CAUSAL RELATIONSHIP BETWEEN EXPORTS, FDI AND INCOME: THE CASE OF VIETNAM

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Abstract

The objectives of the paper are to study foreign trade and investment dimensions of Vietnam in comparison with its competitors such as Indonesia, Malaysia, Philippines, Singapore and Thailand as also to study the role of FDI to the growth of exports in Vietnam. Vector autoregression model (VAR) is adopted to estimate the long run causal relationship among exports, foreign direct investment and GDP. The cointegration test result shows that there exist a long run equilibrium relationship among exports, FDI and GDP. It is found from the estimated Error Correction Model that FDI is a significant variable and the result indicates that 1% increase in FDI will lead to 0.25% increase in exports with one year time gap. Granger Causality Test indicates that there is a unilateral relationship between exports and FDI and the direction is from FDI to exports which mean that FDI causes exports.

JEL classifications: F14, F21, F23

Key words: FDI, Exports, Vietnam, Error Correction Model, Cointegration, Granger Causality

1. Introduction

Vietnam economy is one of the fast growing economies in the East Asia and pacific with a gross domestic product (GDP) of US $ 103.6 billion and per capita GDP US$ 1174 in 2010[1]. Its population of 89 million is growing at the rate of 1.2 per cent on an average per annum during 2005- 2010[2]. The country was ravaged in a long colonial war by France, China, Japan, Britain and America for about 116 years. The country followed a centrally planned economy, an import substitution strategy and restricted trade policies till 1986. It has prohibited the imports competing with domestic production and imposed high tariffs on permissible imports.

The government has taken drastic measures to improve its economic health by launching the 'Doi Moi' reforms in 1986 which triggered economic growth. The 'Doi Moi' reforms transformed the economy from closed and centrally planned economy to an open and market oriented economy. This has resulted a sharp fall of inflation from 780% in 1986 to 14.4% in 1994. Before 1986, government controlled wages, interest rates, and prices to contain inflationary pressures. It invested massively in state-owned enterprises (SOEs) to enhance growth of the economy. But it had undergone a major economic restructuring towards a more industrialized free market economy that can compete globally since 1986. It had created a "business friendly" and entrepreneurial oriented environment to attract private investment in the country.

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[1] World Economic Forum.2010-11. Report of Global Competitiveness

[2] UNCTAD, Hand Book of Statistics, 2010

The market-led economy had offered many opportunities for exporters and investors to invest in key areas of development. It promulgated the law of investment to boost FDI in the country in 1987. Later it had amended the Law of Foreign Investment 1987 many times to remove many hurdles to attract FDI in Vietnam. Today Vietnam's foreign investment laws are quite liberal compared to other neighboring countries. The main thrust of the policy was to promote private sector and to develop human resource capacity. The foreign direct investment together with growth of local businesses led the development of infrastructure like highways, power generation, telecommunications, etc in the country. Vietnam has become a vibrant manufactured-based economy with industry sector contributed 39.7% in GDP with a growth of 4.7% in 2008[3].

Vietnam has successfully transformed its manufacturing sector from state controlled to market oriented through price deregulation, ownership reform of state-owned enterprises, private sector development, foreign direct investment and trade liberalization. Government of Vietnam's attitude towards private sector and FDI helped the country to enter the second stage of development. Vietnam followed a fixed exchange rate regime based on averaging of the previous day's interbank exchange rate with varying band width.

The objectives of the paper are (i) to study foreign trade and investment dimensions of Vietnam in comparison with its competitors such as Indonesia, Malaysia, Philippines, Singapore and Thailand (ii) to study the role of FDI to the growth of exports in Vietnam.

The paper is organized as follows. Section 2 is devoted to survey of literature. Section 3 compares fundamentals of Vietnam with some of the neighboring countries. Section 4 analyses foreign direct investment of Vietnam vis-a-vis the neighboring countries. Section 5 discusses exports model, its estimates and analysis and section 6 concludes the discussions.

