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**How Latin is the Philippines?**

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## Abstract

Dornbusch (cited in Ramos, 2003) referred to the Philippines as a confused country “which is some crossbreed between Asia and Latin America”. This paper compares the Philippines with an Asian country (Thailand) and a Latin American country (Mexico) in terms of the sources of macroeconomic fluctuations that buffet their economies. Structural vector autoregression (SVAR) *a la* Blanchard and Quah (1989) is used to measure the relative contribution of external shocks (world intermediate input prices and world output) and internal shocks (country-specific aggregate supply and demand disturbances) in explaining short-term movements of domestic output, real exchange rate, and inflation. Evidences from the Philippines and Thailand show that domestic shocks are the main sources of GDP fluctuations. In both countries, domestic supply factors are the most important domestic shocks. In Mexico, world output shocks and domestic supply shocks dominate as sources of GDP fluctuations.

Keywords: Structural vector autoregression (SVAR), Philippines, Latin America, Mexico, Thailand

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# How Latin Is the Philippines?<sup>1</sup>

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## 1. Introduction

Keynesian Aggregate Demand -Aggregate Supply (AD-AS) model tells us that output fluctuations can either be due to demand or supply shocks. AD shocks emanate from fiscal and monetary policies that individual countries implement. A positive AD shock increases output and prices. However, AD shocks have no long-run effect on output, only on prices. AS shocks, on the other hand, arise due to changes in productivity, labor supply, and structural reforms. A positive AS shock increases output but lowers the price. AS shocks, unlike AD shocks, have long-run effect on output.

Blanchard and Quah (1989) exploited this dichotomy using structural vector autoregression (SVAR) to explain the relative importance of demand versus supply shocks in explaining GDP fluctuations in the United States (US).<sup>2</sup> They found out that demand disturbances account as the primary source of GDP fluctuations at short-term horizons. Moreover, AD disturbances have a hump-shaped effect on output; the effect peaks after 4 quarters and vanishes after 8 to 12 quarters. The effect of AS disturbances on output increases steadily over time, reaching a peak after 8 quarters and a plateau after 20 quarters.

Reside (2002) extended the Blanchard-Quah model using Philippine data. He found out that a positive AD shock increases output with stronger impact being felt after 4 quarters. AS shock increases output with the peak impact after the 7<sup>th</sup> quarter; however the effect plateaus over time.

The Blanchard and Quah bivariate SVAR has been extended to apply to systems of greater than two variables. Moreover, the model has been extended to open economies to examine the relative contribution of world shocks and country-specific shocks on domestic macroeconomic variables. Ahmed and Park (1994) studied the sources of

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<sup>1</sup> The title is adapted from former President Fidel V. Ramos' Lecture entitled "RP- Latin American Relations (How Latin is the Philippines?)" held at AIM Conference Center, Makati City on 27 October 2003.

<sup>2</sup> The Blanchard and Quah (1989) model estimated a bivariate VAR using GDP and unemployment data. They assumed that there are two kinds of disturbances in the economy, each uncorrelated with the other; and that neither has a long-run effect on unemployment. They interpreted the disturbances that have a temporary effect on output as being mostly demand disturbances, and those that have a permanent effect on output as mostly supply disturbances. Bayoumi and Eichengreen (cited in Reside, 2002) substituted the price level for unemployment data and directly link the VAR structure to that of the standard AD-AS model.

economic fluctuations in seven OECD small open economies (Australia, Austria, Canada, Finland, France, Italy, and the United Kingdom). They defined a small open economy as one that takes the real interest rate and terms of trade as exogenously given. The small open economy assumption implies a partial equilibrium analysis that would allow a clear-cut identification of global and country-specific supply shocks. The identification of the structural shocks is based primarily on long-run restrictions similar to Blanchard and Quah. However, the short-run dynamics is sufficiently general so as to be able to discriminate among alternative theoretical models. Ahmed and Park found out that a large fraction of GDP fluctuations, even in short-term horizons, is attributable to supply shocks. Hoffmaister and Roldos (2001) extended the study by focusing on two developing countries namely Brazil and South Korea. They found out, similar to Ahmed and Park's results, that domestic shocks are the main source of GDP fluctuations. Global shocks explain only a small fraction of movement in GDP. In South Korea, the most important domestic shocks are those associated with supply factors; in Brazil, it is domestic nominal demand shock. The relevant world shocks are also different: in South Korea they are those associated with world intermediate input prices while those associated with world output dominate in Brazil.

