

External Sector Development Index: The Case of Chinese and ASEAN Economies

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Abstract

This paper introduces an alternative index to measure the external sector from a different focus. The indicator, called the “external sector development index” (SX_i), is a new analytical tool for studying the external sector behaviour of any country or region. The SX_i has four objectives. The first objective is to measure the vulnerability of the external sector of any country. The second is to evaluate the external sector performance. The third is to analyze the relationship between “the external sector main variable” ES_i and GDP growth rates. The fourth is to evaluate the external sector (SX_i) cycle based on the table of possible combinations between ES_i and GDP. In our case, we apply the SX_i on the Chinese and ASEAN economies.

Keywords: *Econographicology, international trade, trade index*

JEL classification: *F15*

1. Introduction

For many decades, economists and policymakers have been using a variety of analytical tools in the study of external sector behaviour in different countries and regions. The most common analytical tools applied in such studies so far are the terms of trade (ToT)¹ and the openness index (O_i)². This paper introduces a new index to measure the external sector of any country or region from a different analytical perspective. This new index is called the “external sector development index” (SX_i). The SX_i is strongly affiliated with the openness index (O_i). The difference between these two indices is that the measurement of SX_i replaces absolute values with growth rates (or relative values), which in turn are the trade volume growth rate ($\Delta T = \sum \text{export growth rate plus } \sum \text{import growth rate}$), foreign direct investment growth rate (ΔFDI) and gross domestic product growth rate (ΔGDP). The SX_i analysis will also

introduce a new variable called “the external sector main variable” (ES_i). The ES_i is equal to the trade volume growth rate (ΔT) plus the foreign direct investment growth rate (ΔFDI) (see Figure 1). However, the three indicators (ToT , O_i and SX_i) have different objectives and analytical foci, but they share something in common – they all aim to evaluate the external sector of any country (see Table 1).

Figure 1 Procedure to Measure the External Sector Development Index (SX_i)

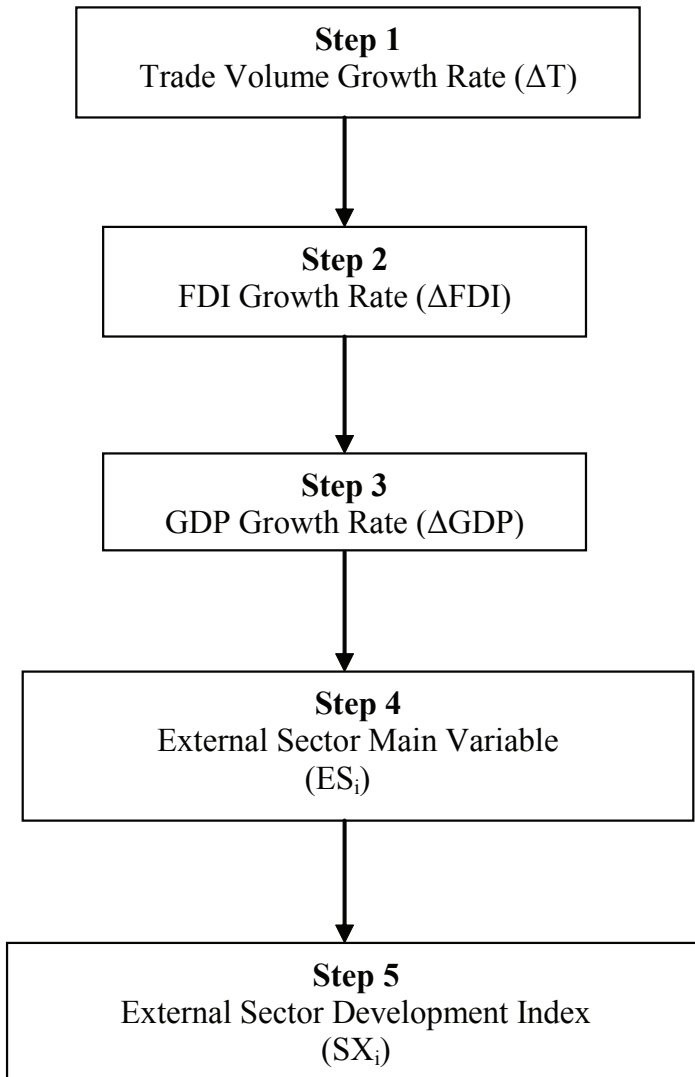


Table 1 Comparison of Terms of Trade, Openness and External Sector Development Index (SX_i)

