Asian Journal of Economics and Empirical Research
ISSN: 2409-2622
Vol. 2, No. 1, 23-38, 2015
http://asianonlinejournals.com/index.php/AJEER

Dynamics of Business Cycles in Vietnam a Comparison with Indonesia and Philippines

***Le, Thanh Ha*[1]**

[1] Economics Department, National Economics University, Vietnam

Abstract

The main purpose of this paper is to investigate the impacts of structural shocks on macroeconomic fluctuations in Vietnam, and then make a comparison to Indonesia and the Philippines. The study adopts the Structural Vector Autoregressive (SVAR) originated by Shapiro and Watson (1988) and Blanchard and Quah (1989) with long-run restriction for small open-economy with flexibility of price, suggested by Ahmed and Park (1994) and Gali (1992). The evidence for countries suggests that: (i) the main source of output variance is domestic supply shocks but there is a significant decrease in long-run; (ii) the fluctuations of trade balance are mostly due to external shocks, especially term of trade shocks in Vietnam, as opposed to Philippines and Indonesia where IS shocks play an important role; (iii) the fluctuations of real exchange rate are mainly driven by the domestic shocks but internal causes of each country are different; (iv) the two important sources of price's movements are domestic shocks, especially IS and nominal shocks in Vietnam.

Keywords: Structural shocks, Business cycles in Vietnam, Fluctuations, SVAR.

Contents

1. Introduction

Understanding and distinguishing among factors that affect macroeconomic fluctuations in the short-run and the long-run have been among the main area of quantitative macroeconomic research. Lucas (1977) argued that understanding business cycle is critical for designing appropriate stabilization policies. The term *business cycle* refers to source of deviations from which a trend occurs because of the wavelike motion of real economic activity. Over three decades, a large body of empirical business cycle analysis with many powerful tools have attempted to discover the main sources of macroeconomic fluctuations. Kydland and Prescott (1982) and Long and Plosser (1983) were pioneers in the *real business cycle* approach to economic fluctuation. In spite of unresolved issues, the research successfully explained some of the key empirical regularities of business cycle. Subsequently, research developed and focused on deriving the driving forces of business cycle fluctuations (Shapiro and Watson, 1988; Blanchard and Quah, 1989).

This line of research, however, has primarily focused on industrialized countries, thus there is a serious lack of empirical research in emerging countries. This is due to the lack of data from developing countries to conduct research in this field. Moreover, these countries tend to experience sudden crises, which make it difficult to determine the sources of business cycles. Recently, scholars have attempted to adjust and constructed new methods for developing countries which open new chances for economic research in this field in these countries (Mendoza, 1991; Hoffmasiter and Roldos, 2001; Thanh, 2007). But these methods might not appropriately apply to others because of distinct characteristics of business cycles as well as economic development models of each country. Therefore, we need more business cycles analyses that are conducted for particular developing countries, especially in Vietnam.

Economic reforms and international integration brought a high growth rate and a stable economic development, with average annual growth of 7.2%, Vietnam was considered as a new emerging country with many potential developments. Vietnam, however, experienced the Asian financial crisis in 1997 and has recently faced macroeconomic instability. This instability has become more serious since 2007 when Vietnam participated in World Trade Organization (WTO). Especially, the global financial and economic crisis in 2008 and its consequences prompt some key questions, such as whether the macroeconomic fluctuation could end soon or last for long, whether the internal or external shocks have more impacts on these fluctuations and others. Vietnam's policy aims to control these problems such as control prices and inflation, stabilize the value of money, and ensure the sound development of financial institutions. However, these policies tend to be inconsistent overtime, partly contributing to macroeconomic instabilities in Vietnam. Therefore, the study of business cycles and its sources has become an important goal to not only help Vietnam overcome the current macroeconomic instabilities but help policy makers identify the main sources of these instability to design appropriate stabilization policies and reach stable economic growth in the long-run.

However, no empirical study to date has investigated the business cycle in Vietnam. Following the above arguments, conducting research about the sources of macroeconomic fluctuation in Vietnam has become a critical requirement. Such study would serve two important purposes. On the one hand, it will attempt to explain the main sources of business cycles in Vietnam, which help policy makers design stabilization policies to reach a long-term growth. On the other hand, this research also fills the serious gap in the empirical literature. The specific questions to be addressed are: (i) What are the main features of business cycles in Vietnam?; (ii) How does the economy respond to various structural shocks, how relatively important is the contribution of each shock to macroeconomic fluctuations?; and (iii) What are the policy implications in the context of current macroeconomic instability?

By adopting the Structural Vector Autoregressive (SVAR) originated by Shapiro and Watson (1988), and Blanchard and Quah (1989) with long-run restriction for small open-economy with flexibility of price, as suggested by Ahmed and Park (1994) and Gali (1992), the study attempts to investigate the main source of macroeconomic fluctuations in Vietnam. Moreover, this study compares the business cycle of Vietnam with those of Indonesia and the Philippines, both members of the Association of Southeast Asian Nation (ASEAN) with common social and economic characteristics, in order to identify and explain any similarities and differences. The main purpose of study is to indicate empirical evidences about impacts of five kinds of shocks, including term of trade shocks, external supply shocks, domestic supply shocks, IS and LM shocks on macroeconomic fluctuations in some developing countries during 1996-2013 period.

The remaining of this paper is organized as follows: chapter 2 briefly reviews the literature on the empirical methodologies as well as the evidence of business cycle in previous research. Chapter 3 will represent the empirical methodology to investigate the features and main sources of business cycle. Subsequently, the study will indicate and analyze the driving factors of macroeconomic fluctuations (chapter 4) in Vietnam over period 1996-2013. Finally, chapter 5 will show some conclusion of main finding and policy implications.

2. Literature Review

Structural vector autoregressive models (SVAR) has been the most popular method for business cycle analysis. Furthermore, there was empirical research, which utilized other methods, for example Ahmed and Lougani (1998) utilized a vector-error correction model (VECM) to examine business cycle in Asian countries and Canada, respectively. Regardless of the kinds of methodology, one of the most important goals of previous studies is to investigate the main sources of macroeconomic fluctuations.

2.1. Sources of Business Cycles in Developed Countries

Research of Blanchard and Quah (1989) is a famous study about business cycles, which other researchers based on to investigate the main source of business cycles. The authors assumed that there were two kinds of disturbances having permanent and transitory effects which could be interpreted as supply and demand shocks. By carrying out a research in the US with bivariate VAR (real GNP growth and the unemployment rate) over the period 1965Q1 to

1986Q4, they found that demand disturbances significantly explained to output fluctuations in short-term and middle-term whereas the effects of supply disturbances increased steadily overtime. Moreover, they indicated that the supply component of GNP positively correlated with real wages at high and medium frequencies.

Blanchard and Quah's study was also one of the pioneers in applying SVAR approach with long-run restriction. Many empirical studies have applied similar approaches but imposed long-run restriction from different theories. Ahmed and Murthy (1994) utilized real business cycle theory with small open-economy framework to investigate main sources of business cycle in Canada from 1973Q1 to 1992Q4 with seven variables. The authors found that domestic supply shocks played a vital role in explaining short-run fluctuations in output whereas real interest rate and term of trade had no effect. Gali (1992) built model which relied on Blanchard and Quah (1989) who identify aggregate demand and aggregate supply shocks by using a long-run constraints. However, Gali developed this method and imposed both long-run and short-run restriction to examine the sources output fluctuation in the US after the war. The author investigated the impacts of exogenous disturbances: supply, money supply, money demand, and IS shocks on four variables: output, money, prices and interest. The main results of this study showed that supply shock significantly account for most of the output fluctuation in US.

2.2. Sources of Business Cycles in Developing Countries

Business cycle analysis primarily focused on major developed economies and a limited number of developing countries. It is only since late 1990 that, this figure gradually increase toward emerging countries. The study of Hoffmaister and Roldos (1996) in groups of developing countries was remarkable. They carried out research, which compared business cycle in 15 Asia and 17 Latin American countries in the period 1,970-1993. The authors utilized structural VAR with a set of long-run economic restrictions. This study also extends to examine the role of world interest rate to provide a framework with many kinds of shocks namely term of trade, supply, fiscal and nominal shocks. The main results showed that supply shocks substantially explained to output fluctuations in Latin American (65%) and Asia (90%) in both short run and long run whereas term of trade shock played a key role in examine trade balance fluctuation but not for output or real exchange rate. What's more, the nominal shocks had insignificant impacts on output and real exchange fluctuations. Hoffmasiter and Roldos (2001) continued utilizing the same method to examine the main sources of business cycle in South Korea and Brazil. They found that output variations in Korea were mostly driven by domestic supply shocks whereas domestic demand shocks played a large role in Brazil.

Siregar and Ward (2001) investigating 5-variable VAR in Indonesia in period 1984-1999, imposed two long-run restrictions related (a) a long-run money demand equation and (ii) a modified McCalumn (1994) policy reaction function on the cointegration matrix. Accordingly, aggregate demand shocks were considered as the main source of output and other macroeconomic fluctuations whereas aggregate supply shocks are less important. Authors indicated the reason for it was smallness of the economy.