This paper is an extension of the Blanchard and Quah framework and is applied to three small open economies namely the Philippines, Thailand, and Mexico. This is an interesting case study largely because the Philippines is said to be a Latin American-type economy oddly located in Asia (Ramos, 2003). This paper attempts to compare the Philippines and Thailand (an Asian country) and the Philippines and Mexico (a Latin American country). The study looks into the sources of macroeconomic fluctuations in the three economies in explaining the short-term movements in domestic GDP, real exchange rate, and inflation.

To study the sources of business fluctuations in small open economies, the paper follows the Blanchard and Quah approach that relies on long-run economic restrictions, extending it to encompass world/external shocks that impinge upon business fluctuations of small open economies. World supply shocks are composed of world import prices (proxied by petroleum spot price deflated by US Producer Price Index (US PPI)) and world output (proxied by US GDP). Domestic shocks, however, are interpreted more generally as all domestic supply shocks including structural reforms, relative demand shocks (changes in relative preferences and public spending) and nominal demand shocks (changes in prices). Domestic supply shock is proxied by the country's real GDP. Domestic demand shocks are broken down into relative demand shocks (proxied by the real exchange rate) and nominal demand shocks (proxied by the Consumer Price Index (CPI)).

A second set of model is also estimated. World output shock is now measured as a weighted average of GDP of each country's top three trading partners weighted by the share of exports to each trading partner.

World financial shocks (proxied by six-month London interbank overnight rate on US dollar deposits deflated by US PPI) are also incorporated in this study. World output shock is replaced with world interest shock.

The paper is structured as follows: Section 2 briefly describes the three countries' economies and the extent of financial liberalization. Section 3 presents the empirical model of the paper. Section 4 interprets the main empirical results. Section 5 concludes.

## 2. Basic economic facts on Thailand, the Philippines, and Mexico

*Economy.* Table 1 shows some basic economic facts of Thailand, the Philippines, and Mexico.

**Table 1. Basic Economic Data of Thailand, the Philippines, and Mexico, 1998**

	Thailand	the Philippines	Mexico
Real GDP (in US \$)	111.86	65.17	421.00
Household Consumption/ GDP	54.15	74.30	67.42
Government Spending/ GDP	11.06	13.30	10.40
Investment/ GDP	20.44	20.34	24.32
Exports/GDP	58.88	52.15	30.69
Imports/ GDP	42.99	58.78	32.83

Source: International Financial Statistics

Mexico's economy is four times as big as Thailand and six times as big as the Philippines. Private consumption to GDP ratio ranges from 54 to 74 percent in the three economies. Investment is one-fifth of GDP. Government spending is slightly modest at around 10 to 13 percent. Mexico has a persistent budget deficit that went to as high as 1.8 percent of its GDP in 2002. Mexico finances its budget deficit mostly through domestic borrowing. Thailand enjoyed a budget surplus until 1997. Its budget deficit went to as high as 3 percent of its GDP in 1999. Thailand finances its budget deficit largely through domestic borrowing. The Philippines briefly enjoyed a budget surplus from 1994 to 1997 and had a persistent budget deficit afterwards. In 2002, its budget deficit was 5 percent of its GDP. The Philippines finances its budget deficit through domestic and foreign borrowing.

Thailand, the Philippines and Mexico are open economies. The export to GDP ratio is quite high: 59 percent for Thailand, 52 percent for the Philippines, and 31 percent for Mexico. If we use the ratio of the sum of exports and imports to GDP, the ratio goes as low as 64 percent for Mexico to as high as 111 percent for the Philippines.

Thailand's three top exporting partners are the United States (US), Japan, and Singapore. A fifth of its exports goes to US (22 percent), 14 percent goes to Japan, and 9 percent goes to Singapore. Much of its exports go to industrial countries (58 percent).

Thailand experienced a current account deficit in the early 1990s but has had a current account surplus since 1998.

The Philippines' three biggest exporting partners are the US, Japan, and Netherlands. A third of its exports goes to US (34 percent), 15 percent goes to Japan, and 8 percent goes to the Netherlands. Most of its exports go to industrial countries (71 percent). Like Thailand, the Philippines has started to experience a current account surplus since 1998.

Mexico's three primary exporting partners are the US, Canada, and Germany. Nine-tenth of its exports goes to US (88 percent) and just around 1 percent each to Canada and Germany. Mexico's exports goes mainly to industrial countries (94 percent). Mexico has had a persistent current account deficit.