2. A survey of literature

There is an emerging consensus that FDI inflows depend on the motives of foreign investors. Motives of foreign investors can broadly be classified as (i) market seeking (ii) resource or asset seeking and (iii) efficiency seeking. Market seeking FDI is to serve local and regional markets. Tariff-jumping or export-substituting FDI is a variant type of this FDI. Market size and market growth of the host country are the main drivers. In the case of resources or asset seeking FDI, investors are looking for resources such as natural resources, raw materials or low-cost labour. This vertical-export oriented FDI involves relocating parts of the production chain to the host country. Resources like oil and natural gas, iron ore, cheap labour attracted FDI in this sector. Efficiency seeking FDI occurs when the firm can gain from the common governance of geographically dispersed activities in the presence of scale and scope. One important variable explaining the geographical distribution of FDI is agglomeration economics. Investors simply copy investment decision taken by others. The common sources of these positive externalities are knowledge spillovers, specialized labour and intermediate inputs.

[3] UNCTAD. Global Investment Report.2009

A seminal work by Wheeler and Mody (1992) makes a strong case for agglomeration (and market size) in US investors' location decisions. The theory of agglomeration economics argue that once countries attract the first mass of investors, the process will be self-reinforcing without needing a change in policies (Wheeler and Mody 1992) whereas factor endowments theory argues that FDI is drawn to those countries where lower wages and more abundant natural resources prevail. Dunning's eclectic paradigm developed a comprehensive and holistic approach to explain the level and the pattern of international production (Dunning 1988, 1993).

Dunnings analyzed FDI inflows based on three sets of factors viz., ownership specific advantage (O), locational advantage (L) and presence of superior commercial benefits in exploiting both O-type and L-type advantage internally (I) and directly rather than in exchanging them on market through licensing or cooperation agreements with an independent foreign firm.

Ownership advantages are those that are specific to a particular firm and that enable it to take advantage of investment opportunities abroad.

Locational advantages are those advantages specific to a country which dictate the choice of production site. Internalization advantages determine whether foreign production will be organized through markets (licensing) or hierarchies (FDI). The location of FDI has been traditionally been explained through the classical sources of comparative advantage (Ricardo, 1817). Firms locate production operation abroad to generate locational advantages that arise from direct access to growing markets, lower labour costs, reduced transportation and communication costs, avoidance of tariffs and non-tariffs barriers and direct access to raw materials and intermediate products that are indispensible for the production of certain goods. Locational factors that ensure cost minimization are determined by relative factor prices, market size and growth (Kravis and Lipsey 1982, Veugelers 1991) as well as transportation cost (Aliber 1970).

The ownership advantage of firms is ownership rights over patents, trademarks, commercial secrets and production process there by effectively denying access to both foreign and domestic competitors. FDI is often used to overcome barriers to entry into a foreign market, including tariff and non-tariff barriers (Motta 1992).

Markuseu and Venables (1995) argued that multinational enterprises (MNEs) reduced the agglomeration forces that arise when international factor mobility is allowed. Wheeler and Mody (1992) had identified three sources of agglomeration economics viz., infrastructural quality, the degree of industrialization and the existing level of FDI. The location preference of foreign investors attempts to link the host country choice with basic motivation for undertaking the investment (Dunning 1988). Resource seeking investors locate production plants where necessary resources are available while efficiency seeking foreign investors is attracted to those countries well endowed with factors of production such as low-cost labour.

Market seeking firms choose countries that offer the best opportunities for entering and expanding within the domestic or regional market while strategically motivated FDI may link one of the above motivations with strategic consideration. Strategic FDI is quite similar to resource seeking FDI (Dunning 1988). According to Mundell (1957) FDI flows into those countries that are importing goods from abroad. Vernon (1966) argues that adequate infrastructure is required to migrate production abroad. Within the basic

framework of OLI, Dunnings (1981) had developed a theory of Investment Development Path (IDP) which evolved five stages of development viz. pre-industrialization with no FDI, inflow of FDI, outflow of FDI, but net inward FDI stock, net outward FDI and finally high stocks of both inward and outward FDI. The final stage represented international integration of industrialization. There would be variation of IDP theory across the countries based on their economic structure (Dunning and Narula, 1996).

