Impacts of External Shocks on Nations' Policy Responses and Economic growth —World Economic Synchronization

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Abstract

Since late 2007, surging crude oil and other commodity prices and the credit crunch shocks have rippled through the world economy. This paper proposes to investigate the impact of external shocks on domestic policy responses; and to analyze how measures of policy response differentiated national economic performances, particularly in less-developed countries (LDCs).

This paper redefined the drill-down methodology, called External shock Accounting, originally developed by Bacha (1987), to measure the reactions of policy rules to external shocks; and regression models were employed to measure the effects of national policies on economic performance. The methodology in this paper first disaggregates current account balances of 123 nations into external shocks (terms of trade, indebtedness, and external interest rate) and policy variables (export penetration, import replacement, and consumption contraction). Then, it focuses on the relationship between the size of external shocks and measures of policy response, as well as on the relationship between measures of policy response and short-term economic performance based on data derived from External Accounting.

To measure the impact of external shocks on policy responses and world economic synchronization, the author analyzed the dataset (World Development Indicators, the World Bank, 2007) for counties including developed countries (DCs) and LDCs, over the time period of 1973 to 2005. First, the measures of adverse external shocks were derived to capture attributes of the changes in a nation's current account deficit to national output. Second, various regression models were employed to test the sensitivity, stability and continuity for policy responses to external shocks. Third, a regression analysis was performed, based on the dataset of external shock accounting, to determine how LDC growth difference was attributed to export-oriented policy.

Traditional economic studies have described trade as an engine of economic growth. Conversely, this paper hypothesizes that it was also as a "gear" of world economic synchronization. This study posits that export penetration as the most significant variable producing external shocks while simultaneously stimulating economic growth across the world's major economies. This analysis also explores the disproportional impact of external shocks in LDCs and economic growth in world business cycle. Assuming a transmission mechanism of world economic synchronization, the interactions between external shocks and policy responses took a center role of transmitting shocks and economic stimulus. This paper therefore seeks the empirical evidences that policies attributable to interactions among external shocks and economic growth created differences in economic well-being according to each individual country's approach to trade.

Based on derived external-accounting data, this study found that the adoption of export-oriented policies distinguished the economic growth of LDCs. Those economies maintaining consistent increases in net exports experienced twice the rate of economic growth of those economies without regular gains in net exports. In a typical high-growth LDC, export oriented policy accounted for 55% of all policy responses to external shocks. This policy response factor was 120% greater for a high-growth LDC than for an average low-growth LDC. Contrary to conventional wisdom, those fast growing economies experienced three times the adverse external shocks as those slower-growth economies. However, high-growth LDCs were able to successfully avoid economic slump for an extended period, in contrast to the performance of slower-growth LDCs. The predictors of economic success to differentiate a fast-growth LDC from a slower-growth LDC involve the measures of export penetration and the size of adverse shocks facing the nation.

Section 1 Introduction

As of early April 2008, the world is witnessing major external shocks, originated from imbalanced demand and failed financial markets. Meanwhile, high commodity prices and a credit crunch have been rippling across the international economy. The uncertain impact of such external shocks on the world economy has caused great anxiety to economic policy makers around the world. The concern also motivates interest in understanding external shocks and policy responses, often overlooked as missing links between trade and economic growth. This paper focuses on the intermingled relationships among external shocks, domestic policy responses and economic developments for less developed countries (LDCs). Empirical analyses will be attributed to the role of external shocks and the measures of policies responses considerably differentiating economic performance among LDCs.

The methodology used the redefined External Shock accounting method, originally developed by Edmar Bacha (1987) on the source data extracted from World Development Indicator (The World Bank, 2007). This approach is a drill-down methodology permitting the desegregation of current account deficits into external shocks and policy responses, plus error. Given the requirement for a large set of variables, about 32 for each LDC, and data requirements for completeness and consistency, while excluding economies driven by oil-exports, only 30 LDC were selected for this empirical external shock accounting study. However, comparisons of Gross Domestic Product (GDP) growth associating with world economic synchronization were done with GDP growth data for 123 nations, from high income to low-income.

Using this methodology, the original current account dataset (WDI, 2007) was able to be transferred to the external accounting dataset; Then econometric models were employed to analyze policy sensitivity and stability; to identify which policy response stood out as a key policy rule, whether or not the key policy rule was consistent; and what policy rule differentiates high-growth LDCs from low-growth LDCs. Emphasizing the characteristics of economic synchronization, or world business cycle, the paper explores which external shocks and policy responses were playing pivotal roles in transferring economic boom and bust cross borders.

This paper unfolds in four sections. Section 1 introduces theoretical discussion. Section 2 highlights a methodology and data, followed by redefining Bacha's external shock accounting model. Section 3 discusses measures of external shocks. Section 4 exames policy responses. Special attention will be given to export orientated policies.

Section 2 Methodology and Data

2.1 The Theory Behind Bacha's Model

The methodology employed in this study used Bacha's approach to analyze the impact of the 1973-2005 external shocks on LDC and the range of their policy responses. Current account deficits, external shocks and policy responses provided the three major components in Bacha's model. Basically, the form of model is,

Changes in Ratio of Current Account Deficit to GDP

= Changes in External Shocks – Changes in Policy Responses + Error Term

These three components were not only statistically relevant to economic performance but also theoretically meaningful to be employed to explore world business cycle's transmission mechanisms with Bacha's external shock accounting approach.

In conventional macroeconomics, negative external shocks, such as terms of trade deterioration, reduced demand for exports and international interest-rate increases, directly shrank national income by reducing demand or the purchasing power of existing output (or both). Even if total national output were to be sustained, cuts in income would be possible through a government austerity policy response. Hence, either real national consumption or real national savings (or both) must fall. Other things being equal, a reduction in national savings would decrease real investment and thereby cut future output and real income as well. Real investment could only be sustained if the national saving rate rose or if increased resources could be obtained from the rest of the world. Similarly, real consumption could only be sustained if the savings rate declined or increased external resources were available. Thus, sufficient external resources made it possible to keep both consumption and investment at pre-shock levels.

External finance could also prove a crucially important determinant of external shocks influencing national macroeconomic performance. The U.S. government loan to Mexico in 1995 was an example where external finance availability dynamically changed the impact of external shocks on domestic economic performance. Without external

financial aid, external shocks permanently alter the terms on which individual countries interact with the international economy. An economy facing external shocks required that "adjustments" be made if previous projections of consumption, investment and income are to be realized in the medium to longer term. Conversely, external finance could represent another source of external shock to a national economy.

External shocks originating from external finance could be favorable or adverse to a LDC economy. Economies relying on foreign resources could receive more adverse external shocks than those less independent on foreign resources. Those economies vulnerable to adverse changes in external variables, such as terms of trade, international interest rates, foreign direct investment and supplies of crucial raw materials confront major challenges. Lacking appropriate economic strategy to manage adverse external shocks could worsen the plight of these economies, making them permanently impotent of reacting to external shocks due to their heavy reliance on external finance.

Not only did external shocks engineer the world business cycle transmitting mechanism, but trade and some domestic policy responses influenced it as well. Facing slowing demand for their exports, LDCs might scale back their output level. As a consequence of a scarcity of imported essential inputs, output might fall below or further below the economy's capacity to produce, even with no decline in domestic resources. This situation might be contributed by a decline in the availability of foreign exchange, which determines the economy’s purchasing power for imports. Such a foreign exchange constraint might also impede investment and growth in future capacity if key capital goods, such as machinery and equipment, could not be domestically acquired. Hence, in

the medium to long-term, structural adjustments to external shocks were required to offset the short fall in foreign exchange earnings. These adjustments include decreased investment or reduced domestic spending (or both), and further import substitution or enhanced export competitiveness (or both).

2.2 The Derivation and Description of Bacha's Model

First, variables and their explanations are used in this paper.

Variables	**Explanations of variables**
M	*Imports of goods and Non-Factor Services (NFS) at current domestic currency prices (DCP).*
V	*Factor payments to abroad (net) at DCP.*
E	*Exports of goods and NFS at DCP.*
T	*Net current transfers from abroad at DCP.*
D	*Current account deficit including transfers at DCP.*
J	*Imports of goods and NFS at 2000 domestic currency prices (2000 DCP).*
X	*Exports of goods and NFS at 2000 DCP.*
p_m	*Domestic current price index of imports, with 2000 = 1.0.*
p_x	*Domestic currency price index of exports, with 2000 = 1.0.*
j	*Import content of domestic absorption at 80 DCP. or* $j = J_t/(A_t)$
C	*Sum of government and private consumption at 2000 DCP.*
I	*Gross capital formation at 2000 DCP).*
A	*Gross domestic absorption at 2000 DCP.*
W	*General Agreement on Thrifts and Trade (GATT) volume index of world exports, expressed in 2000 dollars, and converted to 2000 domestic currency prices by using of the average domestic currency/dollar exchange rate for 2000.*
x	*Market share in world exports at 2000 DCP. Calculated according to equation,* $x = X/W$
V_i	*Net interest payments to abroad in DCP. This is calculated multiplying the item `others' of `net factor service income from abroad' in current dollars by the average domestic currency/dollar exchange rate.*
R	*Net workers' remittances from abroad at DCP.*
V_d	*Net direct investment income to abroad at DCP. This is calculated by the equation,* $V_d = V - V_i + R$
r	*Dollar rate of interest. This is calculated by the equation,* $r = V_i/F$

F	*Net foreign debt at end of year t-1, expressed in domestic currency by use of average domestic currency/dollar exchange rate in year t.*
Y	*GNP at DCP.*
Z	*GNP at 2000 DCP.*
P_y	*Implicit GDP deflator.*

Second, this type of Bacha's model may be set out as follows.

$$D_t \equiv (M_T - E_t) + (V_t - T_t)$$

or

$$D_t \equiv M_T + V_t - E_t - T_t \quad (1)$$

where '*t*' denotes time.

