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RESEARCH ARTICLE

Measuring Fiscal and Monetary Policies Spillovers in ASEAN

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Abstract: This paper aims to comprehensively examine fiscal and monetary policies spillovers to real GDP and inflation in ASEAN-5 countries. We examine the effects of shocks from each of the ASEAN members and advanced economies by employing the global vector autoregression (GVAR) model because it allows us to investigate this issue in a multinational system. The empirical results show several important findings. Generally, both internal and external fiscal and monetary spillovers have a significant effect on all ASEAN-5 countries, although internal monetary spillover seems to be stronger than internal fiscal spillovers. At country level, out of the five ASEAN countries, Indonesia's variables of interest are less affected by external policy shocks. Regarding fiscal spillovers, expansionary fiscal shocks cause a significant increase in real GDP of ASEAN-5 countries. Particularity, fiscal spillovers from other East Asia countries (in particular, China) to ASEAN-5 countries have a much stronger effect than those from the advanced countries. Regarding monetary spillover, the effects of monetary spillover from advanced economies (especially, the U.S. and European countries) are much larger than those of the East Asia countries. However, the effects of monetary spillovers on ASEAN countries' real GDP and inflation are ambiguous, and we found negative impacts of internal and external monetary spillovers (from some ASEAN countries, China, and advanced economies) on ASEAN-5's real GDP. The inverse impacts of policy spillovers implicate the need for policy coordination at both regional and global levels.

***Keywords*:** Fiscal and Monetary Policies Spillovers, Policy Coordination, ASEAN, Global VAR.

JEL Classifications: C32, E52, E61, R62, F15

After the Asian financial crisis in 1997, economic integration in Association of South East Asian Nations (ASEAN) has been continuously enhanced within the association as well as with the rest of the world, such as ASEAN+3 and ASEAN+6. Additionally, ASEAN countries (as a part of East Asia region) have also become one of the three hubs in the global value chains. This indicates that ASEAN economies are activating in an increasingly globalized world with the presence of deepening regional economic integration. As results, the member states economy becomes more vulnerable to external spillovers from global, regional, and intra-

regional sources which possibly can be transmitted to member countries' economy through various channels. In this milieu, there is a rising concern about internal (i.e., from any ASEAN country) as well as external (i.e., the rest of the world) policy spillovers to ASEAN member economy, as fiscal and monetary policies adopted in any country in the world can possibly affect ASEAN countries' economy.

The effects of policy spillovers could be even more amplified in time of crisis, as many countries introduce applicable fiscal and monetary policies to stabilize their economy. However, without inter-governmental coordination in policy making, the policy responses might vary from country to country, which, in turn, may cause inverse impact on others economies. Especially for the case of ASEAN, from experience of the recent the global financial crisis in 2008, many ASEAN countries and other countries in East Asia introduced expansionary monetary policy and fiscal policies in response to the crisis to stabilize their economy (i.e., stabilize the price and its real GDP). However, the policy responses were different across ASEAN countries. These differences may cause an inverse impact on ASEAN members countries since there are tightly integrated with each other as well as with the rest of the world. According to existing literature, small and open economies (like most of ASEAN countries) are noticeably dependent on the policy induced by large countries (regional neighbors and other developed countries) and have only limited degrees of freedom in following an independent path (see Capannelli & Houser , 2009; Auerbach & Gorodnichenko, 2013).

Hence, it is critical to obtain information relating to monetary and fiscal policy spillovers in a multinational system. This information is important for ASEAN countries' policymakers to monitor their economic fluctuations comprehensively and then to take in consideration in national policymaking, as well as possible policy coordination among deeply integrated economies, like ASEAN, ASEAN+3, and ASEAN+6.