Recently, Thanh (2007) also utilize SVAR empirical approach with the imposition of long-run restriction which is guide by the stochastic Mundell-Fleming open economy to evaluate the impacts of structural shock on macroeconomic fluctuations in ASEAN-5 countries. The 4-variable VAR model examine 4 types of disturbances including of external shocks, domestic supply shocks, domestic demand shocks and nominal shocks. The author found that output fluctuations in ASEAN-5 countries were mostly driven by domestic supply shocks and domestic demand shocks were the main contributor to variations in trade balance. It is partly explain by a long period of high growth in the region. Furthermore, the external and domestic supply shocks caused output to expand and this expansion was sustainable in the long-run. In contrast, the domestic demand shocks negligibly affected output in short-run.

3. Data and Methodology

3.1. Data and Variables Analysis

The model consists of five variables, which are term of trade (TOT), foreign output (Y^f), real output (y), trade balance (TB) and real exchange rates (RER) and consumer price index (P). The term of trade is the ratio of the export price index to the import price index .However, in some developing countries, such as Vietnam, Indonesia and Philippines these indexes are not readily available. Hence, we will compute our own export and import price by taking a weight average of export-weighted and import-weighted price level of major trading partner. This method was suggested by Ahmed and Lougani (2000) for some Latin American countries. Particularly, in the case of three countries, the author will calculate by utilizing the indexes of four main trade partners, including United States, Japan, Korea (Republic) and Singapore. Several reasons underlie this choice. First, United States, Japan, Korea and Singapore are 4 of 5 the main trade partner with Vietnam, Indonesia and the Philippines. Second, the information on export and import price is already available. The other variable is the level of foreign output which is an export-weighted of real GDP of five main trading partners (www.cia.gov, 2012). Trade balance (TB) proxies by the ratio of net export to nominal output. The real exchange rate (RER) was considered as the ratio of PPI in US to CPI in VN multiplying nominal exchange rate which represents the relative price of non-traded goods and traded goods. Finally, the domestic price level (P) was the CPI.

Other domestic variables were collected from many sources. All variables except for trade balance are in logarithm form and are covered from 1996 to 2013 from International Financial Statistics (IFS). Several data in Vietnam were taken from General Statistics Office of Vietnam. Furthermore, we also take the first differences of all variables and utilize them in the empirical model. This is to make sure that all variables are stationary which are necessary to satisfy the requirements of VAR model. After taking first differences, we need utilized some method to examine this characteristic of time series, such as Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and other methods.

3.2. Theoretical Economic Model

Structural VAR has commonly been utilized to analyze the dynamic characteristics of economic system. The main difference between individual studies is the theoretical model framework. Blanchard and Quah (1989) assumed that there were two kinds of disturbances which are supply and demand disturbances. They argued that the former had permanent effects on output and the latter did not. They utilized this assumption to investigate the properties of business cycle in US. Other scholars, such as Gali (1992), Siregar and Ward (2001) or recently Thanh (2007) applied IS-LM model for small open economy to explain the sources of business cycle. By using different theoretical framework, these scholars had different outlooks and interpretations for the same issues.

This study considers Vietnam, Indonesia and Philippines as developing countries with characteristics of small open-economy. Hence, this section presents a simple version of the Muldell-Fleming small open-economy.

3.2.1. An Open-Economy IS Equation

$$y_t = \varphi_1(e_t - p_t) - \varphi_2\left(r_t - E_t(\Delta p_{t+1})\right) + \varepsilon_t^{IS} \quad (1)$$

Where e_t is exchange rate and $(e_t - p_t)$ is real exchange rate; r_t is interest rate and $\left(r_t - E_t(\Delta p_{t+1})\right)$ is real interest rate. The equation (1) shows that the demand for domestic output positively correlated with the real exchange rate whereas there is a negative association between domestic output and real interest rate. $\varepsilon^{IS} is$ a IS structural shock, such as fiscal policy, term of trade shocks.

3.2.2. Domestic Money-Market Equilibrium (LM Curve)

$$m_t^d = p_t + \varphi_3 y_t - \varphi_4 r_t + \varphi_5 e_t + \varepsilon_t^{md} \quad (2)$$

$$m_t^s = \varepsilon_t^{ms} \quad (3)$$

$$m_t^d = m_t^s \quad (4)$$

The equation (2), (3), (4) represent equilibrium in domestic money market and ε_t^{md} and ε_t^{ms} are money demand shocks and money supply shocks, respectively. Equation (4) is LM curve. The equation indicates that money demand is affected by many factors, such as price level, opportunity cost of holding money (interest rate) and exchange rate. There are many previous studies conducting research about relationship between exchange rate and money demand in open economies. The substitution of domestic assets for foreign asset occurs when there is depreciation of domestic currency. The value of domestic asset will decrease while the price of foreign assets in domestic currency will increase. Thus, it causes domestic money demand to increase.

Price adjustment equation

$$p_t = \varphi_6[\, y_t - (y^N + \varepsilon_t^{ds})] \quad (5)$$

Where y^N is the full-employment level of output (natural output); ε_t^{ds} is domestic supply shocks. The equation (5) represents that whenever demand for domestic output deviates from natural output, price will adjust.

3.2.3. Trade Balance Equation

$$tb_t = \xi q_t - \beta y_t \quad (6)$$

Where tb_t is the domestic trade balance and q_t is the real exchange rate. The equation (6) indicates that the trade balance depend positively on the real exchange rate but negatively on real output. We incorporate the structural shocks in the model by assuming that the stochastic process drive supply of output(y_t^s), the relative money (m_t) and the relative demand shocks (d_t). We have

$$y_t^s = y_{t-1}^s + \varepsilon_t^{IS} \quad (7)$$

$$m_t = m_{t-1} + \varepsilon_t^{LM} \quad (8)$$

$$d_t = d_{t-1} + \delta_t - \gamma\delta_{t-1} \quad (9)$$

Equation (7) and (8) illustrate that y_t^s and m_t perform as random walk series and equation (9) implies that any shocks to relative demand in period (t-1) are revered in period (t) by the parameter (γ)

3.2.4. The Long-Run Equilibrium

The studies of Clarida and Gali (1994) or recently applied research of To Thanh (2007) about the long-run equilibrium consist a lot of important implications which help this study identify the impacts of shock over macroeconomic variables. The set of equation representing the long-run equilibrium is below

$$y_t^e = y_t^s \quad (10)$$

$$q_t^e = \frac{y_t^s - d_t}{\eta} + \frac{1}{\eta(\eta+\delta)}\sigma\gamma\delta_t \quad (11)$$

$$tb_t^e = y_t^s\left(\frac{\xi}{\eta} - \beta\right) + \frac{\xi}{\eta}\left[-d_t + \frac{1}{(\eta+\sigma)}\sigma\gamma\delta_t\right] \quad (12)$$

$$p_t^e = m_t - y_t^s + \left[\frac{1}{(1+\lambda)(\eta+\sigma)}\right]\lambda\gamma\delta_t \quad (13)$$

Where $y_t^e, q_t^e, tb_t^e, and\ p_t^e$ denotes real output, real exchange rate, domestic trade balance and relative price level. These studies and above equations indicate many important implications in the long-run: (i) the IS, LM shocks do not have any impacts on real output; (ii) LM shocks (nominal shocks) do not affect the trade balance and real exchange rate; and (iii) price level is affected by all kinds of shocks.

3.2.5. Output in Response of Term of Trade Shocks

Theoretically, we know that term of trade have positive impacts on trade balance. An increase in term of trade causes a country to earn more for its exports and pay less for its imports. In my model, I will consider that term of trade is captured by the price of intermediate inputs. Like the study of Hoffmaister and Roldos (1996), the small open economy produce an exportable and a nontradable good in which the exportable good utilizes domestic inputs,

including capital (K) and labor (L) and an imported intermediate input (M). In order to examine the impacts of term of trade shocks on output, I will utilize the equation, which was mentioned by Hoffmaister and Roldos (1996), as follows

$$Y_t = \Phi + \left(\frac{1}{\mu}\right)a_{x_t} - \left(\frac{1-\mu}{\mu}\right)p_{m_t} + (1 - s_n / \lambda_n)\log K_t + (\alpha - s_n / \lambda_n)\log l_x \qquad (14)$$

Equation (6) represents the longt-run output in which a_{x_t} and are exogenous shocks. Hoffmaister and Roldos (1996) argued that an increase in the price of intermediate inputs have the same impacts of negative technological progress. Hoffmaister and Roldos (1996) indicated that "An improvement in the term of trade and/or a structural reform that removes distortions leads to a positive response in total GDP." (p.10).

3.3. Empirical Methodology

In this study, we apply and develop some restrictions for small open-economy with flexibility of price which was utilized in the study of Ahmed and Park (1994) besides employing the aforementioned theoretical framework. Additionally, we also impose other restrictions in order to analyze the impacts of other external shocks as well as internal shocks on macroeconomic stability which are more suitable for Vietnam economy. I utilize some main restrictions. *First*, the external factor, such as term of trade are foreign output are exogenously given to the domestic country in the long run (the assumption for small open economy). *Second*, the restriction is imposed to make sure that the long-run neutrality of money is held. *Finally*, LM shocks (nominal shocks) have no impacts on trade balance in the long-run.