That is, the current account deficit including transfers at current domestic currency prices, D_t, is originally set by an identity to net imports--imports minus exports ($M_T - E_t$), plus net transfers--net factor services to abroad minus net transfers from abroad ($V_t - T_t$) at time '*t*'.

When all the following symbols are denoted as above, imports are expressed as the product of the domestic current price index of exports, with 2000 =1.0 and volume of imports at 2000 domestic currency prices (2000 DCP):

$$M_T = P_t^m J_t$$

Exports are expressed in the same fashion as imports.

$E_t = P_t^x X_t$

Exports at 2000 DCP are expressed as the product of the export coefficient, ($x_t = X_t/W_t$) and the real value of world trade (W_t).

$X_t = x_t W_t$.

Similarly, imports at 2000 DCP are expressed as the product of the import coefficient, ($j_t = J_t/A_t$) and real domestic absorption, A_t, which is the sum of real consumption (C_t) and real gross domestic capital formation, (I_t).

$J_t = j_t A_t$, and $A_t = C_t + I_t$

Net factor services to abroad are the sum of net interest to abroad (V_t^i) and other net investment income to abroad (V_t^d), and net workers' remittances from abroad (R_t).

$V_t = V_t^i + V_t^d - R_t$

Net interest, in domestic currency, is then expressed as the product of the current dollar interest rate (per cent per year) (r_t) multiplied by the net stock of foreign debt at the end of the previous year (F_{t-1}).

$V_t^i = r_t F_{t-1}$

It is then possible to rewrite imports, factor payments to abroad and exports as follows,

$$M_T = P_t^m J_t = P_t^m j_t A_t = P_t^m j_t C_t + P_t^m j_t I_t \qquad (2)$$

$$V_t = V_t^i + V_t^d - R_t = r_t F_{t-1} + V_t^d - R_t \qquad (3)$$

$$E_t = P_t^x X_t = P_t^x x_t W_t \qquad (4)$$

Substituting (2), (3) and (4) into equation (1) and dividing both sides by Y_t, equation (1) becomes

$$D_t/Y_t = P_t^m j_t C_t/Y_t + P_t^m j_t I_t/Y_t + r_t F_{t-1}/Y_t + V_t/Y_t - R_t/Y_t - P_t^x x_t W_t/Y_t - T_t/Y_t \qquad (5)$$

National income in current prices is equal to the product of real national income and the implicit deflator of GDP:

$$Y_t = P_t^y Z_t \text{ or } Z_t = Y_t/P_t^y \qquad (6)$$

Substituting (6) into (5), we have

$$D_t/Y_t = P_t^m j_t C_t/P_t^y Z_t + P_t^m j_t I_t/P_t^y Z_t + r_t F_{t-1}/Y_t + V_t/Y_t - R_t/Y_t$$
$$- P_t^x x_t W_t/P_t^y Z_t - T_t/Y_t \qquad (7)$$

Let

$$\rho_t^m = P_t^m/P_t^y \text{ or } P_t^m = \rho_t^m P_t^y \qquad (8)$$

$$\rho_t^x = P_t^x/P_t^y \text{ or } P_t = \rho_t^x P_t^y \qquad (9)$$

Substituting (8) and (9) into (7), we have:

$$D_t/Y_t = \rho_t^m j_t C_t/Z_t + \rho_t^m j_t I_t/Z_t + r_t F_{t-1}/Y_t + V_t/Y_t - R_t/Y_t$$
$$- \rho_t^x x_t W_t/Z_t - T_t/Y_t \qquad (10)$$

Taking first differences of equation (10) and rearranging produces the type of Bacha's equation:

$$d(D_t/Y_t) = j_t A_t/Z_t d(\rho_t^m) - x_t W_t/Z_t d(\rho_t^x) + F_{t-1}/Y_t d(r_t) - X_t \rho_t^x d(W_t/Z_t) + r_t d(F_{t-1}/Y_t)$$
$$+ d(V_t/Y_t) - (R_t/Y_t) - d(T_t/Y_t) + j_t \rho_t^m d(C_t/Z_t) + j_t \rho_t^m d(I_t/Z_t) + \rho_t^m A_t/Z_t d(j_t) - \rho_t^x W_t/Z_t * d(x_t) + \varepsilon \qquad (11)$$

Model (11) is the type of Bacha's model, where the symbol *d( )* is the difference operator. Empirically, subscript '*s*' is used as a simple average of the current year and base year, rather than '*t*', being either the current year or the base year, for the weights for the above model. The following interprets equation (11) in economic terms:

$[\, d(\, D_t/Y_t\,)\,]$ …	Changes in the ratio of current account deficit to GDP between final year and base-year
$[j_s(A_s/Z_s)dp^m{}_t - x_s(W_s/Z_s)dp^x{}_t]$[1]…	Terms of trade deterioration
$[\, - F_{s-1}/Y_s dr_t\,]$ …	interest rate shock
$[- x_s p^x{}_s d(W_t/Z_t)]$…	retardation of world trade growth.
$[\, r_s d(F_{t-1}/Y_t)]$…	burden of debt accumulation
$[d(V^d{}_t/Y_t)]$…	change in net direct investment income to abroad

[1] The first two components of the Bacha's equation (equation 11) reported in Avila and Bacha's paper (1987, PP 179,) were
$d(D_t/Y_t) = j_t * C_t/Z_t * d(r_t^m) - x_t * X_t/Z_t * d(r_t^x)$...

$[- d(R_t/Y_t)]\ldots$	change in workers' remittances
$[- d(T_t/Y_t)]\ldots$	change in unrequited transfers
$[\ j_s p^m_s d(C_t/Z_t)]\ldots$	consumption contraction
$[\ j_s p^m_s d(I_t/Z_t)]\ldots$	investment reduction
$[\ p^m_s (A_s/Z_s)dj_t]\ldots$	import replacement
$[\ - p^x_s (W_s/Z_s)dx_t]\ldots$	export penetration
$[+ \varepsilon]\ \ldots$	interaction effects and adding-up errors.

Briefly, with the derivation of Bacha's model, changes in the ratio of current account balance to GDP are divided into two main parts, namely external shocks and policy-responses. The external shocks are further drilled down into various individual shocks, which are terms of trade, interest rate, retardation of world trade growth, burden of debt accumulation, direct investment, workers' remittances, and transfers. The policy responses are disaggregated into four components in our study. They are the export penetration--increasing share in the world export markets; import substitution -- replacing imports with domestic production; and reducing domestic aggregate spending -- 'belt-tightening' in consumption and investment. Based upon this type of model, policymakers would have information advantages to know if the current external shocks would occurred, to what extent external shocks generally affected economies, and how policy rules reacted to adverse external shocks.

2.3 Data and Time Periods

The data used in this paper include thirty countries[2], classified as LDCs by the World Bank. The selection was determined by the data availability from the World Development Indicators 2007 (WDI, CD format, previously called World Tables, The World Bank). It was not possible as yet to piece together all the necessary data to permit an analysis of the impact of external shocks and the range of their policy responses on all LDC for the 1973-2005 time periods.

Using Bacha's methodology proves an appropriate and logical choice to complete the task of "external shock accounting," as well as the analysis of policy responses. One advantage of this type of drill-down methodology is to derive the measures of external shocks immediately upon release of published current account data. In addition, policy responses, both at the national and at the international level, could be analyzed for both short run and long run impacts. Therefore, it seemed sensible to conduct empirical analyses related to shorter periods rather than the whole time span permitted by the dataset, specifically for those periods marked by known external shocks. Of particular concern in this study, open economies have experienced some severe dislocations, such as oil-shocks, terms of trade deterioration and export volume decline under the heading of a "world recession effects" and interest rate effects. Taking account of those concerns, a long time series (1973-2005) was divided into seven time periods, which were the short-term periods of 1973-77, 1978-82, 1982-86, 1987-91, 1992-95, 1996-2000, and 2001-05.

Through 1973-2005, a half dozens well-documented external shocks clearly marked troughs on the international business cycle. Those major changes were the principal

[2] Names of LDC can be found from the appendix tables.

factors in selecting the periods for this empirical analysis. The paper now examines these periods in more detail.

Beginning in the 1970s, the international framework supported an unprecedented growth in trade and global integration for nearly three decades. When the fixed exchange rate became insupportable, the United States suspended the convertibility of the dollar in 1971. In 1973, EEC governments floated major European currencies. The first OPEC oil-price shock in 1973 disrupted international trade and capital flows. However, the adverse impacts of oil shocks and rising protectionism left the integration of the world economy intact and even stronger after the1970s. However, as history has shown, LDCs exposed to well-defined external shocks in the early 1970s joined the world economy together to plunge into recession, caused by the collapse of the Bretton Woods system (Bordo, M.D. and Eichengreen, B. eds. 1993), and sharp rising in food and commodity prices, as well as soaring oil prices. During 1978-80, the second oil price shock occurred. In early 1980s, the United States adopted a mix of monetary and fiscal policies pushing up real interest rates worldwide. Consequently, the high interest rates, among other shocks, contributed to the international debt crises and terms of trade shocks. In the second half of the 1980s, economic growth accelerated in the industrial countries. The possible contributing factors were the falling price of oil and the U.S. dollar, expansionary monetary policies and policy cooperation of DCs. As a by-product of accelerating DC economies, the world economy became increasingly integrated, allowing trade and financial flows to grow faster than output. In 1988-89, the S&L crises sent the U.S economy along with the world economy into a slump, followed by almost eight years of a technology-driven economic boom. In the early 2000s, the world economy showed

signs of fatigue, and 2001 witnessed unprecedented geopolitical shocks triggered on 9-11-2001. Now, we are seeing that history is repeating the external shocks in the form of soaring food and oil prices and a credit crunch.