A causal relationship among macroeconomic variables such as exports, FDI and income are intrinsically related to a country's economic structure. There exists extensive surveys of literature on the relationship between exports, FDI and income such as Harrison (1996), Dollar (1992), Krueger (1985) and Thornton (1996). Exports and FDI are fundamentally substitutes to each other (Dunning, 1977). Bhagavati (1978) points out that volume and efficiency of FDI are more pronounced in export oriented host countries. Helleiner (1973) explained the role of MNCs in manufacturing exports of LDCs. FDI is essentially a driving force behind China's rapid expansion (Xing, 2006). FDI in China facilitated it's exports to the FDI source countries (Liu, Wang and Wei,2001).

FDI has substantially enhanced Vietnam's exports to its source countries (Xuan and Xing, 2008). Sun (2001) found that FDI has positive and strongest impact on in the coastal region of China. Zhang and Song (2000) found that higher level of FDI led to higher level of provincial exports in China.

Barry and Bradley (1997) concluded that there has been a significant direct contribution of foreign producers to increasing Irish exports. Thanh and Duong (2011) found that FDI has a positive impact on exports in Vietnam. Other studies which have shown a significant positive econometric relationship between inward FDI and the host country's exports are Lin (1995), Leichenko and Erickson (1997), Pain and Wakelin (1998), Hejazi and Zafarian (2001), Liu and Shu (2003) and Melwally (2004). On the other hand Zhang and Felmingham (2001), and Ekanayake, Vogel and Veeramacheneni (2003) found a one-way causality from exports to inward FDI ("exports cause FDI").

3. Fundamentals of Vietnam vis-à-vis its neighboring countries.

Tables 1 to 4, in the Annex, and tables 5 and 6 below, show a comparison of Vietnam with neighboring countries.

Table 5: Share of Exports of Goods and Services in Gdp (%)

	2005	**2006**	**2007**	**2008**
Indonesia	34.1	31	29.4	29.8
Malaysia	117.5	116.6	110.2	121
Philippines	47.6	47.3	42.5	36.9
Singapore	236.4	243.4	230.2	234.3
Thailand	73.6	73.6	72.7	76.6
Vietnam	69.4	73.6	76.9	78.2

Source: World Bank, World Development Indicators-2005

Table 6: Share of Imports of Goods and Services in Gdp (%)

	2005	**2006**	**2007**	**2008**
Indonesia	29.9	25.6	25.4	28.6
Malaysia	94.6	94.5	89.9	95.6
Philippines	51.7	48	42.3	38.7
Singapore	207.9	213.2	198.5	215.3
Thailand	74.7	70.1	65	73.9
Vietnam	73.5	78.2	92.7	94.7

Source: World Development Indicators-2005

Average annual GDP growth rate for Vietnam was 5.3% while the growth rates varied among its neighbors from -2.3% of Malaysia to 4.5% of Indonesia in 2009 (Table 1). The growth rate achieved by Vietnam was because of their policy towards private enterprises and foreign direct investment. They have adopted entrepreneur friendly policies which helped private entrepreneurs to invest heavily to take advantage of the opportunity available in the country. The per capita growth of Vietnam has fallen from 7.1% in 2005 to 4.2% in 2009 mainly due to world recession and increased competition from other ASEAN countries (Table 2). The average annual per capita GDP growth was highest for Vietnam (5%) and lowest for Singapore (-1.7%) in 2008. Vietnam, Indonesia and Thailand consistently maintained their per capita growth rate during 2004-08. The per capita income varied from the highest of US $ 43,117 for Singapore and lowest of US$ 1174 for Vietnam in 2010[1].

