, the effects of FDI on economic growth remain ambiguous. While some studies such as Borensztein, De Gregorio and Lee (1998), Balasubramanyan et al. (1996), De Mello (1996), Blomstrom et al. (1996), Larrain, Lopez-Calva and Rodriguez-Clare (2000), Zhang (2001), Bende-Nabende et al (2003), Castejon and Woerz(2005) and Chowdhury and Mavrotas (2006) observe a positive impact of FDI on economic growth, others papers of Carkovic and Levine (2002), Athukorala (2003), and Durham (2004) detect a negative relationship between the two variables. The impact of FDI on economic growth is far from conclusive. The role of FDI seems to be country based, and can be positive, negative or insignificant depending on the economic institutional and technological conditions in the recipient countries.

International trade theories explain the complementary or substitutive relationship of FDI and trade by focusing mainly on either horizontal FDI[1] model or vertical FDI[2] model. They also predict that the complementary relationship is normally found for vertical FDI as in the models of Helpman (1984), Helpman and Krugman (1985) and Grossman and Helpman (1991). FDI substitutes trade when the investment is horizontal as in

[1] Horizontal FDI consists of the production of the same goods and services in different locations

[2] Vertical FDI consist the geographical fragmentation of the production progress by stages in order to reduce costs

the models of Markusen (1983), Horstmann and Makusen (1992), Brainard (1993), Makusen and Venables (1995) and Helpman, Melitz and Yeaple (2004).

While the theoretical arguments support both complementary and substitutability effects, empirical works on this question almost show a net complementary relationship between trade and FDI. Even though studies were at firm level studies (as in the studies of Lipsey and Weiss (1984), Head and Ries (2001), Mucchielli et. al. (2000)), at industry level (as Mankovska (2000), Pfaffermayr (1996) and Brainard (1997)), and at country level (as in Grubert and Mutti (1999), Andersen & Hainaut (1998), Clausing (2000), Teo and Wang (2001) and Mekki (2003)), those studies show the positive relationship of FDI and international trade. However, the results seem to be sensitive to the choice of explanatory variables, country, and the time period of different samples studying.

4. Methodology of FDI, trade and economic growth's causality testing

The objective of this paper is to recognize the directly causal relationship between FDI inflows, economic growth and trade (including export and import) in Vietnam based on a systematic approach. Granger's definition of causality is framed in terms of predictability. The basic principle of Granger-causality analysis (Granger, 1969) is to test whether or not lagged values of one variable help to improve the explanation of another variable from its own past. Considering two time series stationary variables X_t and Y_t, according to Granger (1969), Y_t is said to "Granger-cause" X_t ($Y \rightarrow X$) if and only if lagged Y_t 's help predict and improve X_t. Many tests of causality have been derived and implemented such as Granger (1969), Sims (1972) and Geweke et al. (1982) (see Hamilton (1994)). However, one of the most well-knowing methods to solve this matter is Vector Auto Regression (VAR). Extended from Granger causality analysis of Granger 91969), the VAR technique in econometric modeling was the first to introduce in the Econometrica Journal by Christopher A. Sims in 1980. To analyze the dynamic impact of random disturbances on the systems of variables, VAR methodology superficially resembles simultaneous-equation modeling (SEM) in that we consider several endogenous variables together. Each endogenous variable is explained by its lagged values and the lagged values of all other endogenous variables.

Mathematically, in a VAR model, each of the random variables in the system is expressed as a linear function of its own past values and the past values of other variables in the system. The system can be presented in the form of matrixes as follows:

$$\mathbf{[Y]_t = [A][Y]_{t-1} + \ldots + [A'][Y]_{t-k} + [e]_t} \text{ or}$$

$$\begin{bmatrix} Y_t^1 \\ Y_t^2 \\ Y_t^3 \\ \ldots \\ Y_t^p \end{bmatrix} = \begin{bmatrix} A_{11} & A_{12} & A_{13} & \ldots & A_{1p} \\ A_{21} & A_{22} & A_{23} & \ldots & A_{2p} \\ A_{31} & A_{32} & A_{33} & \ldots & A_{3p} \\ \ldots & \ldots & \ldots & \ldots & \ldots \\ A_{p1} & A_{p2} & A_{p3} & \ldots & A_{pp} \end{bmatrix} \begin{bmatrix} Y_{t-1}^1 \\ Y_{t-1}^2 \\ Y_{t-1}^3 \\ \ldots \\ Y_{t-1}^p \end{bmatrix} + \ldots + \begin{bmatrix} A'_{11} & A'_{12} & A'_{13} & \ldots & A'_{1p} \\ A'_{21} & A'_{22} & A'_{23} & \ldots & A'_{2p} \\ A'_{31} & A'_{32} & A'_{33} & \ldots & A'_{3p} \\ \ldots & \ldots & \ldots & \ldots & \ldots \\ A'_{p1} & A'_{p2} & A'_{p3} & \ldots & A'_{pp} \end{bmatrix} \begin{bmatrix} Y_{t-k}^1 \\ Y_{t-k}^2 \\ Y_{t-k}^3 \\ \ldots \\ Y_{t-k}^p \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ \ldots \\ e_{pt} \end{bmatrix}$$

where:
p = the number of variables be considered in the system
k = the number of lags be considered in the system.

$[Y]_t$, $[Y]_{t-1}$, …$[Y]_{t-k}$ = the 1x p vector of variables

[A], … and **[A']** = the p x p matrices of coefficients to be estimated

$[e]_t$ = a 1 * p vector of the stochastic error terms - called **impulses** or **innovations** or **shocks** in the language of VAR- that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Thus, with the objective is to recognize possible links among FDI inflows, import, export and economic growth, the system of Vector autoregressive model can be formulated as follows:

$$\begin{bmatrix} \ln FDI_t \\ \ln EX_t \\ \ln IM_t \\ \ln GDP_t \end{bmatrix} = \begin{bmatrix} A_{01} \\ A_{02} \\ A_{03} \\ A_{04} \end{bmatrix} + \begin{bmatrix} A_{11} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \\ A_{41} & A_{42} & A_{43} \end{bmatrix} \begin{bmatrix} \ln FDI_{t-1} \\ \ln EX_{t-1} \\ \ln IM_{t-1} \\ \ln GDP_{t-1} \end{bmatrix} + \ldots\ldots + \begin{bmatrix} A'_{11} & A'_{12} & A'_{13} \\ A'_{21} & A'_{22} & A'_{23} \\ A'_{31} & A'_{32} & A'_{33} \\ A'_{41} & A'_{42} & A'_{43} \end{bmatrix} \begin{bmatrix} \ln FDI_{t-k} \\ \ln EX_{t-k} \\ \ln IM_{t-k} \\ \ln GDP_{t-k} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \\ u_{4t} \end{bmatrix}$$

where A_0 is a vector of constant terms and A_i and A' are all matrices of coefficients to be estimated and u_t is a vector of residuals and assumed to be white noise, i.e.~ IN(0, 1).

In term of the variables central to the present study, the VAR system can be presented in another form as bellowing:

$$\ln FDI_t = a_{01} + \sum_{i=1}^{k} a_{1i} \ln FDI_{t-i} + \sum_{i=1}^{k} b_{1i} \ln EX_{t-i} + \sum_{i=1}^{k} c_{1i} \ln IM_{t-i} + \sum_{i=1}^{k} d_{1i} \ln GDP_{t-i} + u_{1t} \quad (1)$$

$$\ln EX_t = a_{02} + \sum_{i=1}^{k} a_{2i} \ln FDI_{t-i} + \sum_{i=1}^{k} b_{2i} \ln EX_{t-i} + \sum_{i=1}^{k} c_{2i} \ln IM_{t-i} + \sum_{i=1}^{k} d_{2i} \ln GDP_{t-i} + u_{2t} \quad (2)$$

$$\ln IM_t = a_{03} + \sum_{i=1}^{k} a_{3i} \ln FDI_{t-i} + \sum_{i=1}^{k} b_{3i} \ln EX_{t-i} + \sum_{i=1}^{k} c_{3i} \ln IM_{t-i} + \sum_{i=1}^{k} d_{3i} \ln GDP_{t-i} + u_{3t} \quad (3)$$

$$\ln GDP_t = a_{04} + \sum_{i=1}^{k} a_{4i} \ln FDI_{t-i} + \sum_{i=1}^{k} b_{4i} \ln EX_{t-i} + \sum_{i=1}^{k} c_{4i} \ln IM_{t-i} + \sum_{i=1}^{k} d_{4i} \ln GDP_{t-i} + u_{4t} \quad (4)$$

where FDI, EX, IM and GDP are foreign direct investment inflows, exports, imports and gross domestic production, respectively. a_0, a, b, c and d are parameters; the e's are error terms; and k is the maximum number of lags in the VAR system. One of important point that we need to consider in VAR model is the number of lag's order of variables. The results from Granger-causality tests are highly sensitive to the order of lags in the autoregressive process. Selecting a higher order lag length than the true lag length causes an increase in the mean-square forecast errors of the VAR and underfitting the lag length often generates autocorrelated errors (Lutkepohl, 1993). The optimal lag length can be selected by the minimum value of the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) statistics.