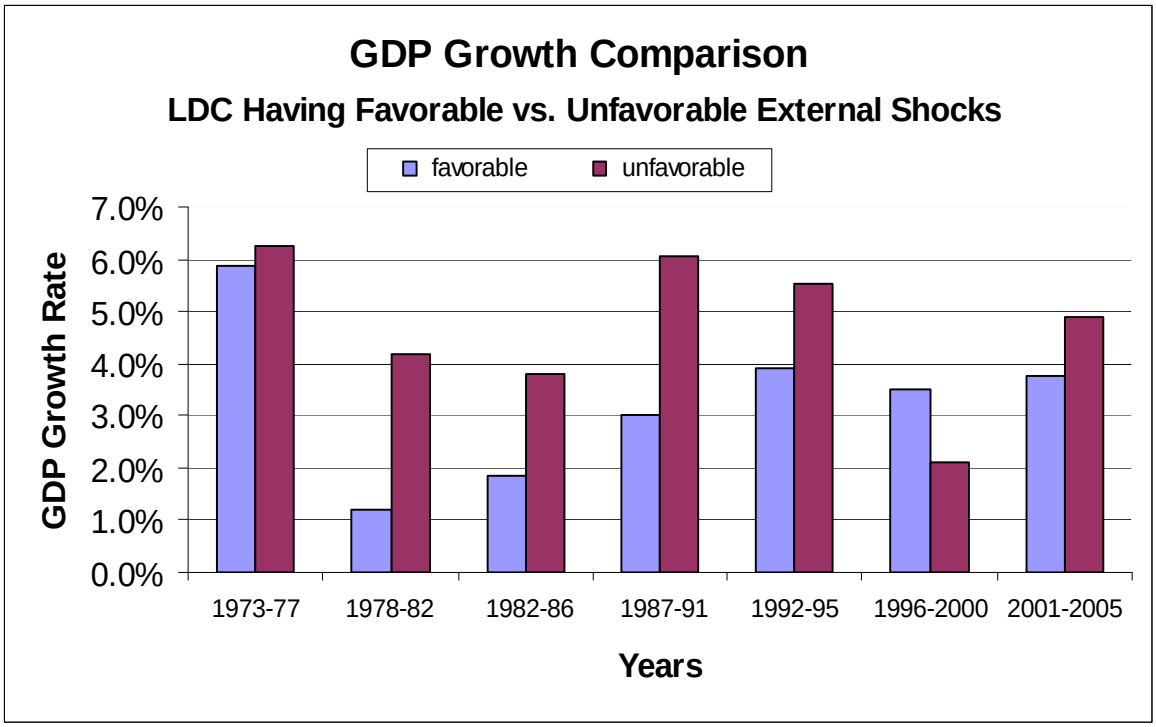
Section 3

External Shocks

3.1 Counterintuitive Relationship between External Shocks and GDP Growth

Dividing non-oil exporting LDC into two groups, one having no external shocks and the other experiencing significant external shocks. Which group of LDCs grew faster? The following Figure 3.1 illustrates that those LDC economies encountering favorable external shocks usually generated slow GDP growth. In contrast, those countries that had confronted unfavorable shocks were rewarded with higher GDP growth.

Figure 3.1

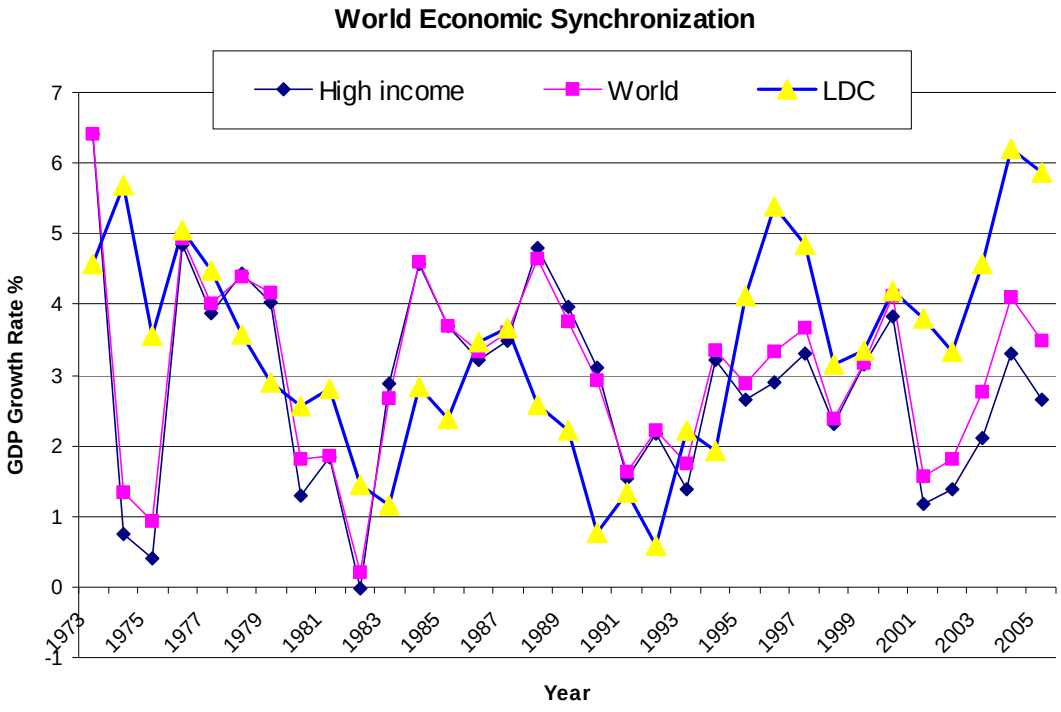


Of economic growth relating to external shocks, it was interesting to notice that as the impact of external shocks shifted from "favorable" to "unfavorable", the change did not lead LDCs from "high" growth to "low" growth. Interestingly, the converse occurred during the years from 1973 to 2005, except for the period 1996-2000. Hence, the higher degree of adverse external shocks translated into higher growth rates for LDCs. The conclusion was reached that facing unfavorable external shocks would not be a sufficient condition for LDCs to suffer low growth, rather the other way around.

3.2 External Shocks and World Economic Synchronization

Phenomena of world economic synchronization (Figure 3.2) prompted numerous economic studies (e.g. Jesus Cañas and Roberto Coronado, 2004, Kouparitsas, Michael, 2001 and Pradumna B. Rana, 2007).

Figure 3.2



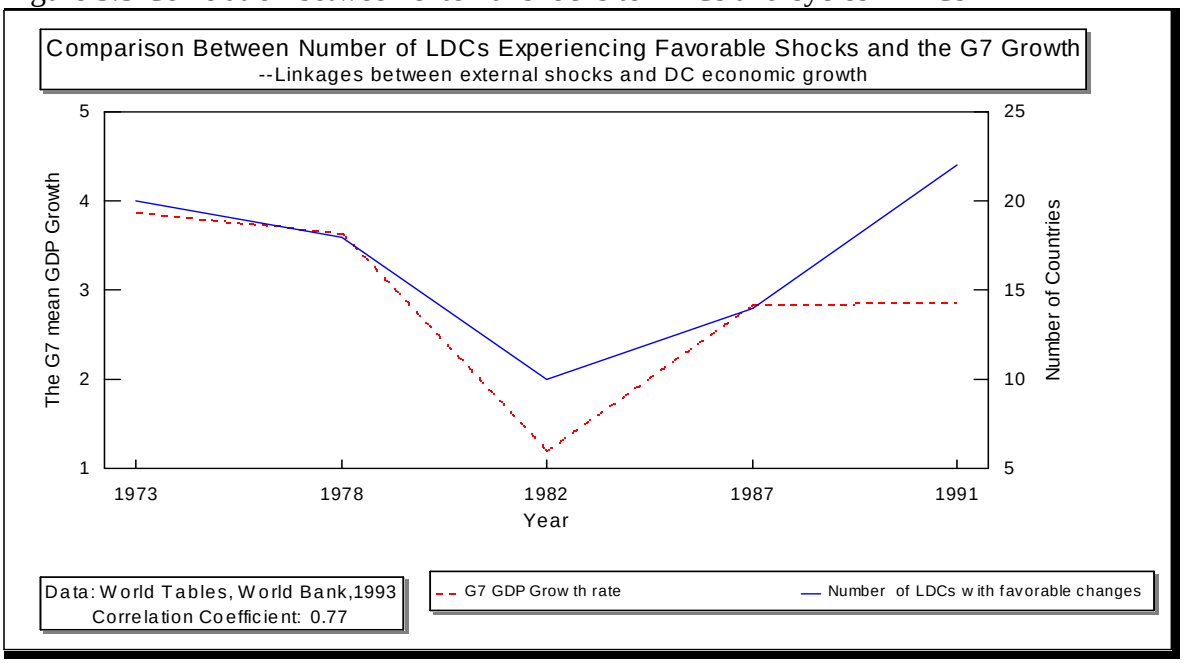
Correlation coefficients in the table (Table 3.1) indicate that most LDC economies were correlated with DC economies, as well as present the measures of economic synchronizations between LDC and DC economies. Various degrees of correlation implied that the degrees of economic synchronizations were not universal among various economies.