Vietnam had improved its exports growth from 22.5% in 2005 to 30 % in 2008 and imports growth from 15.7% to 31 % during 2004-08 (Table 3 & 4). Indonesia has improved its exports growth rate considerably from 20.1% to 24.4% during the same period. Malaysia has improved its exports growth rate from 12% to 19.1% during 2005-2008. Imports growth rates were impressive for Vietnam and Indonesia as their imports growth rates improved from 15.7% and 37.3% in 2005 to 30.9% and 39.4% in 2008 respectively. Imports of Vietnam played a significant role to boost exports and investment. Vietnam considered trade as engine of growth for the country. Share of exports in world's exports varies from 2.2% in Singapore to 0.29% in Vietnam in 2008[2]. The share of exports of Vietnam in its GDP was 78% and imports 95 % in 2008 (Table 5&6). The share of exports of Singapore in its GDP was 234% and imports 215 % in 2008.

The structure of Vietnam economy indicated that industry sector is dominated with 40% of GDP and service sector with 38% and Agriculture sector 22% in 2008[4]. Manufacturing sector constituted 21% of its GDP in 2008[3]. Industry sector is also dominated in Malaysia and Indonesia whereas services sector dominated in Singapore,

[4] UNCTAD. Global Investment Report.2009

Philippines and Thailand in their GDP[5]. Vietnam, Malaysia and Thailand have shown high growth rate in industry sector whereas Vietnam, Indonesia and Philippines have shown moderate growth in service sector in 2008[6]. The high industry sector growth has resulted high over all growth of the Vietnam economy. The high industry growth also has resulted high FDI inflow as FDI is normally attracted to the industry sector (Bhatt 2008a). Manufacturing is the engine of growth as industrial goods have a higher-income elasticity of demand (Kaldor, 1967). The growth of manufacturing sector resulted faster growth of GDP of Vietnam, Malaysia and Indonesia. Vietnam pursued a dynamic industrial policy to encourage industries through trade and investment. It is important to see that service sector also grew in tandem with industry sector because any significant imbalances between the two affect consumption and investment efficiency.

4. Foreign direct investment (fdi) inflows in Vietnam

Table 7 to 10 below, show the evolution of FDI. Table 11 below presents a summary of those variables in year 2009.

Table 7: FDI Inflows **(**Millions Of $)

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
1990	1092	2611	550	5575	2575	180
1995	4419	5815	1459	11535	2070	1780
2000	-4495	3788	2240	16484	3410	1289
2005	8337	4064	1854	15460	8967	2021
2009	4877	1381	1948	16809	5949	4500

Source: UNCTAD: World Investment Report, 2009

Table 8: Stock of FDI Inflows **(**Billions of $)

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
1990	8.7	10.3	4.5	30.5	8.2	1.7
1995	20.6	28.7	10.1	65.6	17.7	7.2
2000	25.1	52.7	18.2	110.6	29.9	20.6
2005	41.2	44.5	15.0	194.6	60.4	31.1
2009	72.8	74.6	23.6	343.6	99.0	52.8

Source: UNCTAD: World Investment Report, 2009

[5] World Competitive Index Report, 2010
[6] World Competitive Index Report, 2010

Table 9**:** FDI Inflows as a Percentage of Gross Fixed Capital Formation

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
1990	3.4	17.9	5.4	46.8	7.5	21.2
1995	7.7	15.0	8.9	41.1	3.0	33.8
2000	-13.7	16.0	13.9	58.1	12.6	15.0
2005	12.3	14.4	13.0	60.0	15.8	11.6
2009	2.9	3.5	8.2	32.9	9.2	12.8

Source: UNCTAD: World Investment Report, 2009

Table 10: Inward Fdi Stock as a Percentage of Gross Domestic Product,

	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
1990	6.9	23.4	10.2	82.6	9.7	25.5
1995	9.3	32.3	13.7	78.2	10.5	34.5
2000	15.2	56.2	24.2	119.3	24.4	66.1
2005	14.4	32.2	15.2	160.5	34.2	58.8
2009	13.5	39.0	14.6	194.0	37.5	51.9