There are three steps involving in implementing the direction of a VAR causality test.

Firstly, it is important to determine the trending nature of data series, of variables whether they are stationary or not by using standard statistical techniques. A time series is said to be non-stationary or integrated of order d >0, if it achieves stationary after being differenced d times. That is, if the time series contain a unit root, i.e. integrated of order I(1), then first-differencing is necessary for stationarity. There are many methods to test for a stationary of variables such as Graphical analysis, correlogram test or Unit root test of variables. However, a widely popular method to test of stationary (or nonstationary) over the past several years is unit root test. To detect the existence of a unit root in time series variables, both Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) statistic are performed. The null hypothesis is that the time series has a unit root, meaning the time series under consideration is nonstationary. By ADF, the estimated t value of the coefficient of the testing variable follows the **τ** statistic (tau statistic). If estimated absolute value of τ ($|\tau|$) exceeds the DF critical tau values, we reject the null hypothesis, so that the time series is stationary. If estimated absolute value of τ ($|\tau|$) < the DF critical tau values, we do not reject the hypothesis, so that the time series is nonstationary. If the variables are stationary, we can do those variable series in the estimation of a vector autoregression (VAR) model for Granger causality test.

The **second step** is to identify whether all the variables that are included in the system are cointegrated tied in a long run relationship. A widely used approach is Johansen's (1988) and Johansen and Jesulius (1990) or Johansen's (1991 & 1995) procedure based on 'Maximum Likelihood method'. Cointegration is said to exist if the values of computed statistics are significantly different from zero. Thus, variables if found to be cointegrated, implies that there exist a linear, stable and long-run relationship among variables, such that the disequilibrium errors would tend to fluctuate around zero mean. This means that variables tend to move together to its steady state path in the long run.

Lastly, for the causality testing, there is also having two choices of serving.

(A) If the null hypothesis of non stationary is not rejected at the series level and could be rejected at d level (means that the stability condition for VAR is met at d differencing) and the series are not cointergrated at I(d), the granger causality test for short run relationship between series obtained by d order differentiation of the VAR model.

Under bivariate our VAR equation system (1) – (4), the null hypothesis "FDI does not Granger cause EX, given IM and GDP" is tested via a standard F test (Wald test) and it is rejected if the a_{2i} in equation (2) are jointly significant different from zero (mean all the a_{2i} must be equal to zero). In the same way, the null hypothesis "EX does not Granger cause FDI, given IM and GDP" is rejected if the b_{1i} in equation (1) are jointly significant different from zero. Similar logic applies to $\{IM_t\}$ and $\{GDP_t\}$.

(B) If the null hypothesis of non stationary is not rejected at the series level and could be rejected at d level , and the series are cointegrated at I(d), the cointegration approach and vector error correction mechanism model (VECM) are recommended to investigate the long run equilibrium relationships between non-stationary variables (Toda and Philips, 1993). An error correction mechanism (ECM), or cointergrated VAR, has to be included in the differenced form to capture the dynamic responses of each of the variables by separating out the short-run deviations of the series from their long run equilibrium path.

We estimate the following four-equation VECM to analyze causality:

$$\Delta \ln FDI_t = \alpha_1 + \alpha_F e_{t-1} + \sum_{i=1}^{k-1} \beta_{1i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{k-1} \delta_{1i} \Delta \ln EX_{t-i} + \sum_{i=1}^{k-1} \lambda_{1i} \Delta \ln IM_{t-i} + \sum_{i=1}^{k-1} \gamma_{1i} \Delta \ln GDP_{t-i} + \varepsilon_{1t} \quad (5)$$

$$\Delta \ln EX_t = \alpha_2 + \alpha_T e_{t-1} + \sum_{i=1}^{k-1} \beta_{2i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{k-1} \delta_{2i} \Delta \ln EX_{t-i} + \sum_{i=1}^{k-1} \lambda_{2i} \Delta \ln IM_{t-i} + \sum_{i=1}^{k-1} \gamma_{2i} \Delta \ln GDP_{t-i} + \varepsilon_{2t} \quad (6)$$