Table 3.1 Real GDP growth correlation between DCs and LDCs

CORRELATION COEFFICIENTS[3] 1973-2005				
	USA	EUROPE	JAPAN	OECD
USA	1.00			
EUROPE	0.56*	1.00		
JAPAN	0.32*	0.77*	1.00	
OECD	0.88	0.79	0.68	1.00
Latin	0.54*	0.60*	0.45*	0.26
Central America	0.42*	0.45*	0.44*	0.34*
East Asia,(ex. Japan)	0.36	0.45*	0.40*	0.50*
South Asia	0.23	0.35*	0.21	0.31*
ASEAN	0.17	0.46*	0.30	0.28
Sub-Saharan Africa	0.37	0.53*	0.21	0.17

Despite there is little consensus on the cause of economic synchronization, external accounting results indicated high correlations (Figure 3.3) between the numbers of LDCs experiencing external shocks and world business cycle.

Figure 3.3 Correlation between external shocks to LDCs and cycles in DCs



[3] Note: GDP growth rate in average,1961-91;number of observations:31; '*' denotes significant real GDP growth correlation

As the world economic climate became hostile towards LDCs, the magnitude of adverse external shocks rose, so did the current account deficit level. Concerning the relationship between external shocks and current account deficit, not surprisingly, the two measures were reinforcing each other. Nevertheless, an exception was found during the period 1982-86 when current account deficits did not increase but decreased thanks to the strong impact of domestic policies reversing the impact of external shocks.

Regarding the relationship between external shocks and domestic policy responses, domestic policies were inversely related to the measure of external shocks. Was this pattern realistic? Theoretically, a nation's economy with a current account deficit is just like an economic institution, which has to balance their books through either "belt-tightening" or finding new ways to finance their economic needs. Otherwise its economic resources would be exhausted in the long run. On the other hand, in reality, some policy responses, such as increasing export penetration, caused rising adverse external shocks due to widening international exposure. Thus, the inverse relationship between external shocks and policy responses could be seen in this way: the more severe the external shocks to LDCs, the higher the degree of policy responses.

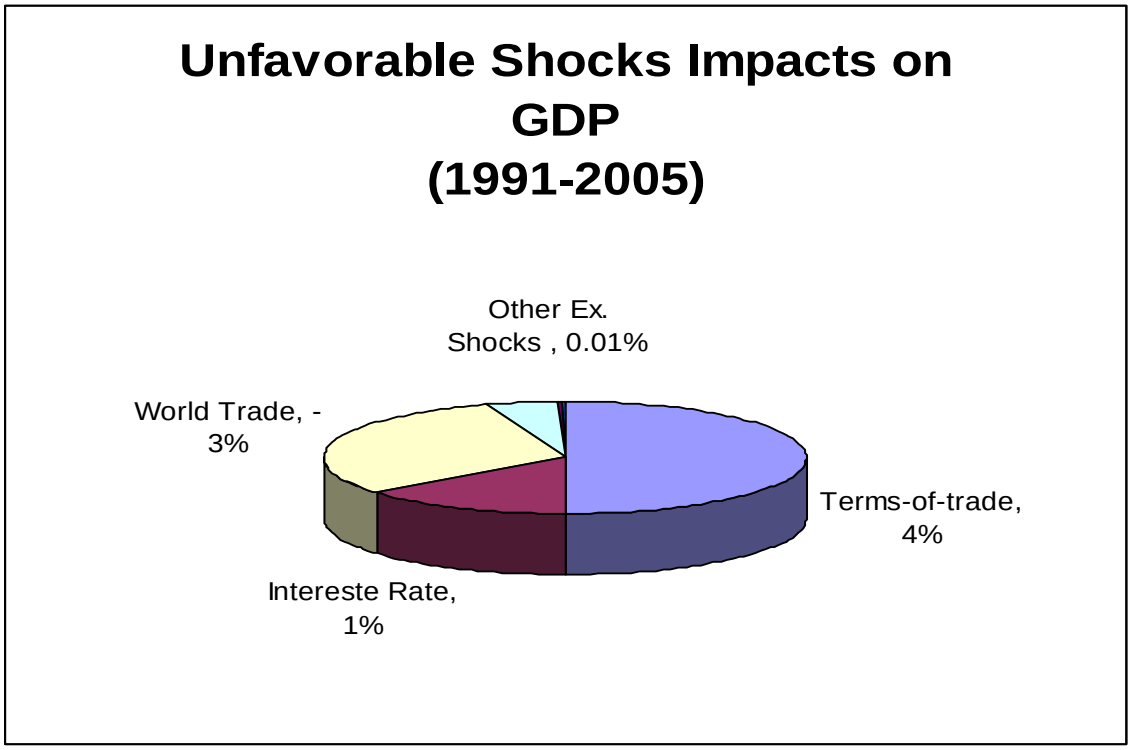
Considering the correlation for each individual economy, some outperforming other national economies could be more likely found among those LDCs associated with unfavorable external shocks (see Table 4.1). This result was not deemed a surprising pattern because of the complexity of the interrelationship between external shocks and GDP growth. First, GDP growth was determined by both short-run and long-run economic factors, while external shocks were a short-run phenomenon. Second, some

'adverse' external shocks might be "good" for a LDC's growth. For example, foreign direct investments in a LDC would contribute to increasing current account deficits, but it would feed its long-run growth. Third, shocks might set off 'wise' policy responses, which could be favorable to its growth. All such policy rules could be LDC efforts to improve export competitiveness. Although finding correlation between external shocks and economic performance prompted some economists' interests (e.g. Helleiner, 1987, pp.154; Mitra, and Associates, 1991), the focus was placed on external shocks, hoping these phenomena alone account for differences in economic performance among individual LDCs. This empirical analysis found that the synthesis of the measure of external shocks and policy responses being responsible for world economic synchronization.

3.3 Measured Impact of in External Shocks

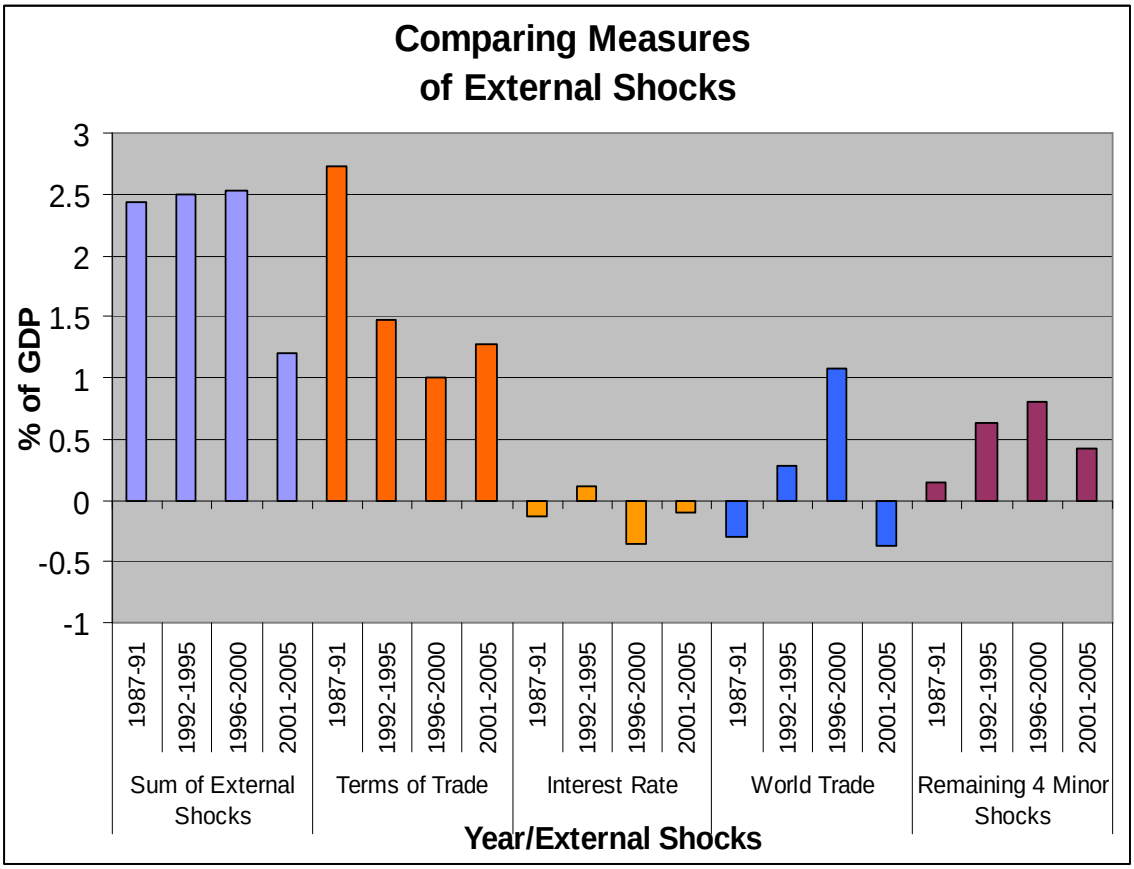
This model captures seven sources of external shocks, as drill-down measures of current account deficits. Figure 3.4 below illustrates how total external shocks were distributed to each shock component during 1991-2005.