Gross domestic product (GDP) growth rate of Thailand, the Philippines, and Mexico in the 1990s is 4.37 percent , 2.93 percent , and 3.18 percent respectively. Mexico's economy contracted in 1995 due to Balance of Payment Crisis but quickly attained its pre-1995 GDP levels in 1997. Thailand grew on the average 8 to 9 percent prior to Asian Financial Crisis but its economy contracted by 10 percent in 1998. Only in 2001 has the country reached its pre-crisis GDP levels. Philippines' GDP slightly contracted in 1998. Net primary income from abroad in the Philippines is continuously increasing (P267.5B in 2002 compared to P35.1B in 1993) contributing greatly to its Gross National Income. Net primary income from abroad in Mexico and Thailand are persistently negative.

*Financial Liberalization.* Williamson and Mahar (1998) did a survey of financial liberalization in various developed and developing countries from 1973 to 1996. Six dimensions of financial liberalization are discussed: (1) the elimination of credit controls; (2) deregulation of interest rates; (3) financial services sector; (4) bank autonomy; (5) private ownership of banks; and (6) liberalization of international capital flows. Williamson and Mahar noted that in Thailand credit controls and entry barriers are largely absent. Privatization of banks is allowed and international capital flows are largely liberalized. Moreover setting of interest rate is largely deregulated. In the Philippines, the banking sector and credit sector are partially repressed. Interest rates setting are largely deregulated. The following dimensions of Philippine financial liberalization are largely liberalized: entry barriers, privatization and international capital flows. In Mexico, all dimensions of financial liberalization are largely liberalized. Overall, the three countries share the features that the credit sector, private ownership of banks, and international capital flows are largely liberalized.

### 3. Empirical model<sup>3</sup>

The structural model proposed to study the business fluctuations in small open economies can be expressed generally as:

$$\Delta \mathbf{x}_t = \mathbf{A}(L) \times \boldsymbol{\varepsilon}_t$$

This is equal to:

$$\begin{pmatrix} \Delta P_{mt}^* \\ \Delta Y_t^* \\ \Delta Y_t \\ \Delta q_t \\ \Delta P_t \end{pmatrix} = \mathbf{A}(L) \mathbf{x} \begin{pmatrix} \boldsymbol{\varepsilon}_t^{pm^*} \\ \boldsymbol{\varepsilon}_t^{y^*} \\ \boldsymbol{\varepsilon}_t^s \\ \boldsymbol{\varepsilon}_t^{d1} \\ \boldsymbol{\varepsilon}_t^{d2} \end{pmatrix}$$

The left-hand side represents the log differences of the world import price, world economic activity, domestic activity, the real exchange rate and prices;  $\mathbf{A}(L)$  denotes a lag polynomial matrix;  $\boldsymbol{\varepsilon}_t$  denotes a vector containing the structural shocks of interest with  $E(\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}^1) = \mathbf{I}$  (the identity matrix).

Consider the long-run effects of these shocks, that is setting  $L=1$

$$\mathbf{A}(\mathbf{1}) = \begin{pmatrix} \mathbf{A}(\mathbf{1})_{1,1} & \vdots & \mathbf{A}(\mathbf{1})_{1,2} \\ \dots\dots & \vdots & \dots\dots \\ \mathbf{A}(\mathbf{1})_{2,1} & \vdots & \mathbf{A}(\mathbf{1})_{2,2} \end{pmatrix}$$

where the recursive matrix  $\mathbf{A}(1)$  has been partitioned so that sub-matrices  $\mathbf{A}(1)_{1,1}$  and  $\mathbf{A}(1)_{2,1}$  correspond to the long-run effects of world shocks respectively on world and domestic variables, and  $\mathbf{A}(1)_{1,2}$  and  $\mathbf{A}(1)_{2,2}$  correspond to the long-run effects of domestic shocks respectively on world and domestic variables. Note that since  $\mathbf{A}(1)$  is recursive, this implies that both the  $2 \times 2$  sub-matrix  $\mathbf{A}(1)_{1,1}$  and the  $3 \times 3$  sub-matrix  $\mathbf{A}(1)_{2,2}$  are recursive, and that the  $2 \times 3$  sub-matrix  $\mathbf{A}(1)_{1,2} = 0$ .