$$\Delta \ln IM_t = \alpha_3 + \alpha_G e_{t-1} + \sum_{i=1}^{k-1} \beta_{3i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{k-1} \delta_{3i} \Delta \ln EX_{t-i} + \sum_{i=1}^{k-1} \lambda_{3i} \Delta \ln IM_{t-i} + \sum_{i=1}^{k-1} \gamma_{3i} \Delta \ln GDP_{t-i} + \varepsilon_{3t} \quad (7)$$

$$\Delta \ln GDP_t = \alpha_4 + \alpha_H e_{t-1} + \sum_{i=1}^{k-1} \beta_{4i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{k-1} \delta_{4i} \Delta \ln EX_{t-i} + \sum_{i=1}^{k-1} \lambda_{4i} \Delta \ln IM_{t-i} + \sum_{i=1}^{k-1} \gamma_{4i} \Delta \ln GDP_{t-i} + \varepsilon_{4t} \quad (8)$$

where ΔlnFDI, $\Delta lnEX$, $\Delta lnIM$ *and* $\Delta lnGDP$ are first differences of lnFDI, lnEX, lnIM and lnGDP respectively. The error-correction term e is a vector of residuals from the long-run equilibrium relationships α, β, γ, λ and δ are parameters; and the ε's are error terms. Engle and Granger (1987) pointed out that when a linear combination of two or more nonstationary time series is stationary, then the stationary linear combination can be interpreted as a long-run equilibrium relationship between the variables. The causality test statistics will usually have asymptotic Chi-square distribution (χ^2).

5. Causality of FDI, trade and economic growth in Vietnam: Data and empirical results

5.1. Data:

The empirical analysis was presented by time series model. The time period of analysis is quarter time series data from 1988 to 2005 in Vietnam. Most of the data on variables used in the tests are taken and calculated from Vietnam's Statistical Yearbook of General Statistics Office, Vietnam. Since

GDP is denominated in Vietnam Dong (VND- Vietnamese currency) and the FDI, import and export are in US dollars, the FDI, import and export data are converted into Dong using yearly average VND/US dollar exchange rate obtained from the socio-economic data indicators in *Vietnam – 20 years of renovation and development,* General Statistics Office, Vietnam. Then all data is converted to the based year data 1994 by using the GDP deflator (1994 =100) for better comparisons.

5.2. Unit root tests

We used the Augmented Dickey Fuller (ADF) test for testing the unit root in time series. Lag length of each variable is chosen by computer automatically based on minimum values of Schwartz Info Criterion (SIO) statistics and max lag is 11. The test equations include constant. The results are presented in **Table 3.**

The results shown in **Table 3** suggest that the null hypothesis of a unit test in the time series can not be rejected on variable levels in a logarithm form. However, all of variables are stationary in their first differences Therefore, all the variables are integrated of order one, I(1).

Table 3: ADF Unit root test

Null hypothesis: lnFDI, lnEX, lnIM and lnGDPC contain unit root

Variable	**ADF Test statistic (p value)**	
	On level series	**On 1st difference series**
lnFDI	-1.96 (0.30)	-4.85 (0.00)***
lnEX	-0.34 (0.91)	-5.86 (0.00)***
lnIM	0.28 (0.97)	-8.03 (0.00)***
lnGDPC	1.25 (0.99)	-6.47 (0.00)***

Note: (1) Test critical values at 1%, 5% and 10% level are -3.53, -2.91 and -2.59, respectively.

(2) ***, ** and * denote rejection of null hypothesis at 1%, 5% and 10% level of significance, respectively.

5.3. Cointergration test

As presented in the last part, the important point of Vector Autoregressive model is the number of lag's order of variables. A chosen appropriate lag length of the variables could create the best model with uncorrelated and homoskedastic residuals. The optimal lag length can be selected from computed data as the minimum value of the Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) statistics. **Table 4** suggested the lag order of 3 that yields the minimum Akaike's Final Prediction error (FPE), Schwartz Information Criteria (SIC), Hannan-Quinn information (HQ) and LR values.