Figure 3.4



It clearly shows the terms of trade being the prominent shock factor, an important indicator for economic openness. Any highly open economy would be easily affected by these types of shocks. Based on the results, the following discusses how and to what extent individual shock component transmits the world economic influence into domestic economies. Therefore, external shocks constitute synchronizing mechanisms for world business cycles.

Figure 3.5



Terms of trade played a major role influencing LDC export earnings as the single most significant factor among adverse external shocks (Figure 3.4 and 3.5), contributing to LDC current account deficits through all time periods analyzed in this paper. The adverse impact on LDC current account deficits as a percentage of GDP was greater than that of all other external shocks (Figure 3.5). The external shock accounting results indicated a clear pattern that Terms of trade inversely correlate with efforts of LDC export penetration. This result suggested that, the greater efforts of export penetration made by LDC, the higher degree of external shock exposure, and the higher probability

of adverse impact from the LDC's terms of trade. Those findings were consistent with the observations reported by some literature (Schiff, 1995; *Trade and Development Report*, United Nations, 1986,). For example, the World Bank index of non-oil commodity prices fell by approximately 50 percent in the period of 1980-92. The price index of cocoa, coffee and tea fell by about 60 percent (Schiff, 1995).

The contributing factors to the deteriorating Terms of trade were debated. First, the slowing-down in DC economies reduced aggregate demand, and spread a strong deflationary impact on money wages and commodity prices (United Nations, 1986, *Trade and Development Report*). According to the United Nations, much price deceleration during the early 1980s recession occurred in the seven largest OECD countries. Second, the export competition from LDCs, mostly concentrated in a few agricultural commodities, contributed to declining in terms of trade in the 1980s (Schiff, 1995). Those arguments suggested the terms of trade were exogenously determined. However, Khorshed Chowdhury (1994) argued that the term of trade could be endogenously determined. He pointed out that structural adjustment in LDCs, responding to negative external shocks and trade liberalization, could result in real exchange rate depreciation and thus a fall in their Terms of trade. The observations in this paper do not conflict with either Schiff's (1995) or Chowdhury's (1994) propositions, which suggested the measure of LDC policy responses were inversely related to the terms of trade, and thus to the external shocks.

The external shock accounting results strongly suggested that the terms of trade were associated with DC economic performance and LDC trade strategies among other policy

responses. This relationship was how the term of trade contributed to world economy synchronization indirectly linking DC economic fluctuations to LDC economic growth.

3.4 Other External shocks

The second most significant factor adversely affecting the current account balance represented the burden of debt accumulation (indebtedness). Based on the results of external accounting results, the measures of indebtedness correlated to GDP growth across LDCs. When LDCs were relieved from reducing their burden of debt accumulation, their economies grew fast. When LDCs suffered from increasing indebtedness, their GDP growth deteriorated significantly. The inverse correlation between LDC indebtedness and their GDP growth was noted in some literature. For example, in Chowdhury's (1994) research, he rejected both Bulow and Rogoff's (1990) proposition that the external debts of LDCs constituted a symptom rather than a cause of economic slowdown; as well as Dornbush (1988) and Krugman's (1989) proposition that external debt contributed to economic slowdown.

Compared with the adverse impacts of other external shocks, the adverse impacts increased indebtedness in LDC current account deficits, and GDP growth prove moderate. The following Table 3.2 compares of the adverse impacts between indebtedness shocks and terms of trade, during the four different periods, between 1973 and 2005.

Table 3.2 A comparison of the adverse impacts between indebtedness shocks and terms of trade across 30 LDC, 1973-2005

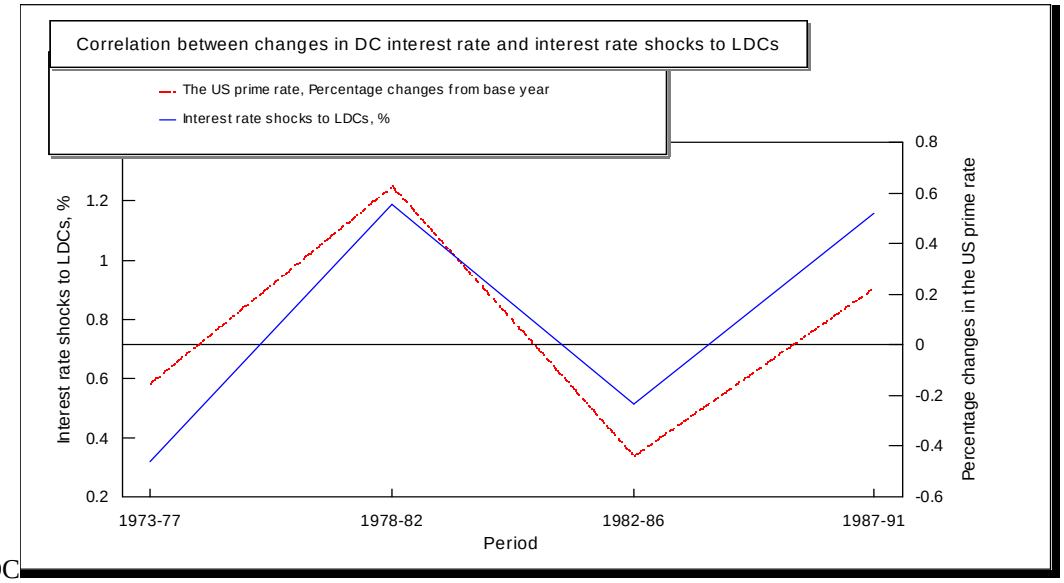
Years	1973-77	1978-82	1982-86	1987-91	1992-1995	1996-2000	2001-2005
Indebtedness	0.20%	0.31%	0.41%	0.20%	2.60%	4.40%	1.10%
Terms of trade	1.73%	1.56%	1.52%	0.78%	1.30%	0.30%	14.50%

Among mechanisms that caused economic synchronization, interest rates played a crucial role affecting trade, indebtedness of LDCs, and ultimately LDC GDP growth. In addition, the results showed that changes in interest rate shocks directly relate to changes in burden of indebtedness. Favorable changes in interest rates resulted in favorable changes in indebtedness, and vice versa.

Regarding real GDP growth, LDCs facing favorable changes in interest rate shocks grew faster than LDCs confronting unfavorable changes in the shocks in the same period, ranging from 5 per cent to 12 per cent.

The following chart (Figure 3.5) shows a close relationship between changes in the U.S. prime rates and interest rate shocks to LDCs, expressed as a percentage of GDP.

Figure 3.5 Correlation between changes in DC interest rates[4] and interest rate shocks to



LDC

Severe external interest rate shocks coincided with the occurrence of tight financial markets in major DCs, reflecting some aspect of the transmission mechanism. Concerning the economic synchronization from 1973 to 2005, the high interest rate in major DCs caused LDC debt-servicing difficulties, ultimately, contributing to the economic cycles of LDCs.

There was some evidence that foreign direct investment (FDI), as one shock component, correlated with interest-rate shocks. For example, the US prime rate, according to the Economic Report of President (1995), rose from 5.72% in the early 1970s to 12.67% at the end of 1970s, and peaked at higher levels between 14% and 18.87% in the early

[4] Note: The prime rate in the US, 1973-91

Period	1973-77	1978-82	1982-86	1987-91
Mean the US prime rate	8.07%	14.15%	11.19%	9.37%
Percentage changes from base year	-15.00%	63%	-44%	23%

Data: Economic Report of President, 1995

2000s. The outward flows of FDI from the United States fell from an average of 16.9 billion dollars (Eric D. Ramstetter, 1993, pp. 156) during 1976-80 to 4.8 billion dollars during 1981-85. The outward flows in FDI trended in the opposite direction to levels of in the U.S. interest rates.

Table 3.3 Correlation between foreign direct investment and GDP growth

Periods	LDC classified By direct investment Income	Change in* Direct Investment Income	Number of Countries	Percentage of total LDC %	Average Growth Rate Of GDP
1973-77	Favorable changes	-1.67	24	80	6.31
	Unfavorable changes	1.17	6	20	5.82
1978-82	Favorable changes	-1.32	16	53	4.43
	Unfavorable changes	2.11	14	47	1.50
1982-86	Favorable changes	-1.67	12	40	3.45
	Unfavorable changes	2.48	18	60	2.53
1987-91	Favorable changes	-1.83	17	57	4.42
	Unfavorable changes	0.95	13	43	3.79

Note: *: Negative sign indicates increasing FDI ; Positive sign indicates decreasing FDI , as percentage of GDP

As shown in the above Table 3.3, the number of FDI recipients decreased from 24 LDC (1973-77) to 16 LDC (1978-82), and further declined to 12 LDC (1982-86), while the mean LDC growth across countries dropped accordingly. After 1986, FDI rose in 17 LDCs when the mean GDP growth improved for those that had inward flows of FDI. The measure of FDI inflow remained quite stable between 1% to less than 2%. There was a clear pattern indicating the correlation between GDP growth rate of FDI recipients and the measure of FDI inflow/outflow, expressed in percentage of growth.

The results suggested that world economic synchronization was attributable to FDI, which had impacts on cycles in LDC recipients. The external accounting results indicated that changes in FDI made to LDCs directly correlated to changes in their GDP

growth. There was little doubt that FDI did have an important role in the transmission mechanism for economic synchronization.