Concept	Measures	Function	Advantage	Disadvantage
Terms of Trade (ToT)	<p>X Price/M Price $X = \text{Export Index Price}$ $M = \text{Import Index Price}$</p>	To study the relationship between export price ratio and import price ratio to find the deteriorating terms of trade among countries	Permits the visualization of the relationship between various international prices in the international market	Difficult to be applied to many countries and goods simultaneously
Openness (O_i)	<p>$TV/GDP \times 100\%$ $TV = X+M$</p>	To measure the level of trade liberalization and the orientation of trade policy	Gives a general idea about how open an economy is in its international trade	Focused on studying how open an economy is from the specific point of view of trade
External Sector Development (SX_i)	<p>$ES_i/\Delta GDP \times 100\%$ $ES_i = \Delta T + \Delta FDI$</p>	To measure the level of trade liberalization and investment mobility simultaneously	Observes the trends of the external sector from the perspectives of the international trade sector and the finance sector simultaneously	Difficult to monitor FDI mobility in the short term

2. External Sector Development Index (SX_i)

The objective of the external sector development index (SX_i) is to observe the external sector behaviour of any economy from a new angle of analysis based on three basic variables: trade volume growth rate (ΔT), foreign direct investment growth rate (ΔFDI) and GDP growth rate (ΔGDP).

The external sector of the SX_i is represented by two specific growth rates: trade volume growth rate (ΔT) and foreign direct investment growth rate (ΔFDI). This part of the research maintains that the trade volume is equal to the sum of exports flow (FOB) plus imports flow (CIF) in US\$ per year. On the investment side, it is represented by the variation of the FDI growth rate between two years. The idea to include the FDI growth rate (ΔFDI) and trade volume growth rate (ΔT) together into the study of the external sector is basically to analyze the external sector as a whole. The computation of the SX_i Index requires four preceding steps detailed in Figure 1.

2.1. Step 1: Trade Volume Growth Rate (ΔT)

The trade volume growth rate (ΔT) is the difference between the trade volume of a given year in millions of US\$ $(X+M)_{n+1}$ and the trade volume of the previous year in millions of US\$ $(X+M)_n$ divided by the trade volume of the previous year in millions of US\$ $(X+M)_n$.

$$\Delta T = \frac{(X+M)_{n+1} - (X+M)_n}{(X+M)_n} \quad (1.1)$$

2.2. Step 2: Foreign Direct Investment Growth Rate (ΔFDI)

The foreign direct investment growth rate (ΔFDI) is the difference between the foreign direct investment volume of a given year in millions of US\$ $(FDI)_{n+1}$ and the foreign direct investment of the previous year in millions of US\$ $(FDI)_n$ divided by the foreign direct investment of the previous year in millions of US\$ $(FDI)_n$.

$$\Delta FDI = \frac{(FDI)_{n+1} - (FDI)_n}{(FDI)_n} \quad (1.2)$$

2.3. Step 3: GDP Growth Rate (ΔGDP)

The domestic product growth rate (ΔGDP) is equal to the domestic product growth of a given year in millions of US\$ $(GDP)_{n+1}$ minus the domestic

product growth of the previous year in millions of US\$ $(GDP)_n$ divided by the domestic product growth of the previous year in millions of US\$ $(GDP)_n$.

$$\Delta GDP = \frac{(GDP)_{n+1} - (GDP)_n}{(GDP)_n} \tag{1.3}$$

2.4. Step 4: External Sector Main Variable (ES_i)

The external sector main variable (ES_i) is equal to the sum of trade volume growth rate (ΔO) and foreign direct investment growth rate (ΔFDI) (see Table 2).

$$ES_i = \Delta T + \Delta FDI \tag{1.4}$$

2.4.1. Possible results

If any value is located within ES_{i+} then this value is included in the category of acceptable performance in the external sector. If any value is located within ES_{i-} or ES_{i=0} then this value is included in the category of weak external sector performance.