3.3.1. External Factors

In this study, we will investigate the main source of macroeconomic fluctuations in Vietnam under 5 shocks: ε^{tot} is the external shocks for term of trade, ε^{f} is the external shocks for foreign output, ε^{ds} is the domestic supply shocks, ε^{IS} and ε^{LM} are the IS and LM shocks, respectively. Importantly, we assume that Vietnam is small open economy with long-run flexibility of price, thus the foreign output and term of trade are exogenously given. The equation of term of trade and foreign output can be expressed

$$\Delta TOT_t = C_{11}(L)\varepsilon_t^{tot} \qquad (15)$$

$$\Delta y_t^f = C_{21}(L)\varepsilon_t^{tot} + C_{22}(L)\varepsilon_t^f \qquad (16)$$

Where $C_{11}(L)$, $C_{21}(L)$, $C_{22}(L)$ are a finite-order polynomial in the lag operator and ε_t^{tot}, ε_t^f are a white noise.

3.3.2. Domestic Output

The behavior of domestic output is described as follows

$$\Delta y_t^d = C_{31}(L)\varepsilon_t^{tot} + C_{32}(L)\varepsilon_t^f + C_{33}(L)\varepsilon_t^{ds} \qquad (17)$$

Where $C_{31}(L)$, $C_{32}(L)$, $C_{33}(L)$are a finite-order polynomial in the lag operator and the processes ε_t^{tot}, ε_t^f, ε^{ds}, ε^{IS} and ε^{LM} are a white noise. Looking at the equation (17), we can see that the term of trade and external supply shocks directly affect the domestic output. The term of trade shocks are captured by the price of intermediate inputs. An increase in this price has the same impacts as negative technological process. Kose *et al.* (2003) examined the correlation between term of trade and total output by using the small open economy model and the result indicated that there is a positive correlation between them. So, we need to carefully determine the sign of C_{31} .The positive domestic supply shocks probably raise the domestic output in direct and indirect ways due to the substitution effects on the labor input. We might predict that the effect of domestic supply shocks on domestic output is more likely to be positive and persist over time.

3.3.3. Balance of Trade

The following equation reflects behavior of trade balance

$$TB_t = C_{41}(L)\varepsilon_t^{tot} + C_{42}(L)\varepsilon_t^f + C_{43}(L)\varepsilon_t^{ds} + C_{44}(L)\varepsilon_t^{IS} \qquad (18)$$

According to Ahmed and Park (1994), there is not clear presumption about the direction of nominal shocks (LM shocks) on trade pattern, thus we impose the restriction C_{45}=0 for my empirical study. The term of trade shock directly affect the trade balance through export and import but the sign might be ambiguous. The external shocks for foreign output and the domestic supply shocks is likely to be temporary but are expected have positive impacts on trade balance in short-run.

The long-run response of the real exchange rate (RER) in response to the different shocks is represented by following equation

$$RER_t = C_{41}(L)\varepsilon_t^{tot} + C_{42}(L)\varepsilon_t^f + C_{43}(L)\varepsilon_t^{ds} + C_{44}(L)\varepsilon_t^{IS} \qquad (19)$$

Hoffmaister and Roldos (1996) argued that positive supply shocks result in the appreciation of real exchange shock because of a higher demand for non-tradables which leads to a reallocation of labor in non-traded sectors. This supply shocks might be a technological progress in the tradable sector or trade liberalization. The IS shocks is expected to leads to the appreciation of real exchange rate through the mechanism of Mudell-Flemming model for a small opened economy. Furthermore, we also impose a restriction that nominal shocks have no impact on the changes of real trade balance.

3.3.4. Price Level

The inflation is a function of all the five shocks discussed above

$$\Delta P_t = C_{51}(L)\varepsilon_t^{tot} + C_{52}(L)\varepsilon_t^f + C_{53}(L)\varepsilon_t^{ds} + C_{54}(L)\varepsilon_t^{IS} + C_{55}(L)\varepsilon_t^{LM} \qquad (20)$$

We expect that the aggregate supply shocks and term of trade shocks cause price level to fall whereas the price level increase in response to aggregate demand shocks. Thus, the sign of C_{51}, C_{52}, C_{53} is negative and those of C_{54}, C_{55} is positive.

3.4. SVAR Estimation Strategy

3.4.1. SVAR Model

In this section, we will discuss about the empirical methodology. The reduced form of VAR model is expressed as following

$$Y_t = A_0 + \sum_{i=1}^{k} A(i)Y_{t-1} + e_t = A_0 + A_L Y_{t-1} + e_t \quad (21)$$

We assume that Y_t=[tot, y^f, y^d,tb, p] is a covariance stationary process. In the study, A_0 is a (5x1) vector of constant. e_t is (5x1) vector of serially uncorrelated structural disturbances and there exists a (5x5) non-singular matrix $c(0)$ such that $e_t = c(0)\varepsilon_t$ implying that the reduced form residuals are a linear transformation of the structural shocks, where (ε^{tot}, ε^f, ε^{ds}, ε^{IS}, ε^{LM}). ε^{tot} is the external shocks for term of trade, the vector of ε^f is the external shocks for foreign output shocks; ε^{ds} is the internal domestic supply shocks; ε^{IS} and ε^{LM} are the vector of the internal IS shocks and domestic LM shocks or nominal shocks, respectively. A_L is a (5x5) matrix of lag polymonials.

The reduced-form VAR can be written as the moving average expression (VMA (∞)),which trace out the time path of various shocks:

$$Y_t = (I - A_L L)^{-1}A_0 + (I - A_L L)^{-1}e_t = \mu + B_L e_t = \mu + e_t + b(1)e_{t-1} + b(2)e_{t-2+\cdots}$$
$$= \mu + \sum_{i=0}^{t} b(i)\, e_{t-i} \quad (22)$$

where $\mu = (I\text{-}A_L L)^{-1}A_0$, $B_L = (I\text{-}A_L L)^{-1}$ is the (5x5) matrix of lag polynomials where $B_{L.mn} = \sum_{i=0}^{\infty} b_{mn}(i)L^i$. $b(i)$ is a (5x5) matrix of coefficients for i = 0, 1, 2, …, k and $b(0)$ = I.

There exists a (5x5) non-singular matrix $c(0)$ such that $e_t = c(0)\varepsilon_t$ where (ε^{tot}, ε^f, ε^{ds}, ε^{IS}, ε^{LM}).Then (12) can be rearranged as follows:

$$Y_t = \mu + \sum_{i=0}^{\infty} b(i)c(0)\varepsilon_{t-i} = \mu + \sum_{i=0}^{\infty} c(i)\varepsilon_{t-i} \quad (23)$$

The residual in the reduced-form VAR are represented by the structural shocks in model, including external shocks (term of trade shocks, foreign output shocks), domestic supply shocks and domestic demand shocks.

Y can be expressed into internal and external variables and also in structural demand and supply shocks, as follows

$$Y_t = \begin{bmatrix} Y_{1t} \\ \dots \\ Y_{2t} \end{bmatrix} = \begin{bmatrix} \Delta TOT_t \\ \Delta Y_t^f \\ \Delta Y_t^d \\ \Delta TB_t \; or \Delta RER_t \\ \Delta P_t \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_{1t} \\ \dots \\ \varepsilon_{5t} \end{bmatrix} = \begin{bmatrix} \varepsilon^{tot} \\ \varepsilon^{f} \\ \varepsilon^{es} \\ \varepsilon^{IS} \\ \varepsilon^{LM} \end{bmatrix}$$

$$c(i) = b(i)c(0)$$

Equation (22) is the SVAR model in moving average expression, in which Y_t is expressed by a function of history of innovations. The structural innovations are in the central role in the SVAR approach as they are the driving forces behind the stochastic dynamics of the system's variables. The elements of matrix $c(i)$ are impulse response functions.

3.4.2. Identification of SVAR and Specification of Model

From my business cycle analysis, I utilize some main restrictions. First, the external factor, such as term of trade are foreign output are exogenously given to the domestic country in the long run (the assumption for small open economy). Second, the restriction is imposed to make sure that the long-run neutrality of money is held. Finally, LM shocks (nominal shocks) have no impacts on trade balance in the long-run.

Additionally, we will utilize the long-run restrictions approach. Thanh (2007) discussed some main reasons for using this approach. He indicated that model relied on implications of economic theories should impose long-run restrictions. Moreover, he argued that "this approach does not restrict the short-run relationship among the variables in the system and the dynamics of the system are less constrained and determined by the data" (p.19). So, in the study, we also employ the long-run restriction approach.