Relying on restrictions on  $\mathbf{A}(1)$ , Blanchard and Quah showed that the structural model is obtained by post-multiplying the  $\mathbf{C}(L)$  matrix from the reduced-form or Wold

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<sup>3</sup> This section draws heavily from Hoffmaister and Roldos (2001).

representation of the model  $\Delta x_t = C(L) \times \mu_t$ , by the  $A_0$  matrix. In general, this translates into  $A_j = C_j \times A_0$  for all  $j$ , and in particular  $A(1) = C(1) \times A_0$ . Thus, the structural model is identified once  $A_0$  is identified, that is, once the contemporaneous effects of the structural shocks are identified.

The 25 elements of  $A_0$  are identified using a combination of three types of restrictions. The first type of restrictions refers to the orthogonality of the structural shocks, that is  $E(\varepsilon\varepsilon^1) = I$ . Since  $A_0\varepsilon = \mu$ , this implies that  $A_0A_0^1 = \Omega$ , and because  $\Omega$  is a symmetric (5 x 5) matrix, this condition provides 15 independent restrictions. The other types of restrictions stem from the long-run matrix and their relation to the reduced form  $A(1) = C(1) \times A_0$ .

Consider the economic rationale for the long-run restrictions embedded in the recursive sub-matrices  $A(1)_{1,1}$  and  $A(1)_{2,2}$ . The first restriction is that the world price of intermediate inputs is unaffected in the long-run by world economic activity. This restriction is motivated by the fact that there is no a priori reason why an expansion in the long-run world output would affect the relevant intermediate input for small open economy in a differential way so as to change its relative price. This restriction makes the element above the main diagonal of  $A(1)_{1,1}$  equal to zero. The second and third restrictions are that the long-run level of domestic output is not affected by the demand shocks; that is, long-run domestic output is determined by supply factors. The fourth restriction is that the long-run level of the real exchange rate is not affected by the aggregate demand (nominal) shock, that is, the long-run real exchange rate is determined by supply and relative demand. The last three restrictions imply that all three elements above the main diagonal of the sub-matrix  $A(1)_{2,2}$  are zero.

Consider the restrictions  $A(1)_{1,2} = 0$ . These restrictions imply that domestic shocks-  $\varepsilon^s$ ,  $\varepsilon^{d1}$ ,  $\varepsilon^{d2}$ - do not affect world economic activity and world input prices in the long-run. This reflects the small open economy assumption as discussed by Ahmed and Park (1994).

To summarize, the matrix  $A(1)$  is a lower triangular matrix, that is, the upper off-diagonal is set to zero with the other elements left unrestricted. This implies that (1) the long-run world output would not affect the relevant world input prices for a small open economy in a differential way to affect so as to change its relative price; (2) domestic shocks (both supply and demand disturbances) do not affect world variables; (3) long-run domestic output is determined by supply factors and not by demand-side factors; and (4) long-run domestic real exchange rate is affected by supply and relative demand shocks and is not affected by nominal demand shocks. As a note, many macroeconomic models share the premise that the long-run path of output is determined by supply-side factors. Ahmed and Park (1994) cited works of Shapiro and Watson (1988) and King, Plosser, Stock, and Watson (1991).

#### 4. Empirical results

The estimates are obtained using 40 quarterly observations from 1992:1 to 2001:4. Augmented Dickey-Fuller (ADF) tests are used to test for unit roots . The results reveal that the following variables are differenced once to render it stationary, I(1): Petroleum prices , US GDP, 6-month London interbank overnight rate (LIBOR), the Philippine real exchange rate and inflation, Thailand GDP and real exchange rate and Mexico inflation. The following variables are differenced twice to render it stationary, I(2): the Philippine GDP, Thailand inflation, and Mexico GDP and real exchange rate.

The relative importance of shocks are considered through variance decomposition and are presented in Tables 2, 3, and 4.

As a note, the structural shocks  $e^{PM^*}$ ,  $e^{Y^*}$ ,  $e^S$ ,  $e^{D1}$ , and  $e^{D2}$  are respectively shocks to world import prices, world output, domestic supply , domestic relative demand, and domestic nominal demand.