Source: UNCTAD: World Investment Report, 2009

Table 11. Summary of FDI variables in year 2009

Year	Indonesia	Malaysia	Philippines	Singapore	Thailand	Vietnam
FDI Inflowas (Bn $)	4.877	1.381	1.948	16.809	5.949	4.500
Stock of FDI Inflows (Bn $)	72.8	74.6	23.6	343.6	99.0	52.8
FDI Inflows (% of GFCF)	2.9	3.5	8.2	32.9	9.2	12.8
Inward FDI Stock (% of GDP)	13.5	39.0	14.6	194.0	37.5	51.9

Notes: FDI: Foreign Direct Investment; GFCF: Gross Fixed Capital Formation; GDP: Gross Domestic Product. Source: UNCTAD: World Investment Report, 2009

High FDI inflows contribute high level of investment and employment generation, raising productivity and skill development and sharply improved competitiveness (Bhatt 2008b). Vietnam is an open economy with low barriers for trade and foreign direct investment. FDI in Vietnam was both efficiency-seeking and market-seeking which helped the expansion of manufacturing and trade in the country. FDI inflows in Vietnam have increased from US$ 180 million in 1990 to US $ 4.5 billion in 2009. This was the result of improved investment environment, government's permission to invest in some previously government-monopolized industries, its accession to World Trade Organization (WTO) in 2007 and its partnership with European Union (EU), ASEAN, APEC and US.

Vietnam's location in the Asian region is an added advantage to attract of FDI in Vietnam. Singapore has attracted the highest FDI inflows to the tune of US$ 16.8 billion followed by Thailand (US$ 5.9 billion), and Indonesia (US $ 4.9 billion) in 2009 (Table 7).

FDI inward stock of Vietnam and was US$ 52.8 billion in 2009 which has increased from US $ 1.7 billion in 1990. The FDI stock was the highest of US$ 344 billion for Singapore followed by Thailand (US$ 99 billion) and Malaysia (US $ 74.6 billion) in 2009 (Table 8). FDI inflows have contributed immensely to its industrial structure. The country has adopted an investment-led industrial policy which helped foreign investors to invest in a big way.

FDI inflows as a percentage of gross fixed capital formation in Vietnam was 12.8% in 2009. The percentage has varied from 2.9% for Indonesia to 32.9% for Singapore in 2009 (Table 9). Stock of FDI inflows as a percentage of Gross Domestic Product was 51.9% for Vietnam in 2009. The percentage was highest of 194% for Singapore, followed by Malaysia (39%) and Thailand (37.5%) in 2009 (Table 10). Vietnam has increased the percentage of FDI to GDP from 25.5% in 1990 to 51.9% in 2009 which was very significant. Many multinational companies entered the country through mergers and acquisition (M&As) to take advantage of opportunities.

5. Exports model of Vietnam

The exports model considered in this study is given by:

Exports = f (FDI, GDP)

Where FDI = Foreign Direct Investment, GDP = Gross Domestic Product

The two other variables such as capital stock and exchange rates have been dropped from the model as they are not significant in the estimated model. Moreover these two variables are correlated with FDI and GDP creating multicollinearity problem.

The data that are used in this analysis are annual covering the period 1990-2008 and are obtained from UNCTAD.

Vector Auto-regression model (VAR) is adopted to estimate the long run causal relationship among exports, foreign direct investment and GDP.