Third, one of the most important purposes of this study is to examine not only the domestic shocks but also the external disturbances. Hence, based on the ideas of Mudell-Fleming model, we clearly separate types of shocks to identity the main sources of business cycles. Moreover, we also construct a block-exogeneity assumption which reflects the features of a small and open economy. This approach is quite similar to long-run restrictions of Blanchard and Quah (1989) and Thanh (2007). The long-run impact matrix can be expressed in the formula: $Y_t = \mu + C\varepsilon_t$ and the long-run multipliers are $C_{ik} = \sum_{j=0}^{\infty} c_{ik}(j)$. And we have

$$\begin{bmatrix} \Delta TOT_t \\ \Delta Y_t^f \\ \Delta Y_t^d \\ \Delta TB_t \text{ or} \Delta RER_t \\ \Delta P_t \end{bmatrix} = \begin{bmatrix} \mu_1 \\ \mu_2 \\ \mu_3 \\ \mu_4 \\ \mu_5 \end{bmatrix} + \begin{bmatrix} C_{11} & 0 & 0 & 0 & 0 \\ C_{21} & C_{22} & 0 & 0 & 0 \\ C_{31} & C_{32} & C_{33} & 0 & 0 \\ C_{41} & C_{42} & C_{43} & C_{44} & 0 \\ C_{51} & C_{52} & C_{53} & C_{54} & C_{55} \end{bmatrix} x \begin{bmatrix} \varepsilon^{tot} \\ \varepsilon^{f} \\ \varepsilon^{es} \\ \varepsilon^{IS} \\ \varepsilon^{LM} \end{bmatrix}$$

4. Empirical Results

In this study, I investigated the main sources of business cycle in Vietnam following two Structural VAR models. Model 1 is run with five endogenous variables, including (TOT, Y^f, Y, TB, P) and Model 2 explains the impacts on structural shocks on (TOT, Y^f, Y, RER, P). The selection of these variables was based on the theoretical framework as I discussed earlier for a small open economy. The main purpose is to compare the effects of structural shocks on domestic variables for two models and analyze whether the changes of structural shocks' impacts when I run two model are significant or not. If they are different, I attempt to provide some explanations for these changes. Additionally, by substituting the trade balance for real exchange rate, I can examine effects of shocks on a real exchange rate and provide knowledge to policy maker in order to design appropriate policies to limit these effects.

This section depicts the empirical evidence about the impacts of external (term of trade, foreign output) and domestic (supply, IS and LM) shocks on macroeconomic variables (output, real exchange rate and trade balance, prices) for Vietnam, Indonesia and the Philippines. Besides analysis of these effects summarized by the variance composition, I also illustrate the dynamic of adjustment through the impulse response functions.

4.1. Output Fluctuations

4.1.1. Domestic Shocks

In Vietnam, although output growth fluctuations are mainly explained by domestic shocks while external shocks account for a small fraction (around 25% in model 1 and 13% in model 2), the percentage of output fluctuations explained by domestic shocks is quite different in two models. In principle, the domestic supply shocks are most important determinant to explain output's movements. Particularly, in model 1, the supply shocks are the main sources which explain roughly 40% and the IS shocks and LM shocks are 17% and 19% in short-run. However, the former decrease slightly by nearly 20% after 2 years, whereas the latter increase slightly in the long-run. In model 2, the supply shocks continue to play a vital role on explaining the fluctuations of output (approximately 80%) but this figure fall drastically to nearly 50%. In Indonesia and Philippines, the output fluctuations can also be explained by the domestic supply shocks, with nearly 70% and 55% in Model 1 and around 65% and 70% in model 2, respectively. However, these figures tend to witness a decreasing trend over time. The results indicating the important role of supply shocks is similar to many other studies in this aspect, for instance Shapiro and Watson (1988), Gali (1992), Hoffmasiter and Roldos (2001), Hoffmaister and Roldos (1996), To Thanh (2007) and others. According to the impulse response figure, supply shocks drive up output at a far higher magnitude than any other kind of shocks in both short-term and long-term in three countries. Clearly, the government of these countries should employ the supply side to push up the economy further.

Additionally, the IS and nominal shocks explain insignificantly the changes of outputs but we should pay attention to these shock because it tends to increase in the long-run. In detail, the variance decomposition table for the two models indicate that impacts of IS and LM shocks enlarge substantially over two years in Vietnam. The increasing trend of these shocks in the next periods reflects that Vietnam economy should carefully focus on fiscal and monetary policies to reach the stable state in the future. This is shown more clearly when we look at the impulse response figure in Vietnam. These two kinds of shocks lead to fluctuations of output. Hence, these policies should be implemented strictly and flexibly to control these fluctuations. The results also illustrate that Philippines should concentrate on fiscal policy to limit the variations of output because IS shocks seemly lead to a decrease in output in the long-run while they account for relatively high proportion (around 30%) of output's fluctuations in the short-run and this figure remain stable in the long-run. In Indonesia, these shocks play a small role and the output seems to not respond to them.

4.1.2. External Shocks

In Vietnam, term of trade shocks represent a trivially increasing trend over time in model 1 while output's changes are mainly explained by external supply shocks in model 2. Specifically, term of trade shocks account for roughly 15% in short-run and gradually increase in the long-run in model 1. In contrast, although explained a small part in the short term, the figure for foreign output shocks experience an upward trend in model 2. Focusing on the impulse response functions, the results indicates that the domestic output generally increases with respect to term of trade shocks, whereas the response to foreign output seems to decrease in the long run. There are several possible reasons to explain for this fact. Vietnam apply export-led growth model that Vietnam's overall exports of goods grew nearly 20% in 2012. But the largest and fastest growing segments have mainly focused on relatively labor-intensive, low-value-added manufactured products, such as textile, footwear and others which account for one-third of Vietnamese exports. Indeed, Vietnam exports the low end of the value-added than other countries in the same regions. Therefore, Vietnam still experiences a growth of exports even in the context of financial crisis. Notwithstanding, the external shocks just play a small role on explaining the fluctuations of output as the decomposition tables represent.

The external supply shocks mostly explain for the fluctuations of output but this impact decrease trivially in the long-term in Indonesia, whereas the term of trade shocks play an important role but only in the long-run in Philippines. Particularly, the external supply shocks make up for nearly 20% in model 1 and 12% in model 2 and these numbers decrease to roughly 15% and 10% in the long-run in Indonesia. What's more, these shocks lead to

narrowing trend of output. The reason is that export and imports have declining shares of GDP because the commodity boom, the real contraction in manufacturing export. Indonesia successfully started to diversity its export toward manufacturing export which the majority exports stem from manufacturing performance improvements not from production volume. Moreover, according to IMF estimation, China that the main partner of Indonesia could lower Indonesia's growth through commodity prices as well as increase in production and export volume, especially on-oil and gas commodities namely coal, palm oil and rubber. In Philippines, the output tends to decline in the long-run with respect to the term of trade shocks but term of trade shock only make up for small proportion of variation. The Philippines economy has weathered global economy due to lower dependence on exports, relatively resilient from domestic consumption and a rapidly expanding business process outsourcing industry.

In brief, domestic shocks mainly explain for output's fluctuations in which domestic supply shocks are the most important disturbances in explaining in both short-run and long-run. These supply shocks lead to output expansion in three countries. IS and LM shocks have trivially increasing impacts on output in Vietnam and IS shocks play a vital role in explain the variation of output in Philippines. The impacts of external shocks vary across three countries. The outputs only response to term of trade shocks in long-run in Philippines, while the variations of output in Indonesia could be explained by external supply shocks.

4.2. Trade Balance

The variance decomposition tables represent the result similar to what I expect in the theoretical framework session. The fluctuations of trade balance are mostly due to external shocks, especially term of trade shocks in Vietnam.

4.2.1. Domestic Shocks

Amongst the domestic shocks, IS shocks play an important role in explaining the fluctuations of trade balance in three countries. IS shocks account for more than 25%, 40% and 50% in Vietnam, Indonesia and Philippines, respectively in the short-run and this figure tend to diminish slightly in the long-run except for a significant increase in Philippines. This result is consistent to the research of Hoffmaister and Roldos (1996) which fiscal policies explain over 70% of the movement in short-run for Asian countries roughly 55% for Latin America or the research of To Thanh (2007) for ASEAN countries. In general, the magnitude of IS shocks in Vietnam is lower than these countries and these shocks are largest in Philippines. Impulse response function also indicates that the IS shocks lead to an expansion of trade balance in the long-term. The role of fiscal policy is so important to control the issues of trade balance. Depending on the targets for trade balance, policy makers can mainly concentrate on fiscal policy and design appropriate policies to achieve these goals.

Moreover, although supply shocks account a modest part in the first period, this impact gradually improves over time in Vietnam. If we observe changes in the long-run, we can see that the role of supply shocks cannot be taken for granted. In Indonesia, we can see that the supply shocks are an important determinants besides the IS shocks. Theoretically, the change in trade balance is capture by its elasticity with respect to the real exchange rate and to output level. As the Muldell-Fleming model argued, the positive supply shocks lead to an expansion of output which enhances the demand for imports. What's more, these shocks also have positive impacts on export through a depreciation of real exchange rate. Previously, we indicated the impacts of supply shocks which cause output to expanse, thus then results in an expansion of trade balance. So, the effects of supply shocks are undeniable through theoretical framework as well as the empirical evidence in Vietnam and Indonesia. In Philippines, the impacts of supply shocks are only relatively significant in the short-run.