**Table 2. Variance Decomposition of Domestic Variables  
(Real Gross Domestic Product)**

Thailand Gross Domestic Product (THGDP)  
Percentage of the variance of  $\Delta$ THGDP due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	2.77	19.28	73.96	2.14	1.85
2	3.48	17.64	75.70	1.84	1.34
4	5.54	16.69	66.89	5.08	5.79
8	5.59	20.11	63.00	5.03	6.28
10	5.67	20.03	62.87	5.07	6.36

Philippine Gross Domestic Product (PHGDP)  
Percentage of the variance of  $\Delta$ PHGDP due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	2.28	4.46	86.01	6.56	0.69
2	2.37	10.13	73.60	7.59	6.31
4	1.85	12.13	66.69	7.58	11.74
8	1.92	12.24	67.28	7.20	11.36
10	1.91	12.26	67.34	7.17	11.31

Mexico Gross Domestic Product (MXGDP)  
Percentage of the variance of  $\Delta$ MXGDP due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	2.91	21.12	58.49	11.04	6.44
2	8.87	41.10	42.28	4.82	2.93
4	10.95	38.96	40.13	4.38	5.58
8	10.71	39.41	40.85	3.10	5.92
10	10.71	39.60	40.90	2.90	5.89

**Table 3. Variance Decomposition of Domestic Variables  
(Real Exchange Rate)**

Thailand Real Exchange Rate (THRER)  
Percentage of the variance of  $\Delta$ THRER due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	33.33	1.21	32.90	30.77	1.80
2	33.06	1.35	31.75	31.08	2.76
4	30.25	8.14	30.06	28.39	3.16
8	30.53	8.22	29.69	28.22	3.34
10	30.53	8.23	29.69	28.21	3.33

Philippine Real Exchange Rate (PHRER)  
Percentage of the variance of  $\Delta$ PHRER due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	9.91	2.78	0.91	59.22	27.18
2	9.61	3.45	0.88	58.01	28.04
4	13.60	4.40	5.29	43.00	33.70
8	15.53	5.34	5.11	41.47	32.55
10	15.62	5.33	5.10	41.28	32.67

Mexico Real Exchange Rate (MXRER)  
Percentage of the variance of  $\Delta$ MXRER due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	19.56	10.56	0.72	0.09	69.07
2	16.48	8.41	0.55	4.31	70.24
4	16.51	9.86	3.97	3.99	65.67
8	16.50	9.68	3.78	4.00	66.05
10	16.52	9.81	3.93	3.98	65.75

**Table 4. Variance Decomposition of Domestic Variables  
(Inflation)**

Thailand Consumer Price Index (THCPI)  
Percentage of the variance of  $\Delta$ THCPI due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	16.10	11.22	9.24	3.85	59.59
2	14.27	18.91	11.48	3.63	51.70
4	15.65	18.17	15.13	4.84	46.22
8	16.81	19.06	15.30	6.24	42.59
10	16.84	19.11	15.44	6.27	42.34

Philippine Consumer Price Index (PHCPI)  
Percentage of the variance of  $\Delta$ PHCPI due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	12.00	13.16	3.61	38.77	32.46
2	11.05	18.51	10.42	30.66	29.36
4	11.35	22.29	10.54	24.37	31.44
8	12.38	22.64	11.53	23.99	29.46
10	12.66	22.50	11.61	23.85	29.38

Mexico Consumer Price Index (MXCPI)  
Percentage of the variance of  $\Delta$ MXCPI due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	9.98	18.54	9.56	49.60	12.32
2	17.50	20.76	8.06	24.72	28.96
4	18.11	21.68	11.23	23.59	25.40
8	19.38	21.53	11.08	22.44	25.57
10	19.46	21.57	11.15	22.39	25.41

World shocks account for 21 to 26 percent of output fluctuations in Thailand, 7 to 14 percent of output fluctuations in the Philippines, and 24 to 50 percent of output fluctuations in Mexico. The relevant world shock for the three countries is the same, that is, those associated with world output ( $e^{Y*}$ ). However, the magnitude differs; the significance of  $e^{Y*}$  hover around 12 percent in the Philippines, 20 percent in Thailand, and 41 percent in Mexico. The significance of shocks associated with world import prices,  $e^{PM*}$ , is almost twice as big in Mexico (10 percent) compared to Thailand (6 percent) and five times as big compared to the Philippines (2 percent). This means that Mexico is affected primarily by world shocks compared to the two Asian countries. The

high value of world output shock in explaining the variation of Mexico's GDP could be partly explained by the greater intercalation of its economy with that of US following the North American Free Trade Agreement (NAFTA) in 1989.