The results of unit root test of all the three variables are given in Table 12, in the Annex, which indicates that all variables have unit root at level at 5% level of significance. Since all the three variables have unit root, it can be tested whether there exist at least one cointegration equation among the variables by Johansen cointegration test. The test result reveals that there exists at least one cointegration equation at 5% level (Table 13 in the Annex). The existence of the cointegrating equations confirms the long run equilibrium linear relation among the variables. The cointegrating equation is given by:

log(export)	=	1.774894 log(GDP)	-0.215544 log(FDI)
t-ratio		(48.67)	(- 441.62)

A Vector Autoregression Model (VAR) with an Error Correction Mechanism

As seen above, since there exist cointegration relation among the variables, a VAR model with an Error Correction can be estimated.The Vector Error Correction Model takes the following form:

$$\Delta\log(\text{exports})_t = \text{lagged}(\Delta(\log(\text{exports}_t)) + \Delta(\log(GDP_t)) + \Delta(\log((FDI_t))) + \beta u_{t-1} + v_t$$

Where Δ is the first difference of the variables, u_{t-1} are the estimated residuals from the cointegrated regression (long-run relationship) and represent the deviation from the equilibrium in time period t. $-1 < \beta < 0$, short-run parameter and v_t white disturbance term.

The estimated Error Correction Model is given in Table 14. The model is significant with adjusted $R^2 = 0.535510$. The error correction term is statistically significant and has a negative sign indicating that there exists a long run equilibrium relationship among exports, GDP and FDI. FDI is a significant variable in the model which indicates that 1% increase in FDI will lead to 0.25% increase in exports with one year time gap.

Table 14: Vector Error Correction Model

$$\Delta(\log \text{Export})_t = -0.975103\ EC_{t-1}^{*} + 0.149376\ \Delta(\log \text{Export})_{t-1} + 0.016420\ \Delta(\log \text{Export})_{t-2}$$
$$(-2.09141) \qquad (0.45360) \qquad (0.07285)$$

$$+ 0.319671\ \Delta(\log GDP)_{t-1} - 1.295648\ \Delta(\log GDP)_{t-2}$$
$$(0.59083) \qquad (-1.59528)$$

$$+ 0.245768\ \Delta(\log(FDI))_{t-1}^{*} + 0.118281\ \Delta(\log(FDI))_{t-2} - 0.006011$$
$$(1.90870) \qquad (1.16194) \qquad (-0.15996)$$

$R^2 = 0.535510$ Adj $R^2 = 0.229082$ N=16

*indicate significant at 5% level. Δ indicates first difference

Granger Causality Test indicates that there is a unilateral relationship between exports and FDI and the direction is from FDI to exports (Table 15). Hence it is confirmed from the Granger causality test that FDI causes Exports. There is also unilateral relationship between exports and GDP and the direction is from exports to GDP as also a unilateral relationship between GDP and FDI and the direction is from FDI to GDP (Table 15).

Table 15: Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LOG(FDI) does not Granger Cause LOG(EXPORT)		14.9629	0.0028
LOG(EXPORT) does not Granger Cause LOG(FDI)	15	1.6836	0.2705
LOG(GDP) does not Granger Cause LOG(EXPORT)		6.4593	0.0230
LOG(EXPORT) does not Granger Cause LOG(GDP)	15	2.5672	0.1452
LOG(GDP) does not Granger Cause LOG(FDI)	15	2.2114	0.1840
LOG(GDP) does not Granger Cause LOG(FDI)		7.7147	0.0151

6. Summary and conclusion

Vietnam is a fast growing economy with gross domestic products (GDP) of US $ 103.6 billion and per capita GDP US $ 1174 in 2010. The structural reforms 'Doi Moi' in 1986 transformed the economy from a closed and centrally planned economy to an open and market oriented one. FDI inflows for Vietnam were US$ 36.8 billion in 2009. Vietnam had attracted fairly significant FDI inflows whose inward FDI stock accumulated as US$ 52.8 billion in 2009. FDI played a significant role to enhance exports in the country. Stock of FDI inflows as a percentage of Gross Domestic Product was 52 per cent in 2009.