Section 4

Policy Response to External Shocks

4.1 The Roles of Policy Responses

Evidence became undisputable considering the phenomenon of economic synchronization. Policy responses could yield more positive impacts on economies than the adverse impacts of external shocks on deficits. Without the positive impacts of policy responses, the negative measure of external shocks might chip away some GDP growth, given the fact that external shocks adversely affected current account deficits. The results of this empirical study indicate that external shocks set off policy responses from all LDCs, regardless of the adverse or favorable impacts of the shocks. Of 30 LDCs, almost 75 percent experiencing current account shocks responded by means of an improved "trade-ratio," and more than 58% by means of decreasing their aggregate spending during the overall period of 1973-2005. Hence, the transmission mechanism of economic synchronization was also attributed to policy responses, for they played various important roles in the process of the transmission. As suggested in the previous section, appropriate policy strategies could transform the disadvantages of external shocks into economic strength.

How did LDC domestic policies come to play the role of transmission? Not surprisingly as indicated by the external shock accounting results, a list of countries characterized by external shocks, from strongly favorable to strongly unfavorable, experienced the process of economic adjustments inversely relating to the measure of external shocks. In another words, the higher the measures of adverse external shocks, the more favorable impacts of policy responses to current account deficits. Hence, the higher measure of favorable external shocks, the more unfavorable impacts of policy responses to current account deficits.

Did policy responses correlate with the cycles in LDC economic growth? External shocks followed an alienation process, through the reaction of policy responses, transforming changes into economic cycles. The results indicated that LDC policy responses directly correlated with their economic growth and inversely correlate with external shocks (see Table 4.1).

Linking external shocks, policy responses and economic performance into a comprehensive view, the derived measures (Table 4.1) indicated that individual 'policy-efforts' responding to external shocks differentiated LDC economic performances because the policy responses were processes of economic adjustment, as reactions to external shocks.

Table 4.1 Policy responses as linkages between external shocks and GDP growth, 1973-2005

Period	Current account deficits	Average GDP Growth	External Shocks *	Total Policy Responses	Consumption Contract	Investment Reduction	Import Replacement	Export Penetration
1973-77	Favorable	5.9%	-2.8%	2.2%	0.1%	0.3%	0.6%	1.1%
	Unfavorable	6.3%	2.4%	-1.3%	-0.4%	-0.4%	0.1%	-0.6%
1978-82	Favorable	1.2%	-2.4%	1.9%	0.3%	0.0%	0.3%	1.2%
	Unfavorable	4.2%	2.5%	-1.4%	0.0%	-0.2%	-0.9%	-0.4%
1982-86	Favorable	1.8%	-2.2%	0.8%	0.2%	0.1%	0.6%	-0.1%
	Unfavorable	3.8%	2.5%	-4.1%	-0.6%	-0.5%	-0.4%	-2.6%
1987-91	Favorable	3.0%	-1.9%	1.3%	-0.1%	0.0%	0.6%	0.7%
	Unfavorable	6.1%	1.2%	0.6%	-0.2%	0.5%	1.6%	-1.3%
1992-95	Favorable	3.9%	-6.8%	-0.1%	-0.1%	-0.1%	1.0%	-0.9%
	Unfavorable	5.5%	1.5%	0.8%	0.7%	0.2%	0.3%	-0.4%
1996-2000	Favorable	3.5%	-9.0%	1.2%	-0.9%	-0.1%	0.3%	1.9%
	Unfavorable	2.1%	4.3%	1.5%	0.0%	0.1%	0.8%	0.5%
2001-2005	Favorable	3.7%	-20.0%	-2.1%	0.0%	0.1%	0.8%	-3.0%
	Unfavorable	4.9%	10.9%	-3.1%	-0.2%	0.1%	1.2%	-4.1%

Notes:
* All expressed as percentage of GDP;
Negative sign denotes favorable shocks--reduced current account deficits;
Positive sign denotes unfavorable shocks-- increased current account deficits.

Policy responses to the shocks took a variety of forms, which might cause future structural adjustments, restoring external balance and rates of growth of economic activity to normal levels. The future structural adjustment involved export promotion or import substitution, and short-term reduction in domestic spending.

4.2 Policy Sensitivity to External Shocks

Policy responses varied across LDCs, as shown with empirical results of external accounting. Facing various degrees of external shocks, some LDCs preferred "belt-tightening" to the improvement of 'trade ratio," or the other way around. The measured

impact of trade policy responses was apparently much greater than the impact of the "belt-tightening" on reducing current account deficits because consumption contraction and investment reduction were passive economic adjustments, compared to improving "trade ratio" widely adopted by LDCs.

Which policy response was more sensitive to external shocks? Multiple cross-sectional regressions contribute to the analysis, with policy response expressed as a function of external shocks, assuming that external shocks prompted policy responses. The external shocks were the sum of previously discussed individual external shocks. The dependent variables were "policy-efforts," separately, which were export-penetration, import-replacement, consumption-contraction and investment-reduction. They could be to some extent correlated, because changes in LDC policy responses might reflect their practical and ideological preference with respect to the degree of external dependence, the role of market, and the future expectations. All those variables were from cross-country data. They were pooled for the period 1973-2005, and derived from our empirical external-accounting results (see tables of external-accounting results, in Appendices). Four separate equations, export penetration, import replacement, consumption contraction and investment reduction regressed on external shocks are expressed in the following model:

$$\boldsymbol{PR}_{i} = \beta_0 + \beta_1 \boldsymbol{ES} + \mu$$

where

$\boldsymbol{PR}_{i}$ = policy responses (i = 1, 2, 3, and 4), which are export-penetration ($\boldsymbol{PR}_1$), import-replacement ($\boldsymbol{PR}_2$), consumption-contraction ($\boldsymbol{PR}_3$) and investment reduction ($\boldsymbol{PR}_4$), and

ES = External shocks.

The following regression results suggested that export-penetration policy was the most sensitive domestic policy among other policies used in response to external shocks.

Table 4.2 Regression outputs of policy responses on external shocks, 1987-2005

Regression model	Constant	X Coefficient	(t-ratio for X coefficient)	R Squared
The Regression of				
Export-penetration on external shocks	-0.77	-0.43	-6.12 *	0.22
Import-replacement on external shocks	+0.50	-0.13	-2.20	0.03
Consumption-contraction on external shocks	-0.01	-0.03	-0.93	0.01
Investment-reduction on external shocks	-0.27	0.04	+1.25	0.01

Notes: N = 139; * denotes statistically significant at the 1% level (one tail).

As indicated by values of R^2 and the t-ratios in the first equation, only export-penetration policy was sensitive to external shocks at a statistically significant level. The results for the rest of the equations were either statistically insignificant or have a very small coefficient. Hence, the test results were consistent with the tabulated observations (Table 4.2), suggesting that trade orientated policy was the most successful in terms of external-deficit reduction, compared with other "belt-tightening" and import-replacement policies.

Export penetration stood out as the primary policy response, among the other three policy reactions, assuming domestic policies were LDC choices to reverse the adverse impacts of external shocks on current account balances. The relative importance of each policy

[5] Negative sign indicates reactions of domestic policies result in favorable effect for reducing current account deficit.

reactions was measured in means[6] of percentage of GDP resulting in the reduction of external deficits. (Table 4.3)

Table 4.3 The average domestic policy reactions that resulted in the reduction of current account deficits expressed as percentage of GDP

Reducing current account deficit	1987-91	1992-95	1996-00	2001-05
By Improving export penetration	5.1	4.1	6.4	4.5
By Raising import replacement	2.0	3.9	3.7	2.3
By Consumption contraction	1.1	1.2	2.1	1.2
By Investment reduction	2.7	2.6	1.9	0.4

The average impacts of export penetration were higher, ranging from 4.1% to 6.4%, than the impacts of all other policy responses during the four selected time periods. Ranked by the impact of policy-efforts on GDP as presented in the above table, the secondary policy response was import substitution, averaging from 2% to 3.9%. The investment reduction was the third and the consumption contraction the fourth. Both investment reduction and consumption contraction, so called "belt-tightening," would sacrifice economic growth in both the long-run and short-term. Apparently, most LDCs did not use investment reduction and consumption as important means of adjustment. However, "belt-tightening" resulted from rising in the current account deficit was necessary in some LDCs to restore external balance by the reductions in aggregate demand, such as by reducing rates of investment or consumption (or both), thus affecting both current and future GDP.

[6] LDC were sorted by reduced current-accout deficits followed by ranking the mean for each of the measure of policy responses.

However, the above observation invoked another key question: whether or not there were changes over time in LDC export penetration responses to external shocks? If further analysis showed the consistency and the continuity of export orientated policy over other policy responses, decision makers in LDCs would anticipate the impact of external linkage to world business cycle, through measuring the impact of their export orientated policies.

The motivation to answer this question led to the regressions of external shocks on export penetration separately for seven different periods. The model was expressed as follows:

$EP_i = \alpha + \beta_i ES_i + \mu$

where

EP_i = export penetration;

ES_i = external shocks, as '*i*' = 1, 2, 3 and 4, for the periods of 1987-91, 1992-95, 1996-00 and 2001-05 respectively. Regression results are reported in Table 4.4.

Table 4.4 The regression Output of Export penetration on external shocks, 1987-2005

Period	Constant	(β_i)	(t-ratio)	R Squared
1987-91	1.34	-0.32	(-3.04)*	0.22
1992-95	0.90	-0.37	(-4.17)*	0.34
1996-00	-4.84	-0.48	(-2.84)*	0.19
2001-05	-1.18	-0.91	(-5.46)*	0.50

Notes:* denotes statistically significant at the 1% level (one tail)
** Negative sign indicates reactions of domestic policies result in favorable

The results indicated that the coefficients (β_i) were getting more negative from -0.32 to -0.91 through the periods. This output indicated that the impact of export penetration policy on current account balances was rising.