Table 2 Possible Combinations of ΔT and ΔFDI to Obtain ES_i

$\Delta FDI/\Delta T$	$+\Delta T$	$-\Delta T$	$\Delta T = 0$
$+\Delta FDI$	$\Delta T + \Delta FDI = ES_{i+}$	$\blacktriangle(-\Delta T) + \blacktriangledown\Delta FDI = ES_{i-}$ $\blacktriangledown(-\Delta T) + \blacktriangle\Delta FDI = ES_{i+}$	$0 + (\Delta FDI) = ES_{i+}$
$-\Delta FDI$	$\blacktriangle\Delta T + \blacktriangledown(-\Delta FDI) = ES_{i+}$ $\blacktriangledown\Delta T + \blacktriangle(-\Delta FDI) = ES_{i-}$	$\blacktriangle(-\Delta T) + \blacktriangledown(-\Delta FDI) = ES_{i-}$ $\blacktriangledown(-\Delta T) + \blacktriangle(-\Delta FDI) = ES_{i-}$	$0 + (-\Delta FDI) = ES_{i-}$
$\Delta FDI = 0$	$\Delta T + 0 = ES_{i+}$	$-\Delta T + 0 = ES_{i-}$	$0 + 0 = ES_{i=0}$

Variables: \blacktriangle = High \blacktriangledown = Low ΔFDI = Foreign Direct Investment Growth Rate
 ΔT = Trade Volume Growth Rate $(-)$ = Negative and $(+)$ = Positive
 ES_i = External Sector Main Variable 0 = Zero

2.5. Step 5: External Sector Development Index (SX_i Index)

The external sector development index (SX_i) is equal to the external sector main variable (ES_i) divided by the GDP growth rate (ΔGDP).

$$SX_i = \frac{ES_i}{\Delta GDP} \quad (1.5)$$

2.5.1. Analysis of the SX_i results

High Vulnerability

If the ES_i and ΔGDP are located in these parameters ($+ES_i / +\Delta GDP$) or ($-ES_i / -\Delta GDP$) or ($ES_i = 0 / \Delta GDP = 0$), then the SX_i can be classified in the category of high vulnerability (see Table 3). The ES_i and GDP in this category are moving in the same direction, showing the strong connection between these two values (ES_i and GDP).

Normal Vulnerability

If the ES_i and ΔGDP are located in these parameters ($+ES_i / -\Delta GDP$) or ($+ES_i / 0$), then the SX_i can be classified in the category of normal vulnerability (see Table 3). The category of normal vulnerability shows how the ES_i grows more rapidly than the GDP, and this result will show not only how the external sector depends on the world trade trend, but also that it cannot be affected so greatly under the GDP growth rate.

Low Vulnerability

If the ES_i and GDP are located in these parameters ($-ES_i / +\Delta GDP$) or ($-ES_i / 0$) or ($0 / +\Delta GDP$) or ($0 / -\Delta GDP$), then the SX_i can be classified in the category of low vulnerability (see Table 3). The category of low vulnerability shows how the ES_i growth is slower than the GDP growth rate; this result will show clearly that the external sector is not a key factor when it comes to affecting the GDP growth rate of any country.

3. Application of External Sector Development Index (SX_i)

The external sector development index (SX_i) will be applied to analyze ASEAN-5's (Indonesia, Malaysia, the Philippines, Singapore, Thailand) and China's external sector performance and vulnerability between 1985 and 2005 respectively. The reason for applying the SX_i is to observe performance, vulnerability and SX_i cycles. The objective for applying the SX_i Index is to observe how trade and investment growth together can affect growth