Domestic supply shocks account for a significant fraction of output fluctuations in the three countries: 63 to 76 percent in Thailand, 67 to 86 percent in the Philippines, 40 to 58 percent in Mexico. At longer horizons (10 quarters), the world output shock and the domestic supply shock in Mexico equally explain at 40 percent each the variability in Mexico's GDP. These results are consistent with Hoffmaister and Roldos' (1999) paper that the main source of output fluctuations in developing countries in Asia and Latin America is supply shocks even in the short-run. Moreover Latin American countries are affected more by world shocks. This paper also lends support to one of the propositions of real-business cycle theory--- even over a very short horizon, supply changes explain the bulk of the movements in aggregate output. Internal supply shocks being more important than external supply shocks in explaining GDP movement may indicate that models focusing on country-specific supply disturbances to study business cycle phenomenon are worth pursuing. (Ahmed and Park, 1994).

World import price shocks account for a significant variation in the three countries real exchange rate: 30 to 33 percent in Thailand, 10 to 16 percent in the Philippines, and 17 to 20 percent in Mexico. As a note, the significance of the shock associated with import prices is twice as big in Thailand (33 percent) compared to the Philippines (16 percent). In Mexico, the values hover around 20 percent. Variations in the real exchange rate in Thailand can be explained almost equally by world import price, domestic supply, and relative demand shocks. In the Philippines real exchange rate fluctuations are primarily due to relative and nominal demand shocks; in Mexico world import price and nominal demand shocks prevail. Changes on the three countries' inflation are primarily due to nominal demand shocks. In the Philippines and Mexico, relative demand shocks also play an important role.

To check the robustness of the results discussed above, a second set of model was estimated. World output shock, instead of US GDP, is now measured as a weighted average of GDP of each country's top three trading partners, weighted by the share of exports to each trading partner. The relative importance of structural shocks are considered through variance decomposition and are presented in Tables 5, 6, and 7.

**Table 5. Variance Decomposition of Domestic Variables  
(Real Gross Domestic Product)**

Thailand Gross Domestic Product (THGDP)  
Percentage of the variance of  $\Delta$ THGDP due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	1.81	16.01	77.50	2.25	2.43
2	3.74	14.98	77.46	2.02	1.79
4	5.08	13.50	68.45	4.75	8.22
8	5.24	14.45	66.97	4.74	8.60
10	5.24	14.38	66.98	4.76	8.63

Philippine Gross Domestic Product (PHGDP)  
Percentage of the variance of  $\Delta$ PHGDP due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	7.80	0.01	90.35	1.81	0.02
2	10.27	0.18	86.65	1.37	1.53
4	9.57	0.40	83.21	1.38	5.44
8	9.03	0.70	83.49	1.38	5.40
10	9.01	0.70	83.52	1.38	5.38

Mexico Gross Domestic Product (MXGDP)  
Percentage of the variance of  $\Delta$ MXGDP due to

Quarters	$e^{PM^*}$	$e^{Y^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	3.36	15.86	67.26	9.34	4.18
2	1.56	19.52	69.63	4.40	4.89
4	2.09	26.60	60.37	3.74	7.20
8	2.23	36.56	51.12	2.97	7.12
10	2.30	38.66	49.35	2.84	6.85

**Table 6. Variance Decomposition of Domestic Variables  
(Real Exchange Rate)**

Thailand Real Exchange Rate (THRER)  
Percentage of the variance of  $\Delta$ THRER due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	19.25	17.48	24.24	37.47	1.56
2	18.89	18.94	22.73	34.17	5.26
4	19.71	21.61	20.09	33.10	5.48
8	19.27	21.38	21.18	32.55	5.61
10	19.25	21.36	21.18	32.54	5.67

Philippine Real Exchange Rate (PHRER)  
Percentage of the variance of  $\Delta$ PHRER due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	14.57	2.06	0.52	45.41	37.43
2	12.60	5.84	0.54	41.22	39.79
4	15.02	6.21	5.52	34.37	38.87
8	14.74	8.11	5.08	31.48	40.60
10	15.11	8.09	5.05	31.46	40.28

Mexico Real Exchange Rate (MXRER)  
Percentage of the variance of  $\Delta$ MXRER due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	12.89	4.99	0.53	0.08	81.51
2	12.62	5.00	0.43	3.84	79.11
4	11.18	6.24	4.50	3.44	74.64
8	11.54	7.06	4.47	3.44	73.49
10	11.52	7.16	4.65	3.42	73.26

**Table 7. Variance Decomposition of Domestic Variables  
(Inflation)**

Thailand Consumer Price Index (THCPI)  
Percentage of the variance of  $\Delta$ THCPI due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	4.23	9.68	9.00	9.17	67.92
2	5.94	15.04	13.92	7.99	57.11
4	7.38	16.19	19.96	6.86	49.60
8	7.68	17.34	21.02	6.70	47.25
10	7.71	17.43	21.07	6.69	47.10