Did that assessment indicate a rising trend of export penetration response to external shocks? Although the answer was apparent, the following models were designed to test the consistency and the continuity of export orientated policy, through the four periods. Thus, the hypothesis to be tested is whether the coefficients (β_i) of external shocks were similar over the four different time periods.

Testing the similarity of the rate of change (i.e., slope) and the average level (i.e., intercept) of export penetration response to external shocks, dummy variables were practically required for the above models. Dummy variables were used to represent external shocks during four different periods. As suggested by Gujarati (1992), two models were run separately to avoid spurious model specification.

Model 1,

$$\boldsymbol{PR}_i = \alpha_1 + \alpha_2 \Delta_2 + \alpha_3 \Delta_3 + \alpha_4 \Delta_4 + \alpha_5 \boldsymbol{ES}_i + \alpha_6 \Delta_2 \boldsymbol{ES}_i + \alpha_7 \Delta_3 \boldsymbol{ES}_i + \alpha_8 \Delta_4 \boldsymbol{ES}_i + \mu$$

where

$\boldsymbol{ES}_i$ = External Shocks, as '*i*' = 1, 2, 3 and 4, for the period 1987-91, 1992-95, 1996-00 and 2001-05, respectively;

Δ_i = 1, as '*i*' = 2, 3, and 4, for the period 1992-95, 1996-00 and 2001-05, respectively, otherwise Δ_i = 0;

α_1, α_2, α_3 and α_4 were intercepts; and α_5, α_6, α_7 and α_8 were slopes for the period 1987-91, 1992-95, 1996-00 and 2001-05, respectively; and

μ = Error term.

The hypotheses to be tested in this section were:

H_0: $\alpha_6 = 0$, H_1: $\alpha_6 \neq 0$

H_0: $\alpha_7 = 0$ H_1: $\alpha_7 \neq 0$

H_0: $\alpha_8 = 0$, H_1: $\alpha_8 \neq 0$

The results of the regression were shown in Table 4.5

Table 4.5 Regression results based on Model 1-- export policy responding to external shocks

Coefficient	α_1	α_2	α_3	α_4	α_5	α_6	α_7	α_8
	1.337	-0.433	-6.178	-2.521	-0.324	-0.045	-0.155	-0.590
(t ratio)	(-4.72)*	(-0.294)	(-4.324)*	(-1.680)	(-3.029)*	(-0.267)	(-0.951)	(-2.506)*

Notes: R^2 = 0.364 and numbers in parentheses are t-ratio; N = 139
* denotes statistically significant at the 1% level (one tail)

As indicated by the above results, the different individual slope dummies were statistically insignificant for the period 1992-95 and 1996-00. An increasing negative slope indicated the rising measure of export penetration policy response to external shocks. However, as the dummy slopes for the two periods tended to be zero statistically, the impacts of policy response (β_2 and β_3) presented a similar pattern to that (β_1) for the base period 1987-91. In contrast, the different slope dummy for the period 2001-2005 was statistically significant at the 1% confidence level. This result indicated that the pattern changed, with increasing export penetration responses as the coefficient (β_1) getting more negative. The derived coefficients from dummy variables for four different periods indicated the rising trend of export penetration responses, are shown in Table 4.6.

Table 4.6 Derived coefficients from dummy variables for the regression of export penetration on external shocks

Period	constant *	coefficient *
1987-91	$\alpha_1 = 1.34$	$\alpha_5 = -0.32$
1992-95	$\alpha_1 + \alpha_2 \Delta_{2_i} = 0.90$	$\alpha_5 + \alpha_6 \Delta_{2_i} = -0.37$
1996-00	$\alpha_1 + \alpha_3 \Delta_{3_i} = -4.84$	$\alpha_5 + \alpha_7 \Delta_{3_i} = -0.48$
2001-05	$\alpha_1 + \alpha_4 \Delta_{4_i} = -1.18$	$\alpha_5 + \alpha_8 \Delta_{4_i} = -0.91$

* Negative sign indicates that export penetration policy response
Reduced current account deficits, expressed as a percentage of GDP.

Model 2,

$$\boldsymbol{PR}_i = \alpha_1 + \alpha_2 \Delta_{2_i} + \alpha_3 \Delta_{3_i} + \alpha_4 \Delta_{4_i} + \alpha_5 \boldsymbol{ES}_i + \mu$$

was used to test the similarity of differential intercept dummies. The null hypotheses were:

H_0: $\alpha_2 = 0$, H_1 $\alpha_2 \neq 0$

H_0: $\alpha_3 = 0$, H_1 $\alpha_3 \neq 0$

H_0: $\alpha_4 = 0$, H_1: $\alpha_4 \neq 0$

The test results are shown in the following Table 4.7.

Table 4.7 Regression results based on Model 2--export policy responding to external shocks

Explanatory Variable	Constant	α_2	α_3	α_4	α_5
Coefficient	1.273	-0.182	-6.128	-1.781	-0.437
(t ratio)	(-4.82)*	(-0.124)	(-4.233)*	(-1.194)	(-6.587)*
$R^2 = 0.332$; N= 139					
Notes: * denotes statistically significant at the 1% level (one tail)					

The results for differential intercept dummies were similar to the results of Model One. The hypothesis could not be rejected, except for the period 1987-91. Hence, the average level of export penetration response to external shocks among the period 1992-95, 1996-00 and 2001-05 was similar, but not for the period 1987-91.

To test equality of coefficients from the above models with and without dummy variables, Chow test was applied. Chow statistic is expressed as follows:

$F = (SSR_2/df_2)/(SSR_1/df_1)$,

Where SSR_2 and SSR_1 = the sum of the squared residuals from the model without and with dummy variables, respectively;

df_2 and df_1 = the degree of freedom, accordingly.

The results ($F_{137, 131}$, = 1.81, and $F_{137, 134}$, = 1.15, for model 1 and 2 respectively) could not reject the hypothesis that the coefficients from the models either with or without dummies were similar.

Let's revisit a significant note made on the statistic findings of Table 4.4, in which the measure of the export policy response was rising successively in reducing current account deficits. That response tripled to 91% from 32% through the period of 1992-2005, almost doubled from the period of 1996-00.

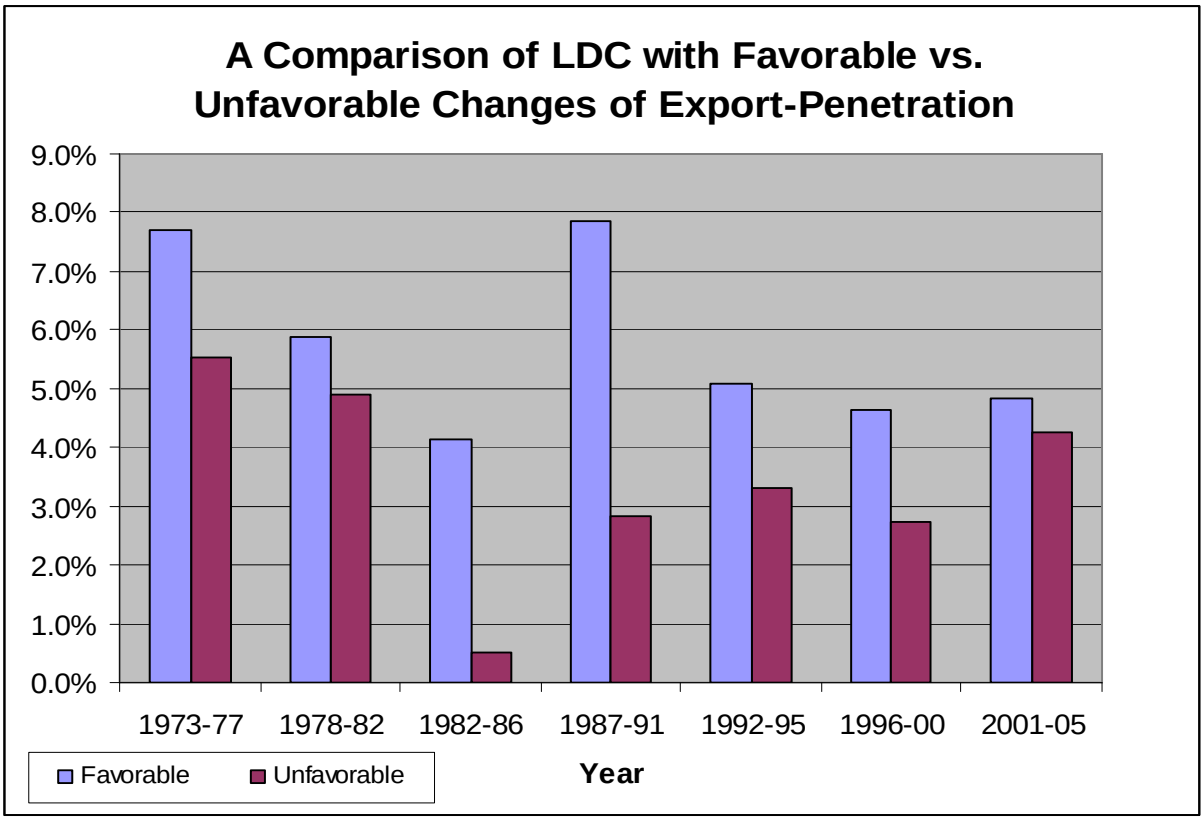
Why was there such a trend? As noted above, policy responses had long-term impacts. Hence, the positive impact of export penetration could be delayed but shown in a rising trend over time. As noted by Syrquin (1988), some LDCs, such as, Chile, Israel, S. Korea and Turkey, had devoted much time to building the export bases before the

emergence of their export expansion. Therefore, it was possible for some countries including China, Indonesia, Philippines, Thailand and other LDCs with export strategies, to take many years to fully achieve their export oriented policies. Another possibility was, seeing the association between export income and the demand for exports, the level of LDC exports was to a great extent determined by income level of DCs. Rising demand for LDC exports worldwide over time could contribute to the trend. Hence, the slopes of export penetration policy responses were rising over time.