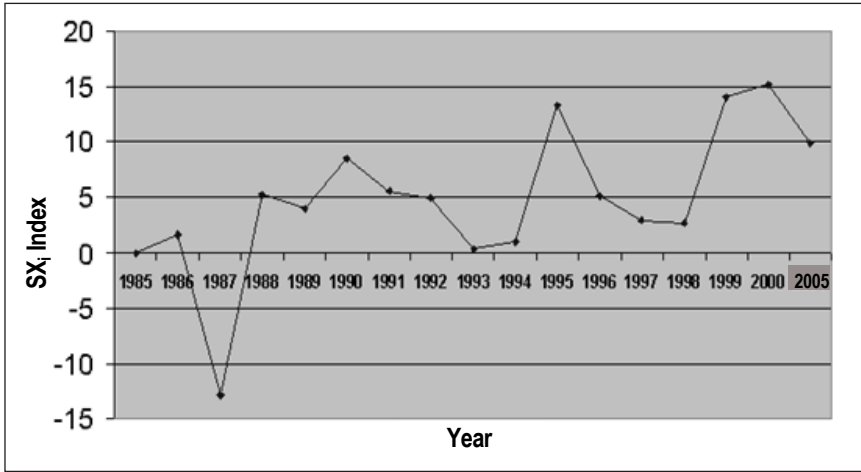
Table 3 SX_i Cycle Levels

ΔGDP ES_i	$+\Delta GDP$	$-\Delta GDP$	$\Delta GDP=0$
$+\mathbf{ES}_i$	<u>Level 1.1</u> <u>High Vulnerability</u> $+\mathbf{ES}_i / +\Delta GDP = +\mathbf{SX}_i$ Acceptable performance	<u>Level 1.2</u> <u>Normal Vulnerability</u> $+\mathbf{ES}_i / -\Delta GDP = -\mathbf{SX}_i$ Weak performance	<u>Level 1.3</u> <u>Normal Vulnerability</u> $+\mathbf{ES}_i / 0 = \mathbf{SX}_i = \infty$ Acceptable performance
$-\mathbf{ES}_i$	<u>Level 2.1</u> <u>Low Vulnerability</u> $-\mathbf{ES}_i / +\Delta GDP = -\mathbf{SX}_i$ Weak performance	<u>Level 2.2</u> <u>High Vulnerability</u> $-\mathbf{ES}_i / -\Delta GDP = +\mathbf{SX}_i$ Acceptable performance	<u>Level 2.3</u> <u>Low Vulnerability</u> $-\mathbf{ES}_i / 0 = \mathbf{SX}_i = \infty$ Weak performance
$\mathbf{ES}_i=0$	<u>Level 3.1</u> <u>Low Vulnerability</u> $0 / +\Delta GDP = \mathbf{SX}_i = 0$ Weak performance	<u>Level 3.2</u> <u>Low Vulnerability</u> $0 / -\Delta GDP = \mathbf{SX}_i = 0$ Weak performance	<u>Level 3.3</u> <u>High Vulnerability</u> $0 / 0 = \mathbf{SX}_i = 0$ Weak performance

Variables: \blacktriangle = High \blacktriangledown = Low ΔGDP = Gross Domestic Product Growth Rate
 ES_i = External Sector Main Variable (-) = Negative and (+) = Positive 0 = Zero

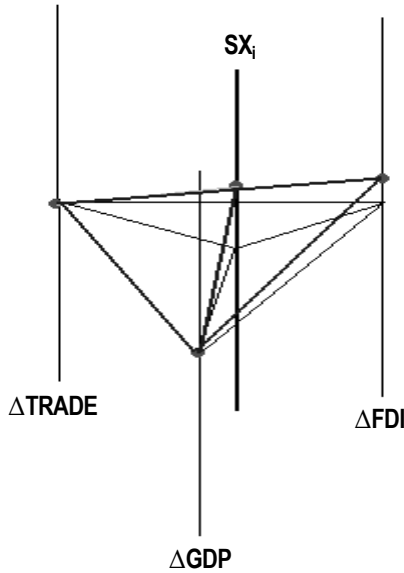
of the GDP. The reason for incorporating FDI growth together with trade volume growth is to observe how both variables can be affected by possible deep international trade or financial crises. Specifically, the SX_i is applied to the ASEAN-5 members, as well as China, to observe the effect of the 1997 financial crisis on these countries. The application of SX_i to the above