In conclusion, the IS shocks play a vital role in both short-run and long-run and the magnitude of shocks in Philippines are the largest. The trade balance experiences an expansion response to the IS shocks. Furthermore, we also pay attention to the role of supply shocks, especially in long-run for Vietnam.

4.2.2. External Shocks

The external shocks account for roughly 65%, 15% and 16% in Vietnam, Indonesia and Philippines of the variance of the trade balance, with the term of trade shocks that explain the bulk of the movements and external supply shocks explaining for around 20% in Vietnam but not too much significant in Indonesia and Philippines in the short-run as well as in the long-run. Amongst three countries, the magnitude of term of trade shocks in Vietnam is the largest and decrease negligibly in the long-run. Indonesia and Philippines make up for the relatively similar percent but these figures in Philippines tent to diminish over time. Theoretically, we know that term of trade have positive impacts on trade balance. An increase in term of trade causes a country to earn more for its exports and pay less for its imports. Particularly, according to impulse response figure, in Vietnam, term of trade shocks lead to an expansion of trade balance within 1 year, but this expansion suddenly stops and starts decreasing after that. The possible explanation is that Vietnam has a high demand for intermediate input due to lack of supporting industries and the export structure. Vietnam's exports mostly processed products and raw material. In 2012, the proportional of total exports for raw materials are so big (crude oil, ores and minerals reach $9.65 billion, account for 8.4%) and unprocessed or semi-processed agriculture and forestry, fishery products have a high proportion (about $27 billion, accounting for 23.6%). Thus, in the long-run, the impacts of this shock will gradually decrease. In contrast, this kind of shocks causes trade balance in Philippines and Indonesia to increase in both short-run and long-run. These evidences are consistent to actual fact because both two countries started to diversity its export toward manufacturing export which the majority exports stem from manufacturing performance improvements. Furthermore, the Philippines now ranks as one of the most promising newly-industrialized industry, which its export moves away from low-added values, agriculture products to electronics and other goods.

External supply shocks explain a small share (nearly 20% in Vietnam) of the movement of trade balance in both short-run and long-run. The important role of external shocks is consistent to the result in research of Hoffmaister

and Roldos (1996) for Asian and Latin America. External supply shocks lead to expansion in Vietnam as indicated by the impulse response figures.

In brief, the fluctuations of trade balance are mostly due to external shocks, especially term of trade shocks in Vietnam. The magnitude of term of trade shocks in Vietnam is largest, compared to Philippines and Indonesia. For domestic shocks, IS shocks mainly explain the variances of trade balance but we also pay attention to domestic supply shocks which are examined by the theory as well as evidences in Vietnam and Indonesia.

4.3. Real Exchange Rate

4.3.1. Domestic Shocks

As widely acknowledge, the negative IS shocks can result in a transitory output deterioration and a real exchange rate depreciation and LM shocks also lead to some change in real exchange rate in the short-run. The variance decomposition table illustrates the main sources of real exchange rate's fluctuations relatively vary across three countries. The real exchange rate variances in Vietnam are mostly determined by the domestic shocks. The domestic shocks account for approximately 85% of its fluctuations in which IS shocks explain a large share of movements, whereas the external shocks explain roughly 15%. Specifically, IS shocks are the most important determinant of real exchange rate in both short-term and long-term. The sources of real exchange rate's movements are consistent to the results in Asian and Latin America suggested by Hoffmaister and Roldos (1996). In Indonesia, changes of real exchange can be explained by both three shocks in which the nominal shocks account for the largest part and the proportion of supply and IS shocks are relatively equal. The supply shocks and IS shocks are the most important driving force of real exchange rate's movement in both short-run and long-run in Philippines.

Looking at the impulse response functions, IS shocks lead to a remarkable increase of real exchange rate. Although nominal shocks explain a large share of real exchange rate's fluctuations in Indonesia, the accumulated response implies that LM shocks causing real exchange rate to appreciate only have impacts in short-run. The supply and IS shocks in the Philippines indicate same trends. Both shocks lead to appreciation of exchange rate in both long-run and short-run.

4.3.2. External Shocks

External supply shocks mainly explain the movement of real exchange rate in Vietnam. The proportion of these shocks remains unchanged over time. External supply shocks result in an appreciation of real exchange rate at a higher magnitude over time. In contrast to Vietnam, the movement of real exchange rate in Philippines and Indonesia are mainly driven by term of trade shocks (approximately 10%). The dynamic response to term of trade shocks in Indonesia, however, leads to appreciation of exchange rate, whereas those in Philippines are depreciated over time.

In brief, the fluctuations of real exchange rate are mainly driven by the domestic shocks but internal causes of each country are different. In Vietnam, IS shocks or fiscal policy are the main determinant, thus Vietnamese policy makers should design the appropriate fiscal policies in order to reach the stability of exchange rate.

4.4. Price Fluctuations

4.4.1. Domestic Shocks

The variance decomposition table for model 1 represents that in the short-run, domestic shocks account for over 85% of price's movement in which LM shocks explain a bulk of fluctuations in three countries. However, the share of nominal shocks decline dramatically by nearly a half after two years. Conversely, although explaining a small share in the first period, those of supply and IS shocks rocket up noticeably in the long-run, especially IS shocks in Vietnam with an increase from roughly 3% to 16% and supply shocks in Indonesia (from 16% to 37%) and the Philippines (from 13% to 26%). In the long-run, the price fluctuations can be explained by two kinds of domestic shocks in Vietnam.

For the Model 2, IS shocks are the main determinant of the variances of price in both short-run and long-run in Vietnam. There are opposite trends for other shocks. Supply shocks account for nearly 12% in the first period but this share remain stable over 2-year period, whereas there is a dramatic increase of LM shock's proportion overtime. In general, the domestic policies play a crucial role in controlling the movement of price but this finding implies that Vietnam should concentrate on fiscal and monetary in the long-run to obtain the stable inflation. The results also emphasize that the government of Indonesia and Philippines should design stabilization policies to limit impacts of nominal shocks.

More interestingly, the dynamic impulse response to nominal shocks for the two models represents the same fact in three countries. The favorable nominal shocks lead to the increase of price and this trend seemly expand in the long-term. In contrast, the IS shocks cause price to decrease at a high magnitude overtime in Vietnam. The response of price to supply shocks increases in price in short-run, but decreases in the long-run. It is so important for policy maker in order to design policies to stabilize the price level in the long-run. Supply shocks in Indonesia and Philippines behave in different ways. The supply shocks result in an increase in price in Indonesia, as oppose to a decrease of price in the Philippines.

4.4.2. External Shocks

Both models represent that external shocks play a very small role in the short-run. However, these proportions, especially term of trade shocks improve significantly in the long-run in model 1 of Vietnam. The external supply shocks continue to explain significantly in the model 2 of Vietnam. The dynamic response to two kinds of external shocks illustrates the same trends. In a predicted manner, the reduction of price appears with respect to positive term of trade shocks and external supply shocks. The trend is quite stable for term of trade shocks in model 2. In Philippines and Indonesia, the impacts of external shocks made up for very small proportion in explaining the fluctuations of price.

In brief, the impacts of external shocks on price fluctuations are not significant. Basing on the results from two models, the most two important sources of price's movements in Vietnam are fiscal and nominal shocks, whereas supply and nominal shocks mainly explain for these changes of price in Indonesia and the Philippines. In order to dampen the prolonged inflation rates, Vietnam should concentrate on the domestic shocks, especially demand side-nominal and fiscal shocks.

5. Conclusions

The study empirically examined the sources of movements in domestic variables, including output, trade balance and real exchange rate, and price under the effects of external (term of trade and foreign output) and domestic (supply, IS and nominal) shocks in Vietnam, Philippines and Indonesia. This paper adopted the SVAR models with long-run restrictions, suggested by Shapiro and Watson (1988) Blanchard and Quah (1989) and many other studies in the same aspect. By developing the spirit of Gali (1992) about the stochastic Mundell- Fleming model and ideas about a small open economy of Ahmed and Park (1994) and Hoffmaister and Roldos (1996), we imposed some long-run restrictions, which are consistent with characteristics of business cycle in developing countries such as Vietnam, Indonesia and the Philippines. We also attempted to make some comparisons in term of the size and trend of shocks on domestic variables between Vietnam and developing countries in other papers. The data covered from 1996 to 2013. In order to obtain the results, we investigated the main sources of business cycle in Vietnam following two Structural VAR models. This study indicated some interesting and useful facts of the business cycle in Vietnam.