A vector autoregression model (VAR) is adopted to estimate the long run causal relationship among exports, foreign direct investment and GDP. The cointegration test result shows that there exist a long run equilibrium relationship among FDI, GDP and Exports. It is found from the estimated Error Correction Model that FDI is a significant variable and the result indicates that 1% increase in FDI will lead to 0.25% increase in exports with one year time gap. Granger Causality Test indicates that there is a unilateral relationship between Exports and FDI and the direction is from FDI to Exports which means that FDI causes Exports.

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Annex on line at the journal Website: http://www.usc.es/econmet/aeid.htm

Annex 1. Data

TABLE 1: AVERAGE ANNUAL GDP GROWTH RATE (%)

	2004	2005	2006	2007	2008	2009
Indonesia	5.0	5.7	5.5	6.3	6.0	4.5
Malaysia	6.8	5.3	5.8	6.3	4.5	-1.7
Philippines	6.4	5.0	5.4	7.2	4.6	0.9
Singapore	9.3	7.3	8.4	7.8	1.1	-2.0
Thailand	6.3	4.6	5.2	4.9	4.8	-2.3
Vietnam	7.8	8.4	8.2	8.5	6.2	5.3

*included Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore Thailand, Timor-Leste, Vietnam. Source: UNCTAD, Hand book of Statistics, 2010

TABLE 2: AVERAGE ANNUAL PER CAPITA GDP GROWTH RATE (%)

	2004	2005	2006	2007	2008	2009
Indonesia	3.7	4.4	4.2	5.0	4.8	3.4
Malaysia	4.8	3.4	3.9	4.5	2.8	-3.3
Philippines	4.4	3.0	3.5	5.2	2.7	-0.9
Singapore	8.1	5.6	5.9	4.9	-1.7	-4.5
Thailand	5.1	3.5	4.3	4.2	4.1	-2.8
Vietnam	6.4	7.1	6.9	7.2	5.0	4.2

*included Brunei Darussalam, Cambodia, Indonesia, Lao People'sDemocratic Republic, Malaysia, Myanmar, Philippines, Singapore Thailand, Timor-Leste, Vietnam. Source: UNCTAD, Hand book of Statistics, 2010

TABLE 3: ANNUAL GROWTH RATE OF EXPORTS OF GOODS AND SERVICES (%)

Country	2005	2006	2007	2008	2009
Indonesia	20.1	20.1	14.7	24.4	-19.1
Malaysia	12.0	14.0	9.6	19.1	-24.9
Philippines	0.5	18.9	6.0	-2.5	-22.1
Singapore	15.6	18.4	10.1	13.0	-20.2
Thailand	14.5	18.7	17.0	12.9	-12.0
Vietnam	22.5	22.1	22.0	29.7	-10.9

*included Brunei Darussalam, Cambodia, Indonesia, Lao People'sDemocratic Republic, Malaysia, Myanmar, Philippines, Singapore Thailand, Timor-Leste, Vietnam. Source: UNCTAD, Hand book of Statistics, 2010

TABLE 4: ANNUAL GROWTH RATE OF IMPORTS OF GOODS AND SERVICES (%)

	2005	2006	2007	2008	2009
Indonesia	37.3	15.7	15.9	39.4	-28.6
Malaysia	8.7	14.6	12.0	12.0	-24.8
Philippines	10.9	15.2	6.7	4.8	-24.4
Singapore	22.1	19.3	10.2	21.5	-21.1
Thailand	25.2	8.9	9.4	27.0	-24.6
Vietnam	15.7	20.1	37.1	30.9	-16.2

*included Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore Thailand, Timor-Leste, Vietnam. Source: UNCTAD, Hand book of Statistics, 2010

Annex 2. Unit root and cointegration

Unit Root Test.

Before testing the cointegration of two or more variable, it is required to check whether the variables have unit root. The existence of unit root can be tested by augmented Dickey-Fuller test and/or Phillip- Perron test.