Figure 2 SX_i Index: Indonesia, 1985-2005



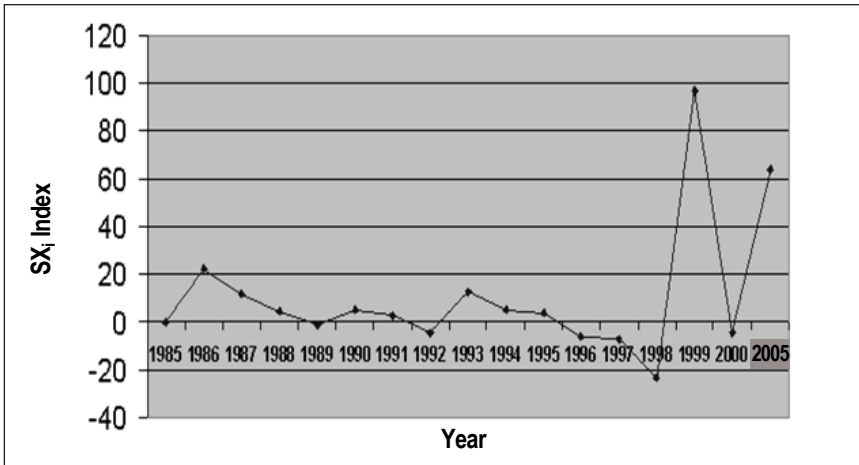
Source: ADB, NBSC WB.

Average SX_i Index: Indonesia, 1985-2005



countries shows that the countries most affected by the 1997 financial crisis were the Philippines $SX_{i-1998} = -23$ (see Figure 6), Singapore $SX_{i-1997} = -20$ (see Figure 3), Thailand $SX_{i-1997} = -6$ (see Figure 5), Malaysia $SX_{i-1997} = -4$ (see Figure 4), Indonesia $SX_{i-1997} = -3$ (see Figure 2) and China $SX_{i-1997} = 0$ (see Figure 7).

Figure 3 SX_i Index: Singapore, 1985-2005



Source: ADB, NBSC WB.

Average SX_i Index: Singapore, 1985-2005

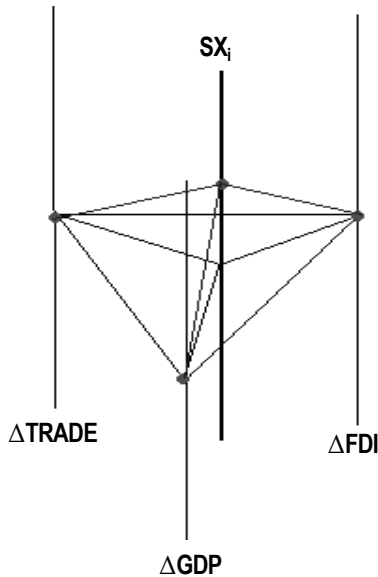
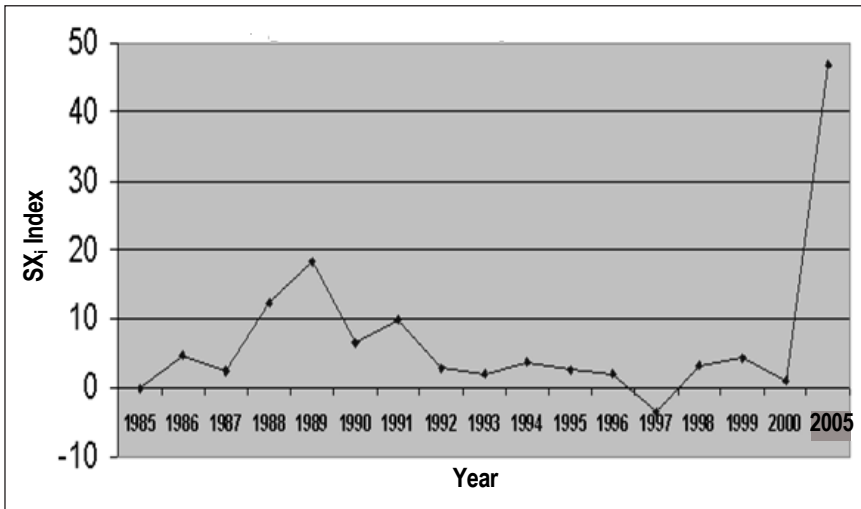


Figure 4 SX_i Index: Malaysia, 1985-2005



Source: ADB, NBSC WB.