Table 4: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-73.65246	NA	0.000124	2.353105	2.485811	2.405543
1	344.5202	772.9859	6.31e-10	-9.833947	-9.170415	-9.571754
2	370.5407	44.94444	4.68e-10	-10.13760	-8.943240	-9.665650
3	377.8022	11.66235	6.19e-10	-9.872793	-8.147610	-9.191091
4	396.8769	28.32316	5.79e-10	-9.965968	-7.709960	-9.074512
5	486.3578	122.0193*	6.53e-11*	-12.19266*	-9.405827*	-11.09145*
6	500.7193	17.84312	7.34e-11	-12.14301	-8.825351	-10.83204

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

As all variables are determined I(1), the cointegration test is performed for the long run relationship among series by using Johansen cointegration test. **Table 5** presents the results of Johansen cointegration test with a cointegration rank of four and two in both the trade test and the maximum Eigen value test, thereby there are exiting the long run relationship among the variables.

Table 5: Johansen cointegration test

Null hypothesis: lnFDI, lnEX, lnIM and lnGDPC are no cointegration, VAR lag = 5

Null	Alternative	Trace Statistic	95% Critical Value	Max-Eigen Statistic	95% Critical Value
Rank = 0	r ≥ 1	72.85***	47.85	37.18***	27.58
Rank ≤ 1	r ≥ 2	35.66***	29.79	18.73	21.13
Rank ≤ 2	r ≥ 3	16.94**	15.49	12.64	14.26
Rank ≤ 3	r = 4	4.30**	3.84	4.30**	3.84

Note: (1) Test includes intercept (no trend) and linear deterministic trend
(2) **and *** denote rejection of null hypothesis at the 5% and 1% level, respectively

5.4. Granger causality test in Vector error correction mechanism model (VECM)

Based on the results of unit root and cointegration test, we will use vector error correction mechanism in a VAR model to recognize the direction of the variables. Causality inferences among pairs of variables in the multivariate VECM model are based upon estimating the parameters of the model, subject to the predetermined number of cointegrating vectors in the system, using the Johansen maximum likelihood method. The results presented in **Table 6**.

As shown, the bidirection causality between FDI and GDP, FDI and EXPORT, GDP and EXPORT, and IMPORT and EXPORT. There are only unidirection between FDI AND IMPORT, and GDP and IMPORT. However, there are only unidirection causal connection running from IMPORT to FDI and GDP. The results are consistent with growth theories that export promotion and attracting FDI can generate permanent effects on the level of GDP. It also consistent with the theories about determinant of FDI that economic growth and openness of a country are the important factors attracting FDI inflows. The results suggested that FDI invested in Vietnam was attracted by its economic growth and its foreign trade strategy. On the other hand, the results also illustrated that FDI and trade are two important factors that effect economic growth in Vietnam.

Table 6: VEC Granger Causality/Block Exogeneity Wald Tests, VAR lag = 5

Null hypothesis: column variable does not cause the row variable

Dependent variables	Chi square test statistics				Causality directions
	ΔlnFDI	ΔlnGDP	ΔlnEXPORT	ΔlnIMPORT	
ΔlnFDI		10.68*	26.17***	35.16***	GDP⇒ FDI EXPORT ⇒ FDI IMPORT ⇒ FDI
ΔlnGDP	10.83*		62.02***	36.67***	FDI ⇒ GDP EXPORT ⇒ GDP IMPORT ⇒ GDP
ΔlnEXPORT	10.03*	13.58**		55.55***	FDI ⇒ EXPORT GDP⇒ EXPORT IMPORT ⇒ EXPORT
ΔlnIMPORT	4.01	7.94	9.26*		EXPORT⇒ IMPORT
Conclusion: Final causality direction					**FDI ⇔ GDP** **FDI ⇔ EXPORT** **GDP ⇔ EXPORT** **IMPORT ⇔ EXPORT** **IMPORT ⇒ FDI** **IMPORT ⇒ GDP**

Note: ***, ** and * denote rejection of null hypothesis at the 1%, 5% and 10% level of significance, respectively

6. Conclusion

The purpose of this study is to examine the link between FDI, trade and economic growth in Vietnam. The paper first presents some stylized facts of patterns of FDI inflows, international trade and economic growth in Vietnam. This shows that both international trade and economic growth are increasing over time. FDI in Vietnam fluctuated in the 1990s, and then increased in the first half of 21st century.