The main findings in Vietnam are described as below. *Firstly*, output growth fluctuations are mainly explained by domestic shocks while external shocks account for a small fraction. The percentage of output fluctuations explained by domestic shocks is a bit different in two models. In general, output's movements are mainly explained by domestic supply shocks in the short-run. We witness a fall in the impacts of supply shocks on output in the long-run. We should pay attention to fiscal and nominal shock because it tends to increase in the long-run. IS and LM shocks have trivially increasing impacts on output in Vietnam. Furthermore, the impulse response functions illustrate that the domestic supply shocks lead to an expansion of the real output in the two models but in the model 2, the real output has become more fluctuated than in model 1. The domestic output generally increases with respect to term of trade shocks, whereas the response to foreign output tends to decrease in the long-run, but the external shocks only play a small role in explaining the fluctuations of output. *Secondly*, the fluctuations of trade balance are mostly due to external shocks, especially term of trade shocks in the short-run. Term of trade shocks lead to an expansion of trade balance within one year, but this expansion suddenly stops and starts decreasing after that. The IS shocks play an important role on explaining the fluctuations of trade balance. What's more, although the supply shocks account for a modest part in the first period, this impact gradually improve over time. It implies that we cannot take supply shocks for granted. *Thirdly*, the IS shocks are the most important determinant of real exchange rate in both short-term and long-term. Besides domestic shocks, the external supply shocks have a relatively large impact on real exchange rate. *Fourthly*, the movements of inflation in Vietnam are mainly determined by domestic shocks. The domestic policies play a crucial role in controlling the movement of price but this finding implies that Vietnam should concentrate on fiscal and monetary policies (demand side) in the long-run to obtain the stable inflation.

5.1. Policy Implications

Firstly, in order to maintain the stability and raise the level of output, policy makers should propose some policies reflecting the change in supply. These policies may reflect the changes of labor market, the improvement of technology, changes in legal and regulatory systems such as a public sector restructures, privatization, infrastructure improvement, tax reforms, removal of trades and capital controls and so on. Particularly, Vietnam has currently pursed an investment-led growth model in which economy is growing quantitatively, based mainly on continuous increase in inputs. However, the effectiveness of using resources is still low, which lead to the inefficiency of economy. Hence, Vietnam should restructure the economy, change from out of date model to the modern one for economic development. That means Vietnam concentrate on improving technology, infrastructures, learning experience of industrialized countries and then applying to Vietnam, and so on. They step by step transform a model- growth based on inputs, resource into a model- growth relied on modern technology, capital. Furthermore, becoming an official member of WTO brought Vietnam opportunities, expectations as well risks in the future relating to the low level of national competitiveness and enterprise competitiveness.

Secondly, the fiscal policies play a critical role in controlling the fluctuations of trade balance, real exchange rates, prices, specifically in long-term. The role of IS shocks such as government spending, shocks to public preferences, shifts in domestic fiscal policies and others is undeniable in Vietnam. In the long-run, Vietnam should concentrate on improving the effectiveness of fiscal policies, avoiding the wasteful loss, corruption in the implementation process. Tight fiscal policies are also an effective way to limit the fluctuations of domestic macroeconomic variables in Vietnam.

Thirdly, LM (nominal) shocks such as money supply change by monetary authorities, appreciation or depreciation of domestic currency or financial innovation are determinants of the variances of output, real exchange rate and price and are not effective in improving the trade balance and real exchange rate. In order to achieve the goal of controlling trade deficit, Vietnam should focus on other policies rather than nominal shocks. The theory representing the relationship between net export and nominal shocks might not be effectively applied in the case of Vietnam. Instead, fiscal policies will be a better choice to control the movement of trade balance and other problems.

Fourthly, inflation has currently become a sensitive problem not only in Vietnam but also other countries. The results suggest that controlling inflation in Vietnam should mainly focus on the effective fiscal policies and monetary policies. Policies relating to demand side or LM shocks might effectively deal with the issues of inflation. Additionally, we can see that the external factors share a small part in explaining the movement of inflation. Hence, Vietnam can concentrate on domestic tools to obtain their goals.

References

Ahmed, S. and P.N. Lougani, 1998. Business cycle in Asia. Working Paper, Board of Governor of Federal Reserve System, 6.

Ahmed, S. and P.N. Lougani, 2000. Business cycle in ermerging market economies. Money Affair, 8(1): 87-111.

Ahmed, S. and R. Murthy, 1994. Money, output, and real business cycles in a small open economy. The Canadian Journal of Economics, 27(4): 982-993.

Ahmed, S. and J.H. Park, 1994. Sources of macroeconomic fluctuations in a small open economy. Journal of Macroeconomics, 16(1): 1-36.

Blanchard, O.J. and D. Quah, 1989. The dynamic effects of aggregate demand and supply disturbances. The American Economic Review, 79(4): 665-673.

Clarida, R. and J. Gali, 1994. Source of real exchange rate fluctuations: How important are nominal shocks. Carnegle-Rochester Conference Series on Public Policy, 41(1): 1-56.

Gali, J., 1992. How well does the IS-LM model fit postwar U.S data?. The Quarterly Journal of Economics, 107(2): 709-738.

Hoffmaister, A.W. and J.E. Roldos, 1996. Are business cycles different in Asia and Latin America (IMF Working Paper No. WP/97/9). Mexico City, Mexico. Available from http://www.imf.org/external/pubs/ft/wp/wp9709.pdf [Accessed January, 1997].

Hoffmasiter, A.W. and J.E. Roldos, 2001. The sources of macroeconomic fluctuations in developing countries: Brazil and Korea. Journal of Macroeconomics, 23(1): 11-30.

Kose, M.A., E. Prasad and M.E. Terrones, 2003. How does globalization affect the synchronization of business cycles. American Economic Review, 93(2): 57-62.

Kydland, F.E. and E.C. Prescott, 1982. Time to build and aggregate fluctuations. Econometrica, 20(6): 1345-1370.

Long, J. and C. Plosser, 1983. Real business cycle. Journal of Political Economy, 91(1): 39-69.

Lucas, R.E., 1977. Understanding of business cycles. Journal of Monetary Economics, 5(1): 7-29.

McCalumn, 1994. Monetary policy rules and financical stability, NBER Working Paper No. 4692. National Bureau of Economic Research.

Mendoza, E.G., 1991. Real business cycles in a small open economy. The American Economic Review, 81(4): 797-818.

Shapiro, M. and M. Watson, 1988. Sources of business cycle fluctuations. NBER Macroeconomics Annual, 3(1): 111-156.

Siregar, H. and B.D. Ward, 2001. Sources of fluctuations in the Indonesia macroeconomy: An application of simple structural VAR model. Singapore Economic Review, 45(1): 73-98.

Thanh, T.T., 2007. Determinants of business cycle synchronization in ASEAN-5. SERC Conference Publication Singapore Economic Review.

Appendix-A. Statistical Properties of Data

Table-A1. Unit Root Test

Variables	ADF Unit Root Test				KPSS Test	
	Level		Difference		Level	Difference
	k	t-statistic	k	t-statistic	t-statistic	t-statistic
Vietnam						
TOT	0	-2.507			0.109**	
Yf	0	-1.149	0	-8.717**	0.231	0.224**
Y	4	-1.723	3	-2.712*	0.142*	0.358*
TB	0	-4.287**			0.133**	
RER	1	-0.989	0	-6.284**	0.322	0.445*
P	5	-0.789	0	-4.492**	0.277	0.584*
Indonesia						
TOT	0	-0.923	0	-9.009**	0.935	0.106**
Yf	0	-1.428	0	-7.155**	0.613	0.078**
Y	0	-2.699	7	-2.837*	0.226	0.642*
TB	0	-2.157	0	-8.121**	0.803	0.388**
RER	0	-2.661	0	-6.348**	0.725	0.12**
P	0	-3.227*	0	-3.795**	1.042	0.362**
Philippines						
TOT	0	-2.887	0	-11.607**	0.580	0.372**
Yf	1	-1.956	0	-14.106**	0.267**	0.168**
Y	0	-2.867	0	-9.388**	0.157	0.196**
TB	0	-5.931**			0.149**	
RER	1	-2.172	0	-5.886**	0.283	0.414*
P	1	-2.714	0	-5.778**	0.072**	

Note: k is the lag length in ADF test which utilize Schwartz Bayesian Criterion (SBC). TOT is term of trade, Yf and Y are foreign and domestic output, respectively; TB is the ratio of net export to domestic output; RER is real exchange rate. All variables except for trade balance are in logarithm form. The model used in the test includes intercept. (*), (**) represent the statistically significant at 5% and 1% level.