Average SX_i Index: Malaysia, 1985-2005

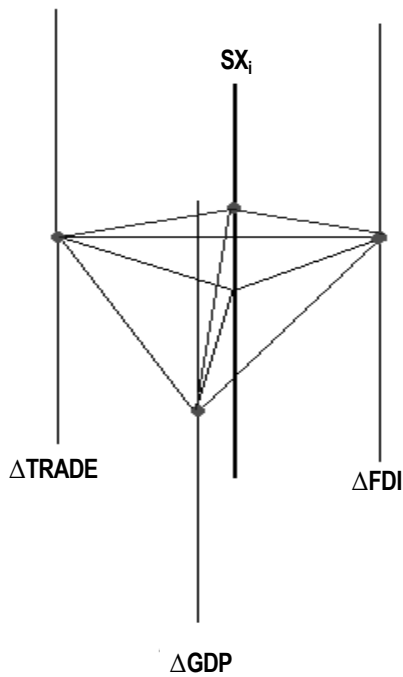
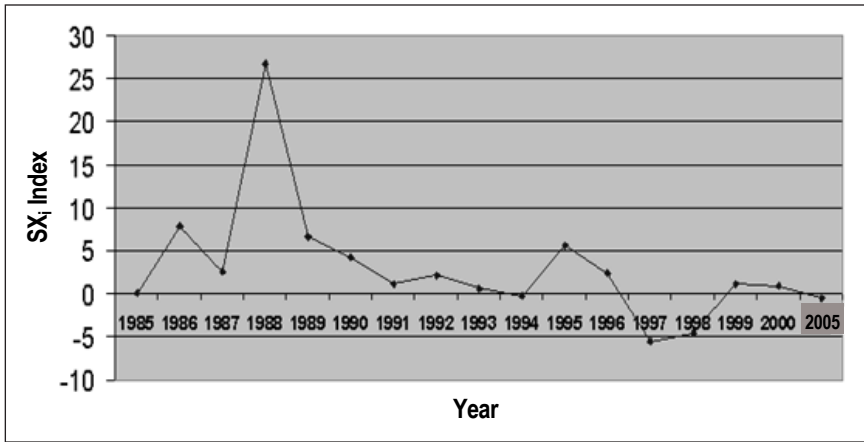


Figure 5 SX_i Index: Thailand, 1985-2005



Source: ADB, NBSC WB.

Average SX_i Index: Thailand, 1985-2005

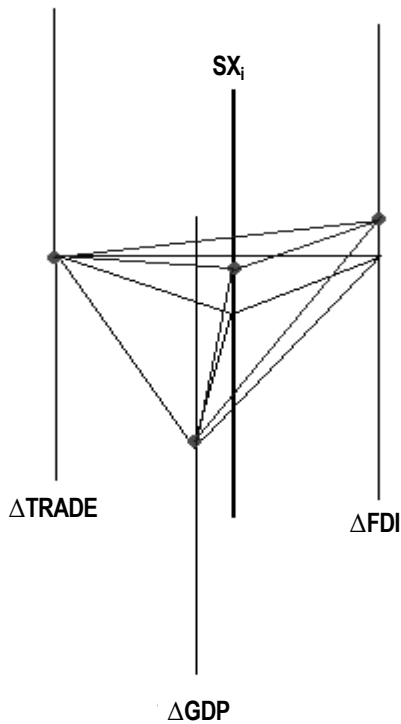
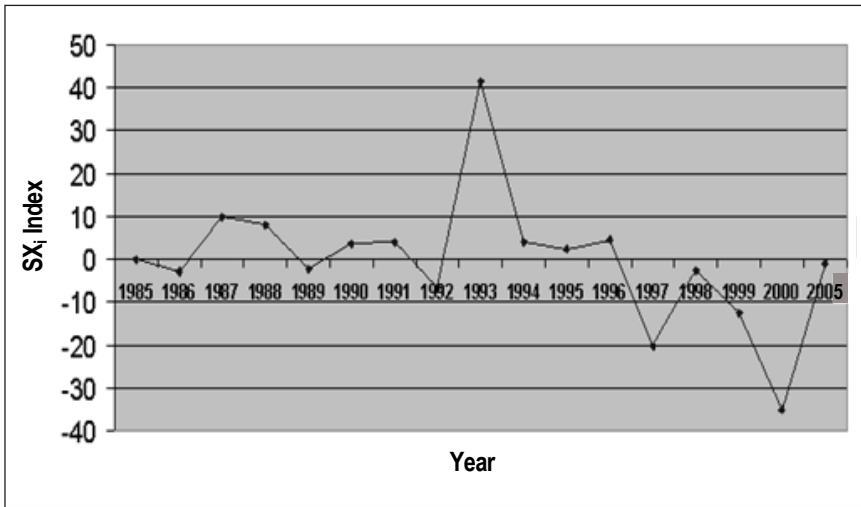