Next, a three – step - empirical analysis of the causations between FDI, trade and economic growth is presented in quarterly data of Vietnam from 1988:1 to 2005:4. As those variables are integrated in I(1) and cointergrated, the VECM framework used to test the causality relationship between the variables. Paper show the two way causal connections exist between economic growth, export and FDI, with unidirection of import to export and FDI. This could conclude that FDI invested in Vietnam was attracted by its economic growth and its foreign trade strategy. Moreover, FDI and trade are two important factors that enhance the affect of economic growth in Vietnam.

References

Athukorala, P., and H. Hill (1999) 'Foreign Investment in East Asia: A Survey', *Asian-Pacific Economic Literature*12: 23-50

Athukorala. P.C. and Jayasuriya, S. and Oczkowski, E. (1995). 'Multinational firms and export performance in developing countries: Some analytical issues and new empirical evidence, *Journal of Development Economics* 46: 109-122.

Balasubramanyam, V.N., M.A. Salisu and D. Sapsford (1996) 'Foreign Direct Investment and Growth in EP and IS Countries', *Economic Journal* 106: 92–105.

Balasubramanyam, V.N., Salisu, M. and Sapsford, D. (1999) 'Foreign Direct Investment as an engine of growth' , *Journal of International Trade and Economic Development* 8, No.1: 27-40.

Bhat, K.S., Tripura Sundari C.U., and K.D. Raj (2004) 'Causal Nexus between Foreign Direct Investment and Economic Growth in India', *Indian Journal of Economics* 85: 171-185

Borensztein, E., J. De. Gregorio, and J-W. Lee (1998) 'How does foreign direct investment affect growth?', *Journal of International Economic*s 45: 111-135.

De Mello, L.R. and K. Fukasaku (2000) 'Trade and foreign direct investment in Latin America and Southeast Asia: temporal causality analysis', *Journal of International development* 12: 903-924

Dritsaki, M. et all.(2004) ‘ A causal relationship between trade, foreign direct investment and economic growth for Greece’, *American Journal of applied sciences* 1 (3): 230-235
Granger, C.W.J. (1986) ‘Developments in the Study of the Cointegrated Economic Variables’, *Oxford Bulletin of Economics and Statistics* 48: 201-212.

Granger, C.W.J. (1988) ‘Some Recent Developments in a Concept of Causality’, J*ournal of Econometrics* 39: 199-211.

Granger, C.W.J., and A. A. Weiss (1983) ‘Time Series Analysis of Error Correction Models’, pp.255-278, in S. Karlin, T. Amemiya and L.A. Goodman (eds.), *Studies in Econometrics: Time Series and Multivariate Statistics,* New York (Academic Press): 255-278.

Granger, C.W.J., B.-N. Huang and C.-W. Yang (2000) ‘A Bivariate Causality between Stock Prices and Exchange Rates: Evidence from Recent Asian Flu’, *The Quarterly Review of Economics and Finance* 40: 337-354.

Granger, Clive W.J. (1969) ‘Investigating Casual Relations by Econometric models and cross-spectral methods’, *Econometrica* 37: 424-438

Grossman, Gene and Helpman, Elhannan (1991) *Innovation and Growth in the Global Economy*, MIT Press, Cambridge.

Hsiao, F. and M. Hsiao (2006) ‘ FDI, exports and GDP in East and Southeast Asia-Panel data versus time series causality analyses’, *Journal of Asian Economics 1*7: 1082-1106

Johansen S. (1988) ‘Statistical analysis of Cointegration vectors’, *Journal of Economic Dynamics and Control* 12:231-54.

Johansen, S. and Jesulius, K. (1990) ‘Maximum likelihood estimation and inference on cointegration-with application to the demand for money’, *Oxford Bulletin of Economics and Statistics* 52: 169-210.

Johansen, S. and Jesulius, K. (1992) ‘Testing Structural Hypothesis in a multivariate cointegration analysis of the PPP and the UIP for UK’, *Journal of Econometrics* 53: 211-244.

Kojima, K (1975) ‘International trade and Foreign Investment: Substitutes or Complements, *Hitotsubashi Journal of Economics* 16: 1-12

Kojima, K., (1973) ‘A Macroeconomic Approach to Foreign Direct Investment’, *Hitotsubashi Journal of Economics* 14: 1-21.

Liu, X., P.Burridge and P. Sinclair (2002) ‘Relationship between economic growth, foreign direct investment and trade: evidence from China’, *Applied economics* 34: 1433-1440.

Zhang, K.H.(2001), 'Does foreign direct investment promote economic growth? Evidence from East Asia and Latin America', *Contemporary economic policy* 19(2): 175-185