Philippine Consumer Price Index (PHCPI)  
Percentage of the variance of  $\Delta$ PHCPI due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	11.93	13.54	3.55	27.61	43.37
2	11.52	12.76	10.68	22.47	42.57
4	12.58	10.08	11.98	17.40	47.97
8	14.63	9.62	13.53	17.36	44.85
10	14.53	9.65	13.50	17.15	45.17

Mexico Consumer Price Index (MXCPI)  
Percentage of the variance of  $\Delta$ MXCPI due to

Quarters	$e^{PM*}$	$e^{Y*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	3.35	10.58	20.16	49.55	16.36
2	6.95	11.06	19.61	24.67	37.71
4	6.92	11.83	23.72	24.00	33.53
8	7.86	12.28	23.30	23.01	33.55
10	7.88	12.30	23.41	22.98	33.43

World shocks account for 18 to 20 percent of output fluctuations in Thailand, 8 to 10 percent in the Philippines, and 19 to 41 percent in Mexico. The relevant world shocks for the Philippines are those associated with world import prices. For Mexico and Thailand, the relevant world shocks are those associated with world output. Mexico, consistent with the first model, is affected significantly by world output shocks compared to Thailand and the Philippines. Domestic supply shocks account for a significant fraction of output fluctuations in the three countries: 67 to 78 percent in Thailand, 83 to 90 percent in the Philippines, and 49 to 70 percent in Mexico.

Relative demand shocks primarily explain real exchange rate variation in Thailand and the Philippines. In Mexico, nominal demand shocks prevail. As a note, world import price shocks account for a significant variation in the three countries' real exchange rate. Changes on the three countries' inflation are primarily due to nominal demand shocks.

To understand the importance of world financial shocks, the world output variable is replaced with world interest rate. World interest rate is proxied by London inter-bank overnight (LIBOR) rate on 6-month US dollars deposits deflated by US Producer Price Index (US PPI).

The relative importance of structural shocks are considered through variance decomposition and are presented in Table 8, 9, and 10.

As a note, the structural shocks  $e^{PM^*}$ ,  $e^{R^*}$ ,  $e^S$ ,  $e^{D1}$ , and  $e^{D2}$  are respectively shocks to world import prices, world interest rate, domestic supply, domestic relative demand, and domestic nominal demand.

**Table 8. Variance Decomposition of Domestic Variables  
(Real Gross Domestic Product)**

Thailand Gross Domestic Product (THGDP)  
Percentage of the variance of  $\Delta$ THGDP due to

Quarters	$e^{PM^*}$	$e^{R^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	0.00	13.87	80.20	3.36	2.58
2	3.66	11.01	80.17	3.23	1.93
4	8.60	9.06	68.54	5.17	8.63
8	9.28	10.14	65.44	4.94	10.21
10	9.33	10.21	65.07	4.96	10.42

Philippine Gross Domestic Product (PHGDP)  
Percentage of the variance of  $\Delta$ PHGDP due to

Quarters	$e^{PM^*}$	$e^{R^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	1.43	4.51	90.88	3.17	0.00
2	2.84	6.63	87.24	2.56	0.72
4	2.91	6.88	83.35	2.78	4.07
8	2.90	6.55	83.22	3.33	4.00
10	2.90	6.53	83.22	3.35	3.99

Mexico Gross Domestic Product (MXGDP)  
Percentage of the variance of  $\Delta$ MXGDP due to

Quarters	$e^{PM^*}$	$e^{R^*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	2.82	2.45	88.97	1.47	4.29
2	3.17	10.08	81.99	0.68	4.08
4	3.86	9.78	79.15	0.63	6.58
8	5.03	10.71	78.02	0.62	5.62
10	5.08	10.78	78.28	0.60	5.26

**Table 9. Variance Decomposition of Domestic Variables  
(Real Exchange Rate)**

Thailand Real Exchange Rate (THRER)  
Percentage of the variance of  $\Delta$ THRER due to

Quarters	$e^{PM*}$	$e^{R*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	18.34	3.70	44.54	31.79	1.64
2	16.51	3.24	43.14	33.34	3.76
4	20.68	6.92	38.22	29.82	4.36
8	20.47	10.28	36.19	28.57	4.48
10	20.40	10.55	36.08	28.49	4.47