Figure 6 SX_i Index: Philippines, 1985-2005



Source: ADB, NBSC WB.

Average SX_i Index: Philippines, 1985-2005

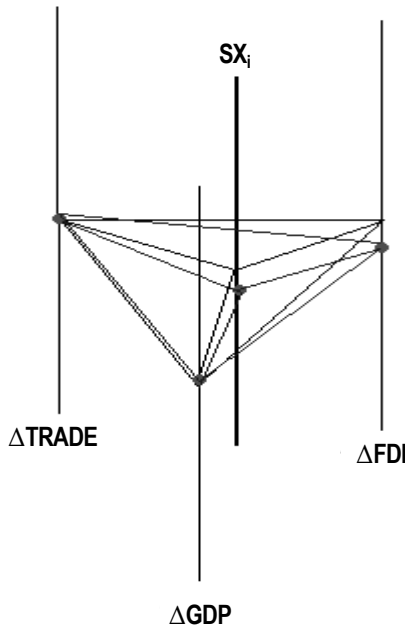
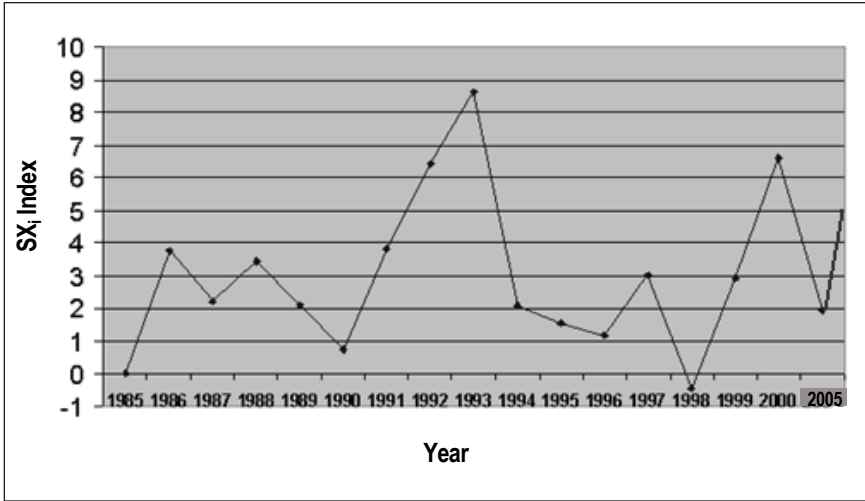
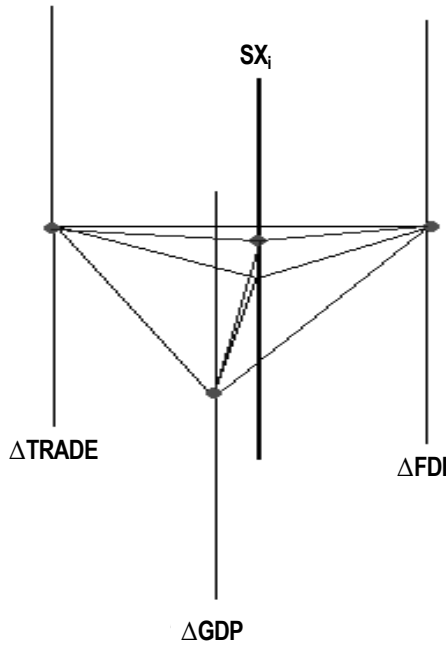


Figure 7 SX_i Index: China, 1985-2005



Source: ADB, NBSC WB.