Appendix-B. Estimation Results

Table-B1. Variance Decomposition of DY to Different Structural Shocks-Model 1

Model 1						
Period	**S.E.**	**TOT shocks**	**External supply shock**	**Supply shock**	**IS shock**	**LM shock**
Vietnam						
1	0.104749	15.43357	5.883302	41.65114	17.32896	19.70303
5	0.132371	18.64764	4.588903	34.29532	18.53601	23.93213
10	0.161461	19.01917	6.732703	26.39958	23.19217	24.65638
20	0.186624	20.20232	5.902749	23.75745	23.12894	27.00854
Indonesia						
1	0.021661	2.600309	19.11047	68.61809	6.222064	3.449066
5	0.025190	5.018192	15.53978	66.26832	7.719778	5.453925
						Continue

10	0.025191	5.018258	15.53973	66.26779	7.719734	5.454486
20	0.025191	5.018258	15.53973	66.26780	7.719733	5.454486
Philippines						
1	0.048873	3.264954	7.324838	54.03172	35.37717	0.001316
5	0.055566	10.07347	6.402956	48.43853	34.38355	0.701494
10	0.055912	10.02160	6.810396	48.01595	34.33595	0.816101
20	0.055917	10.02045	6.812478	48.01184	34.33745	0.817778

Table-B2. Variance Decomposition of DY to Different Structural Shocks-Model 2

Model 2						
Period	**S.E.**	**TOT shocks**	**External supply shock**	**Supply shock**	**IS shock**	**LM shock**
Vietnam						
1	0.125007	1.128674	0.966233	78.54021	6.339671	13.02521
5	0.179715	1.549277	10.06858	57.80404	11.54356	19.03455
10	0.211625	2.217165	12.24324	52.09896	12.14603	21.29460
20	0.240890	1.999871	12.56062	50.68082	11.38090	23.37778
Indonesia						
1	0.019405	0.498395	12.43726	65.93715	18.33312	2.794074
5	0.025001	2.992983	9.560449	57.43691	14.88876	15.12091
10	0.025197	3.015535	9.545461	57.28905	14.72872	15.42123
20	0.025201	3.016056	9.545080	57.28737	14.72587	15.42563
Philippines						
1	0.045038	0.111249	0.002206	70.80594	26.96525	2.115360
5	0.053741	16.80068	0.583399	50.07766	30.11340	2.424856
10	0.053744	16.79924	0.592402	50.07259	30.11078	2.424986
20	0.053744	16.79924	0.592411	50.07258	30.11078	2.424986

Table-B3. Variance Decomposition of TB to Different Structural Shocks-Model 1

Model 1						
Period	**S.E.**	**TOT shocks**	**External supply shock**	**Supply shock**	**IS shock**	**LM shock**
Vietnam						
1	0.070991	46.59476	21.60463	2.530645	25.66785	3.602119
5	0.094356	35.15379	23.49710	12.08301	22.55887	6.707230
10	0.103226	37.07373	23.53327	11.96863	21.05580	6.368562
20	0.107391	37.77742	22.37972	13.18307	19.95869	6.701101
Indonesia						
1	0.027415	13.67684	0.752873	31.31353	44.28228	9.974473
5	0.028668	14.28494	1.406631	29.71269	40.64398	13.95176
10	0.028673	14.28532	1.407901	29.72631	40.63146	13.94901
20	0.028673	14.28532	1.407901	29.72631	40.63146	13.94901
Philippines						
1	0.043780	15.90181	1.235312	18.38130	49.77882	14.70277
5	0.058384	10.53192	0.894100	12.99771	60.85288	14.72339
10	0.059447	10.32563	0.965367	13.34768	60.45623	14.90510
20	0.059466	10.32089	0.968045	13.35047	60.45552	14.90507

Table-B4. Variance Decomposition of RER to Different Structural Shocks-Model 2

Model 1						
Period	**S.E.**	**TOT shocks**	**External supply shock**	**Supply shock**	**IS shock**	**LM shock**
Vietnam						
1	0.024090	3.358150	11.53165	4.404060	74.56602	6.140126
5	0.025337	3.384267	11.73351	4.067711	74.05653	6.757981
10	0.025347	3.424356	11.72762	4.065953	74.00159	6.780483
20	0.025350	3.444421	11.72518	4.065108	73.98619	6.779090
Indonesia						
1	0.109427	9.998815	3.488800	22.46976	24.05687	39.98576
5	0.126525	7.853461	3.737768	25.85561	22.66973	39.88343
10	0.127280	7.814666	3.749512	26.19052	22.63556	39.60975
20	0.127293	7.813875	3.749615	26.19535	22.63555	39.60561
Philippines						
1	0.039945	11.36859	4.732956	36.97155	46.72122	0.205684
5	0.045135	9.619058	6.467142	29.03627	54.45476	0.422771
10	0.045135	9.619052	6.467487	29.03610	54.45450	0.422858
20	0.045135	9.619052	6.467488	29.03610	54.45450	0.422858

Table-B5. Variance Decomposition of D_P to Different Structural Shocks-Model 1

Model 1						
Period	**S.E.**	**TOT shocks**	**External supply shock**	**Supply shock**	**IS shock**	**LM shock**
Vietnam						
1	0.012276	0.989840	12.03350	2.436868	3.670719	80.86907
5	0.022578	16.57978	27.74028	2.912921	16.01555	36.75147
10	0.024288	16.22104	25.70629	9.946381	15.87603	32.25026
20	0.025438	18.05540	24.86880	10.21539	16.40113	30.45929
Indonesia						
1	0.028424	7.123547	13.94734	16.66708	0.153550	62.10849
5	0.038800	7.127889	12.72402	36.99595	0.474995	42.67715
10	0.038828	7.143556	12.71125	37.04575	0.479893	42.61956
20	0.038828	7.143556	12.71125	37.04575	0.479893	42.61956
Philippines						
1	0.008076	10.79405	1.214785	13.03660	5.983466	68.97109
5	0.009875	13.62509	2.503921	26.11249	9.249280	48.50923
10	0.009928	13.54067	2.530870	25.96242	9.803112	48.16292
20	0.009929	13.53847	2.531820	25.96069	9.812208	48.15681

Table-B6. Variance Decomposition of D_P to Different Structural Shocks-Model 2

Model 2						
Period	**S.E.**	**TOT shocks**	**External supply shock**	**Supply shock**	**IS shock**	**LM shock**
Vietnam						
1	0.015072	3.343935	18.54039	12.99761	61.96704	3.151022
5	0.022609	2.238254	21.47009	10.70953	45.39163	20.19049
10	0.023178	2.285396	21.87421	11.67186	44.75266	19.41587
20	0.023423	2.368945	21.60510	12.35010	44.44678	19.22907
Indonesia						
1	0.026018	4.446995	5.362710	2.282927	12.67179	75.23558
5	0.038432	4.198649	7.635068	26.53634	8.252513	53.37743
10	0.038811	4.176565	7.648194	26.63012	8.245378	53.29974
20	0.038819	4.176280	7.648588	26.63386	8.244460	53.29681
Philippines						
1	0.008743	0.705432	0.767483	8.171775	2.302300	88.05301
5	0.009498	1.550477	0.878675	12.72542	2.836938	82.00849
10	0.009499	1.550456	0.879027	12.72562	2.838680	82.00622