The general form of augmented Dickey-Fuller test is given by

$$\Delta Y_t = \alpha + \beta t + \lambda Y_{t-1} + \sum_{i=1}^{p} \gamma i \, \Delta Yt - I + u_t$$

The null and alterative hypothesis for the existence of unit root in Y_t is:

H_0: $\lambda = 0$ $H_1 = \lambda < 0$

The null hypothesis is that there is a unit root.

The Phillip- Perron equation is given by

$$\Delta Y_t = \alpha + \lambda Y_{t-I} + u_t$$

Johansen Cointegration Test (Hjalmarsson and Osterholm, 2007)

Johansen (1991,1995) developed cointegration test based on Vector Autoregression Model (VAR) of order p which is given by

$$y_t = \mu + A_1 y_{t-1} + A_2 y_{t-2} + \text{----------} + A_p y_{t-p} + \varepsilon_t$$

Where y_t is an n x 1 vector of non-stationary I(1) variables and ε_t is an n x 1 vector of innovations.

This can be re-written as

$$\Delta y_t = \mu + \prod y_{t-1} + \sum_{i=1}^{p-1} \Gamma i \, \Delta y_{t-i} + \varepsilon_t$$

Where $\prod = \sum_{i=1}^{p} Ai - I$ and $\Gamma i = - \sum_{j=i+1}^{p} Aj$

Granger's representation theorem asserts that if the coefficient matrix $\prod$ has reduced rank r< n, then there exist n x r matrices α and β each with rank r such that $\prod = \alpha \beta'$ and $\beta' y_t$ is I(0). r is the number of cointegrating relations and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the Vector Error Correction (VEC) model. Johansen's method is to estimate the $\prod$ matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of $\prod$.

Johansen (1988, 1991) and Johansen and Juselius (1990) suggested two test statistic to determine the number of cointegration vectors. The first one is the trace test (λ trace). It tests the null hypothesis that the number of distinct cointegrating vector is less than or equal to q against a general unrestricted alternatives q = r. The test is calculated as:

$$\lambda_{trace\,(r)} = -T \sum_{i=r+1}^{n} \ln (1 - \lambda t))$$

Where T is the number of usable observations and λ_t's are the estimated eigenvalue from the matrix. The trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors.

The second test statistic is the maximum eigenvalue test (λ_{max}) that is calculated as:

$$\lambda_{max(r,\, r+1)} = -T \ln (1- \lambda_{r+1})$$

Where T is the number of usable observations and and λ_i's are the estimated eigenvalue from the matrix.

The maximum eigenvalue test tests the null hypothesis of r cointegrating vectors against the alternative r+1 cointegrating vector

TABLE 12: UNIT ROOT TEST FOR STATIONARITY

Variable	ADF Test Statistic	PP Test Statistic	Critical value at 5% level
log(Export)	-0.700151	-0.700151	-3.040391
Δ (log(Export)	-5.073579	-4.963847	-3.052169
log(GDP)	-0.281389	-0.545738	-3.052169
Δ (log(GDP)	-3.171100	-2.698509	-3.052169
log(FDI)	-1.420086	-1.537335	-3.040391
Δ (log((FDI))	-3.171100	-3.171100	-3.052169

TABLE 13: JOHANSEN COINTEGRATION TEST

Unrestricted Cointegration Rank Test (Trace)

Hypothesized no. of CEs	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None*	0.754017	34.86329	29.79707	0.0120
At most 1	0.454011	11.02091	15.49471	0.2102
At most 2	0.042215	0.733250	3.841466	0.3918

Trace test indicates 1 cointegrating equation at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michalis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized no. of CEs	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None*	0.754017	23.84238	21.13162	0.0202
At most 1	0.454011	10.28766	14.26460	0.1937
At most 2	0.042215	0.733250	3.841466	0.3918

Max-Eigenvalue test indicates 1 cointegrating equation at the 0.05 level. *denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michalis (1999) p-values

[1] World Competitive Index Report, 2010
[2] UNCTAD, Hand Book of Statistics, 2010
[3] UNCTAD, Hand Book of Statistics, 2010