As a brief note made to the linkage between LDC economies and world business cycles, trade policies, served as a "gear" of economic synchronization, were the most sensitive to external shocks, among other policy responses. The global economy, largely influenced by business cycles in DCs, caused external shocks, which called for economic adjustments in LDCs. The most important economic adjustment was trade policy efforts set in motion by business cycles in DC growth, due to the influence of DC income level on the demand for LDC exports.

Based on the external accounting results, a comparison of LDC GDP growth presented below (Figure 4.1). It is not difficult to see the linkage between the adoption of export-oriented policy by LDCs and higher economic growth than otherwise.

Figure 4.1



4.3 High-Growth LDC versus Low-Growth LDC

One remaining question is whether or not export-penetration policy efforts differentiated high-growth LDC (HLDC) from low-growth LDC (LLDC). Alternatively, did HLDCs respond more to external shocks in terms of export penetration policies than did LLDCs?

A Chow Test was used to answer the above question. First, two subset data pools were generated, based on GDP growth rates. One dataset contained a cross-section panel data through 1987-2005. One subset (HLDC) represented LDCs with GDP growth rates of more than 3%. The other subset (LLDC) represented LDCs with GDP growth rates less

than or equal to 3%[7]. Second, export-penetration policies were regressed on external shocks, using the whole cross-section panel data set. Third, two regressions were separately run for HLDC and LLDC, allowing the parameters for both HLDC and LLDC to be tested for differences in policy responses. Thus, there were three equations expressed as follows:

$$\boldsymbol{EP}_i = \beta_{0_i} + \beta_{1_i}\, \boldsymbol{ES}_i + \mu$$

where

$\boldsymbol{EP}_i$ = Export policy responses, (i = 1, 2, and 3);

$\boldsymbol{ES}_i$ = External shocks, (i = 1, 2, and 3); and

i = 1 for equation 1, which employs whole cross-section pool data;

i = 2 for equation 2, which employs the HLDC subset data;

i = 3 for equation 3, which employs the LLDC subset data.

This type of Chow test was used to confront the null hypothesis that HLDC was not different from LLDC, in terms of export policy responses. The hypothesis was expressed as follows:

$$H_0: \beta_{11} = \beta_{12}$$

$$H_1: \beta_{11} \neq \beta_{12}$$

[7] The creterion of 3% used for classifications are arbitary to have sufficient number of countries in each subset.

Table 4.8 The results reflecting differentiation of HLDC from LLDC

Regression of Export-penetration on External shocks,1987-2005			
Equation 1, using whole cross-section panel data,			
Constant	Coefficient	t-ratio	R squared
-0.740	-0.411	-6.217	0.220
Equation 2, HLDC subset, with Growth of GDP greater than 3%			
Constant	Coefficient	t-ratio	R squared
-1.964	-0.546	-5.929	0.300
Equation 3, LLDC subset, with Growth of GDP less than 3%			
Constant	Coefficient	t-ratio	R squared
0.941	-0.251	-3.131	0.156
Chow Test Statistic: 6.746 which is greater than critical value of $F_{(\alpha=1\%, DF1=82, DF2=53)} = 1.73$			
'*' Notes: F = (ssr1-ssr2-ssr3)*DF/(2*(ssr2+ssr3)),			

Table 4.8 above shows the results of the test. Based on the Chow statistic values, the null hypothesis was rejected at an one percent significance level. Therefore, the conclusion strongly suggested that high-growth LDC (HLDC) differed from low-growth LDC (LLDC) in choosing policy responses to external shocks.

How much difference was there? The above regression results show that HLDC export oriented policy accounted for 55 percent of the offsetting response, for every dollar loss caused by external shocks to the current account balance. Compared to LLDC, export oriented policy accounted for only 25 percent of the response to external shocks. That is equivalent to 120 percent greater measured response by HLDC than that by LLDC using export oriented policy. Comparing the intercepts, which represent the mean external shocks, HLDC experienced three times as much external shock as LLDC did in the period 1987-2005. The statistic parameters produced from the previous regressions also stated what external shocks LDC faced seemed not to be necessarily unfavorable to the economic growth of those LDCs. Nevertheless, the conventional wisdom believed in the disadvantage to LDCs if they were exposed to a great degree of external shocks. It made

a contribution to the debate whether adverse external shocks accounted for differences in performance among individual LDCs, despite the denials made by Mitra (1991) and Helleiner (1987).

Why did some LDCs perform better when they were facing more substantial external shocks? The greater measures of external shocks that LDCs experienced, the more open their economies. The greater measures of external shocks forced those LDCs to make some necessary economic adjustments, especially, adopting export oriented policies to offset the adverse impact of external shocks.

Policy responses to external shocks might be involuntary reactions from those LDCs. However, the reactions made those LDCs winners. In the medium term to long-term, export orientation presumably raised total factor productivity through its favorable effects on the efficiency of resource allocation, capacity utilization, economies of scale, technological changes, and ultimately stimulating economic growth.

To the contrary, LLDCs were among those countries minimizing their exposure to external shocks. However, minimizing exposure to external shocks indicated a lack of export orientated policy efforts. For instance, countries like Argentina, Bolivia, Costa Rica, El Salvador, Madagascar, Malawi, Sudan and Venezuela all had negative growth rates, but they had positive changes in their current account balances in the 1978-82 period. This outcome was also essentially true in the 1982-86 and 1987-91 periods. Of those countries with low growth rate or negative GDP growth, most of them did not improve their export competitiveness in the highly integrated world economy.

Consequently, these LDCs could minimize their exposures to external shocks and suffer little adverse impact of external shocks on their external balance, but they could not achieve decent economic growth.

5 Conclusion

Performance of an economy in this integrated world very much depends on the well being of the rest of the world. The highly competitive world economy, through world trade, produced so many shocks to LDCs, such as the 1973 and 1979 oil price crises, high commodity price cycles, the early 1980s' debt crises, geopolitical shock in 2001, and the current soaring commodity prices and credit-crunch of 2008. Facing the impact of external shocks on their external balances, LDC had to find appropriate policies to offset those adverse effects. Through juggling different policy responses to external shocks, some LDCs found themselves evolving and coming out as HLDCs, and some found their economies lagging behind others as LLDCs.

In conclusion, the transmission mechanisms did not merge as a simple form of linkages. With abundant evidences presented above, the transmission mechanism worked this way: cycles in the world economy, in which DC played a crucial role, generated substantial external shocks directly affecting LDC current account deficits. Adverse impacts on current account deficits resulted in policy responses, directly differentiated to some extent by LDC economic performance. LDC policy responses, especially in open economy policies, gave them extensive external exposure, causing them to face major external shocks. This situation resulted in strong linkages connecting great measure of adverse

external shocks to significantly positive policy reactions, potentially delivering high economic growth.

HLDCs were in an economic environment forcing them to adjust their economic structures to survive in the highly competitive world. Those countries able to outperform average countries often turned risks of exposing themselves to external shocks into economic advantages by promoting export penetration. To the contrary, some LLDCs did not have good policies to cope with external shocks. Certain LLDCs virtually isolated their economies from the rest of the world. Without exposing themselves to the "hostile" world, most of them had avoided the impact of external shocks to their current account balance. However, as economic data reiterated, by closing the door to the world, the LLDCs were not able to recover from their prolonged recessions. According to this point of view, trade oriented policy constitutes the essential variable to explain differences in LDC growth.

Appendices

1. Lists of countries whose real GDP growth calculated for economic growth

30 selected LDCs: Argentina, Bangladesh, Benin, Bolivia, Botswana, Brazil, Chile, China, Colombia, Dominica, Ecuador, Egypt, Arab Rep.El, Salvador, Honduras, India, Indonesia, Israel, Korea, Rep., Madagascar, Malawi, Malaysia, Mexico, Morocco, Pakistan, Paraguay, Peru, Philippines, Senegal, Sri Lanka, Sudan, Tanzania, Thailand, Turkey, Uruguay, Venezuela, RB, and Zambia.

Sub-Saharan Africa: Angola, Benin, Botswana, Burundi, Cameroon, Cape Verde Is., Central Africa., Chad, Congo, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zaire, Zambia, and Zimbabwe.

Central America and Caribbean: Barbados, Costa Rica, Dominican Rep., El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Trinidad and Tobago.

East Asia without Japan: Hong Kong, Korea, South(R), Malaysia, Philippines, Singapore, Taiwan, Thailand, Fiji and Papua N. Guinea.

South Asia: Afghanistan, Bangladesh, Burma(Myanmar), India, Nepal, Pakistan and Sri Lanka.

Western Europe: Austria, Belgium, Cyprus, Denmark, Finland, France, West Germany, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Luxembourg, Portugal, Spain, Sweden, Switzerland and UK.

Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Surinam, Uruguay and Venezuela

ASEAN: Malaysia, Philippines, Singapore and Thailand.

OECD: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK and USA.

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