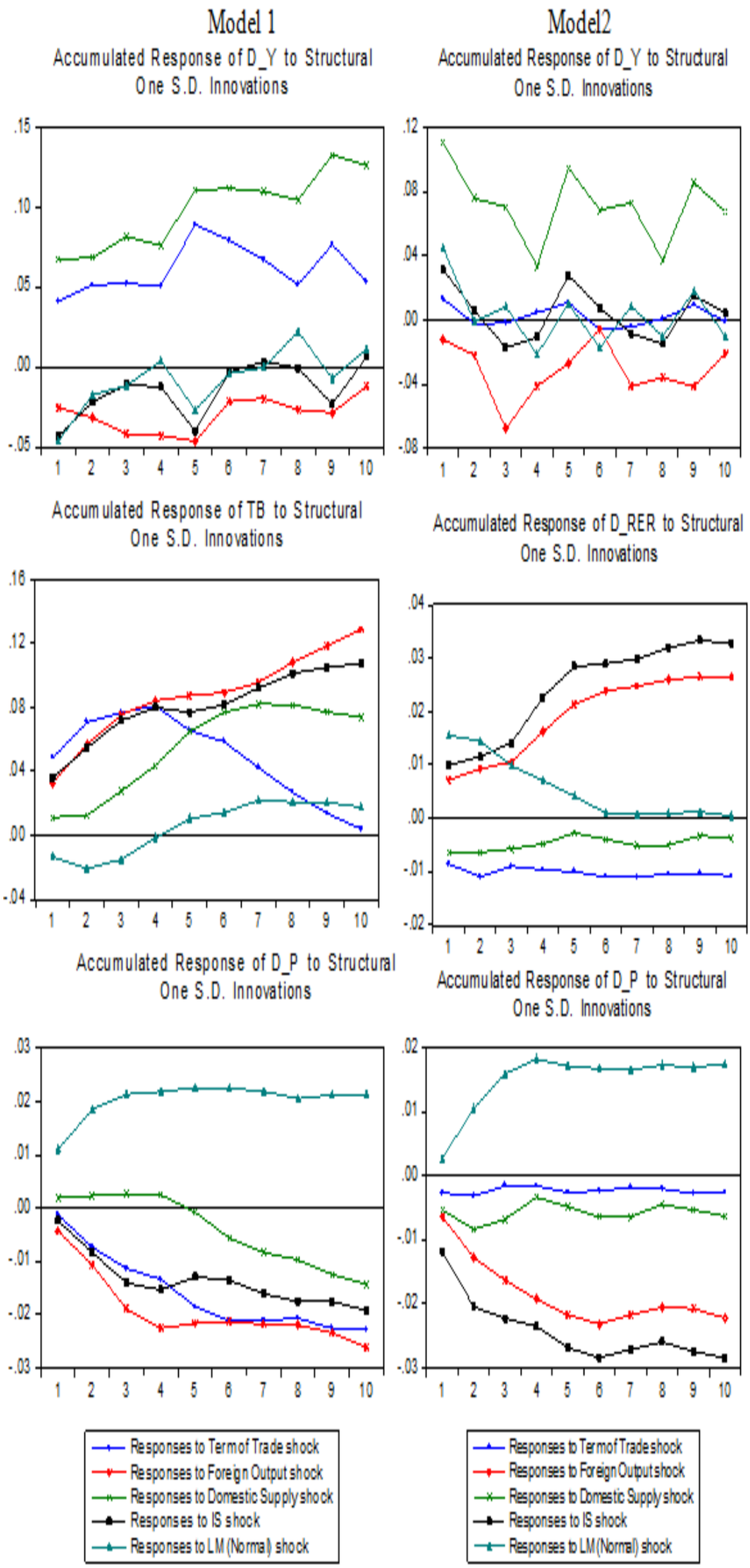

Figure-1. Impulse Response of Domestic Variables: Vietnam

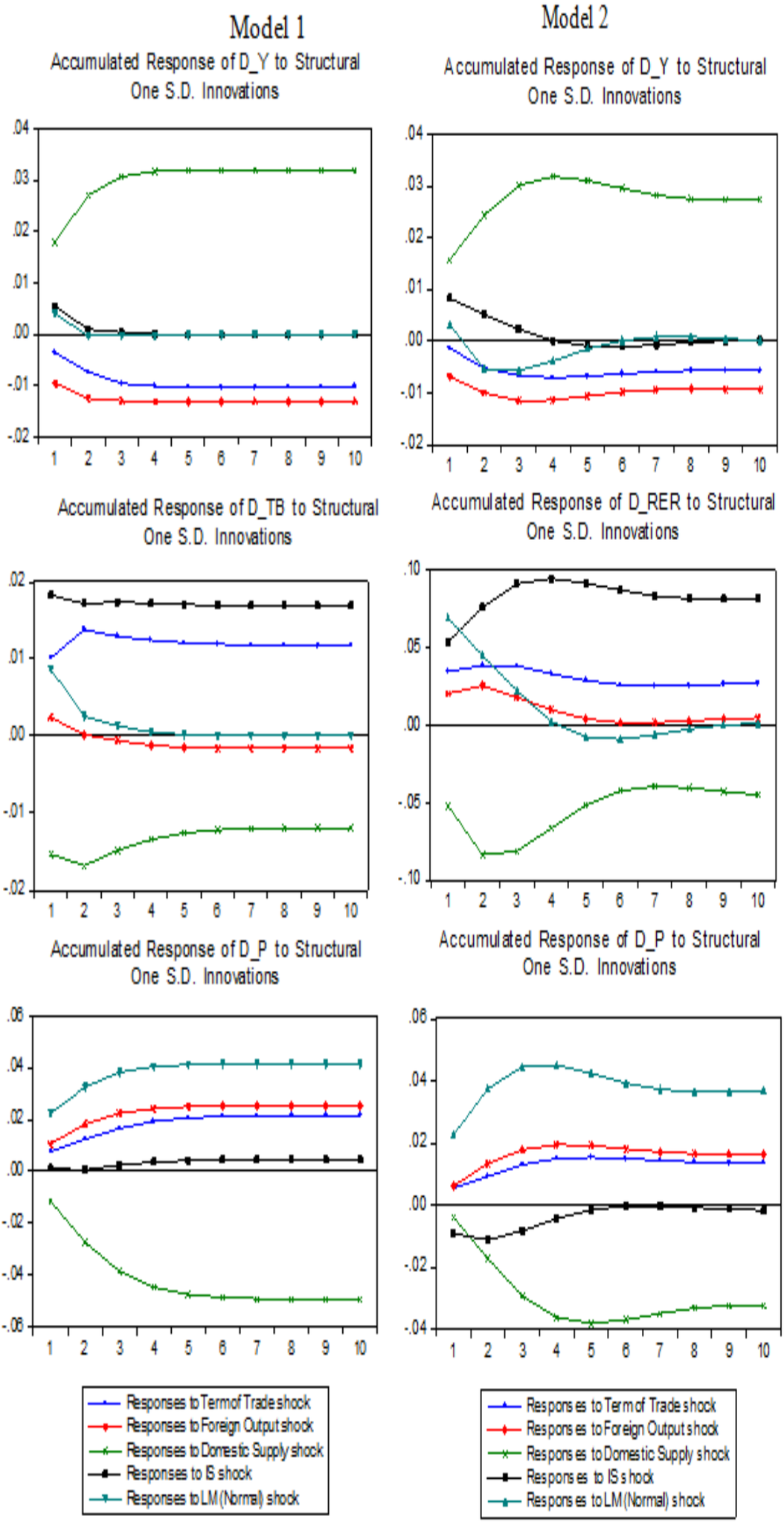

Figure-2. Impulse Response of Domestic Variables: Indonesia

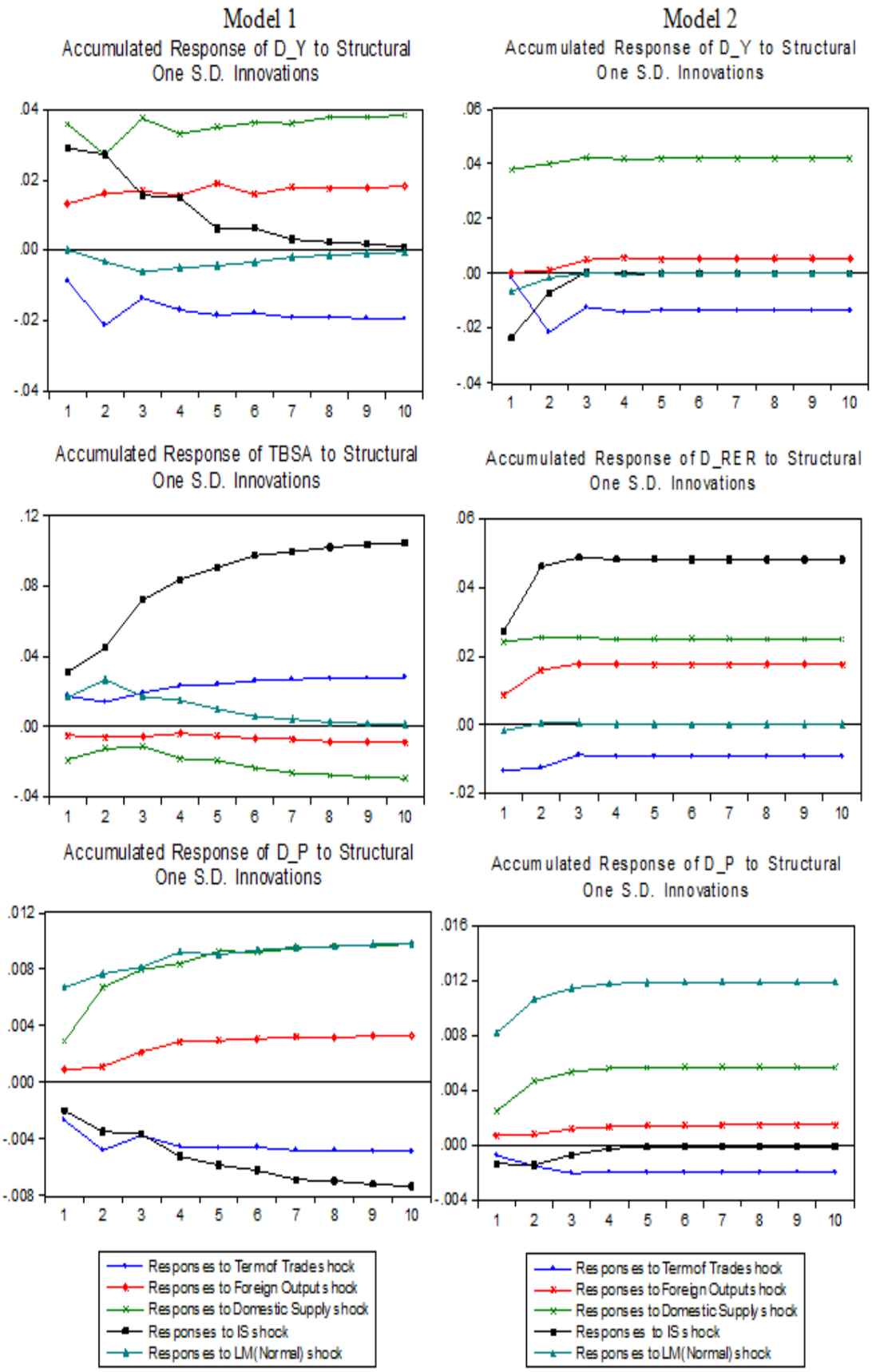

Figure-3. Impulse Response of Domestic Variables: Philippines