Average SX_i Index: China, 1985-2005



We can observe clearly that the financial crisis strongly affected the Philippines (1997), Singapore (1997-1998), Thailand (1997-1998), Indonesia (1997) and Malaysia (1997). In the case of China (1998), the country was affected but not at the same level as among the ASEAN-5 members. The results show how strong the dependency is on the external sector of ASEAN-5 members and China; these countries are highly vulnerable to financial and world trade crises. In the period of 1985-2005, the external sector of ASEAN-5 members and China presented an acceptable performance, but irregularities in external sector behaviour between 1985 and 2005 can be detected in two ASEAN-5 members: the Philippines (low participation of the external sector in the world trade) and Singapore (high exposure of the external sector in the world trade). China had the best performance of its external sector compared to many ASEAN-5 members between 1985 and 2005.

On the other hand, this part of this research is also interested in demonstrating whether the ES_i and GDP growth have a correlation. The results show that in China ($r = 0.68$), Malaysia ($r = 0.67$) and Indonesia ($r = 0.77$), there exists a strong correlation between the ES_i and GDP; in the case of Singapore ($r = 0.30$), Thailand ($r = 0.23$) and the Philippines ($r = -0.23$), there is a lower or negative correlation. This shows that China, Malaysia and Indonesia have a high dependency on the performance of its external sector on international trade, together with FDI growth. Thailand and Singapore have been classified in the category of normal vulnerability; the normal vulnerability of Thailand is caused by its lower trade volume and FDI, but in the case of Singapore (low correlation), which also demonstrates normal vulnerability, this is due to the different proportions of growth between trade volume and FDI growth. The Philippines shows a negative correlation between the ES_i and GDP growth; it shows low vulnerability of the external sector, where its trade volume growth and FDI growth are slow and small.

In the SX_i cycles between 1985 and 2005 (20 years) among these ASEAN-5 members and China, we observe that the SX_i cycles have these results: China shows the best performance, it is located in Level 1.1 (15 years) and Level 2.1 (1 year). Among the ASEAN-5 members the SX_i cycles show that Malaysia is in Level 1.1 (12 years), Level 2.2 (3 years) and Level 1.2 (1 year). On the other hand, Indonesia and Thailand show close behaviour in their SX_i cycles: Indonesia has Level 1.1 (11 years), Level 2.2 (4 years) and Level 1.2 (1 year), whereas Thailand is located in Level 1.1 (11 years), Level 2.2 (1 year), Level 2.1 (1 year) and Level 1.2. (3 years). In the specific case of Singapore, this country is located in Level 1.1 (9 years), Level 2.2 (1 year), Level 2.1 (5 years) and Level 1.2 (1 year). The reason why Singapore shows different results in its SX_i cycles is its high dependency on the international markets, especially the United States of America. The Philippines is located in Level 1.1 (8 years), Level 1.2 (5 years) and Level 2.1 (3 years) owing to

the low participation of its external sector in the world economy, which is in turn because of its small amount of export products with high added value to the international markets.

4. Concluding Remarks

With the application of the external sector development index (SX_i) to the study of trade liberalization and openness, we observe that trade volume and FDI volume growth need to be joined into a single variable in order to study the external sector of any country or region. This single variable will be called the external sector main variable (ES_i). The external sector development index (SX_i) can thus be used as an alternative index to study trade liberalization cycles effectively. In fact, the SX_i can be considered a complementary analytical tool together with the terms of trade (ToT) and the openness index (O_i).

Notes

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1. The terms of trade (ToT) is considered an analytical tool which can explain the relationship between the ratio of export prices (export index price = IP_x) and the ratio of import prices (import index price = IP_m) to find the deteriorating terms among countries (Balassa, 1985). However, ToT continues to be used by many experts on international trade to explain the behaviour of the external sector of any country.

$$\text{ToT} = \text{IP}_x / \text{IP}_m \times 100\%$$

2. The openness index (O_i), on the other hand, studies the relationship between the total trade volume (i.e. exports plus imports) and GDP (Edwards, 1998). It measures the level of trade liberalization as well as the orientation of the trade policy of any country. The objective of the O_i is to show how much participation the external sector (export plus imports) has on the GDP as a whole, or how open an economy is to the international markets.

$$O_i = \text{X+M}/\text{GDP} \times 100\%$$

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