Philippine Real Exchange Rate (PHRER)  
Percentage of the variance of  $\Delta$ PHRER due to

Quarters	$e^{PM*}$	$e^{R*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	11.23	0.29	1.38	62.80	24.29
2	10.04	2.41	1.25	65.34	20.94
4	20.32	3.03	5.48	45.03	26.14
8	19.61	9.09	5.09	43.10	23.12
10	19.89	9.12	5.04	42.62	23.33

Mexico Real Exchange Rate (MXRER)  
Percentage of the variance of  $\Delta$ MXRER due to

Quarters	$e^{PM*}$	$e^{R*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	9.64	3.04	2.66	10.86	73.79
2	16.64	0.96	2.54	3.56	76.30
4	17.02	5.51	6.30	2.89	68.28
8	16.54	6.08	6.49	2.82	68.06
10	16.43	6.72	6.62	2.79	67.43

**Table 10. Variance Decomposition of Domestic Variables  
(Inflation)**

Thailand Consumer Price Index (THCPI)  
Percentage of the variance of  $\Delta$ THCPI due to

Quarters	$e^{PM*}$	$e^{R*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	0.25	6.41	24.42	5.55	63.37
2	10.86	5.81	21.82	4.86	56.65
4	10.67	12.32	21.59	5.22	50.20
8	11.85	13.84	21.31	5.99	47.02
10	11.91	14.09	21.42	5.94	46.64

Philippine Consumer Price Index (PHCPI)  
Percentage of the variance of  $\Delta$ PHCPI due to

Quarters	$e^{PM*}$	$e^{R*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	0.60	16.60	2.48	54.43	25.88
2	10.06	12.80	13.97	42.23	20.94
4	23.21	14.16	14.45	31.15	17.03
8	22.73	28.44	11.93	24.07	12.82
10	21.42	32.44	11.32	22.74	12.08

Mexico Consumer Price Index (MXCPI)  
Percentage of the variance of  $\Delta$ MXCPI due to

Quarters	$e^{PM*}$	$e^{R*}$	$e^S$	$e^{D1}$	$e^{D2}$
1	0.03	33.05	11.49	16.66	38.76
2	1.28	33.75	16.05	5.50	43.41
4	9.23	40.08	13.16	4.29	33.23
8	8.88	51.37	10.23	3.30	26.22
10	8.54	53.78	9.92	3.12	24.62

World shock accounts for 14 to 20 percent of output fluctuations in Thailand. It is around 6 to 10 percent in the Philippines and around 5 to 16 percent in Mexico. The relevant world shock is the same for the three countries: that is those associated with the world interest rate,  $e^{R*}$ . Domestic supply shocks account as the most significant source of macroeconomic fluctuations: 65 to 80 percent in Thailand, 83 to 91 percent in the Philippines, and 78 to 89 percent in Mexico. To note, the effect of world shocks in

Mexico dwarf when the world interest rate is used instead of world output: 5 to 16 percent from 24 to 50 percent.

World import price shocks significantly affect the three countries real exchange rate: 17 to 20 percent in Thailand, 10 to 20 percent in the Philippines, and 10 to 17 percent in Mexico. The effect of world import price dominates over the world interest rate in explaining the variation of real exchange rate. The world interest rate, interestingly, affects more the Philippines' and Mexico's inflation than that of Thailand.

In Thailand, real exchange rate fluctuations are explained primarily by domestic supply and relative demand shocks. In the Philippines, relative demand and nominal demand shocks dominate. In Mexico, world import price and nominal demand shocks prevail. Thailand's inflation is explained significantly by the nominal demand shocks. In the Philippines, it is relative demand shocks and in Mexico, it is world interest rate shocks.

## 5. Conclusion

The study looks into the sources of macroeconomic fluctuations in three developing economies: Thailand, Mexico, and the Philippines. The structural VAR model *a la* Blanchard and Quah (1989) is used to measure the relative contribution of external shocks (world intermediate input prices and world output) and internal shocks (country-specific aggregate supply and demand disturbances) in explaining short-term movements of domestic output, real exchange rate, and inflation. Results reveal that domestic supply shocks are the main sources of GDP fluctuations in Thailand and the Philippines. In Mexico, world output shocks and domestic supply shocks are the main sources of GDP fluctuations. When world interest shocks are used in lieu of world output shocks, domestic supply shocks become the main sources of GDP fluctuations in the three economies. The paper, in general, affirms the dominant role of domestic shocks as a source of business fluctuations in developing countries.

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