However, in the literature with the focus on ASEAN, there is still no study covering this topic and most of these studies analyze the impacts of fiscal and monetary spillovers separately by employing bilateral countries model approaches. Recently, there is an increasing interest in applying a global vector autoregression (GVAR) model proposed by Pesaran, Schuermann, and Weiner (2004) to examine international spillovers in a multinational system. Hence, to fill this knowledge gap in this research field, we use the GVAR approach to comprehensively examine fiscal and monetary policies spillovers from both international and intra-regional sources to the ASEAN-5 economies. This approach allows us to identify the impacts of such shocks on the ASEAN-5 countries' real GDP and inflation through modeling a multinational system in which all national and international factors in the system are interlinked. In the GVAR model, we include five core variables, namely real GDP, inflation, real exchange rate, real interest rate, and total government expenditure, and one global variable, namely, oil price. Quarterly data of 20 countries (ASEAN-5, other Asia-Pacific and E.U. countries, and the U.S.) from 2001 to 2015 are used.

Literature Review

In the last two decades, many researchers have been interested and investigating international spillovers of domestic monetary and fiscal policies. However, most of these studies focused on the policy spillovers from developed countries (such as the United State, Euro area, Japan, and so on) to emerging countries or from large countries to small open countries. Additionally, spillover effects of fiscal and monetary policies were examined separately. Therefore, we will review the literature related to our study in two different strands.

Monetary Spillovers

The first strand of literature is related to monetary policies spillovers. In this research field, most of the studies investigated monetary spillovers (both conventional and unconventional) between countries by employing different research methodologies—of which two methodologies are most frequently employed, namely the event study methodology and the bilateral countries modeling. On the first strand, many researchers employ event study methodology to explain patterns in the unconventional monetary spillovers from developed countries (mostly from the U.S.) to other markets (see Fic, 2013; Chen, Mancini-Griffoli, & Sahay, 2014; Albagli, Ceballos, Claro, & Romero, 2018). These papers suggest that

the quantitative easing of developed countries will affect the developing countries' real economy and the financial market by causing a change in equity prices, long-term yields, and investment in developing countries. However, these impacts on the developing financial market seem to be more significant and larger than its impacts on the real economy. On the other strand, there is also a vast number of studies applying bilateral countries model (such as traditional VAR approach) to investigate the global output spillovers from monetary policy of the U.S. and other advanced countries. The results of these studies suggest that monetary policy of the U.S. and advanced economies has significant global spillovers which raise mainly through spillovers in interest rates (for example, Kim & Roubini, 2000; Kim, 2001; Faust & Rogers, 2003; Faust, Rogers, Swanson, & Wright, 2003; Canova, 2005; Nobili & Neri, 2006; Mackowiak, 2007; Bluedorn & Bowdler, 2011; Miyajima, Mohanty, & Yetman, 2014). Nonetheless, most of the literature emphasizes that the magnitudes of spillovers effects varied across countries, depending on the degree of trade and financial openness to the developed countries, as well as economic fundamentals. Countries with stronger economic fundamentals (such as higher real GDP growth and stronger external current account positions, as well as lower inflation and lower shares of local debt held by foreigners, more liquid markets) could significantly mitigate monetary spillover effects.

However, these empirical papers are mostly based on a two-country model approach, such as two-country VAR models which involve foreign and domestic macroeconomic variables of two economies (or vice versa) and which are estimated for a few countries only. In a globalized world, two-country models cannot capture the multilateral nature of global inter-linkages. The shock to one country's macroeconomic variables may affect the rest of the world economies not only through direct transmission of shock from country to country but also third-country effects and spillbacks that a bilateral model fails to capture. Hence, the GVAR approach has been widely employed by some authors to investigate the spillover from advanced economies' monetary policies to others countries such as Chen, Filardo, He, and Zhu (2015), Georgiadis (2015a and 2015b), and Ganelli and Tawk (2016). The findings of these studies showed that the monetary spillover effect of advanced countries to the developing economies have been often larger than those to the advanced economies. Consistent with the studies that employed other approaches, it is also found that the magnitude of spillovers depends on the receiving country's trade and financial integration, de jure financial openness, exchange rate regime, financial market development, labor market rigidities, industry structure, and participation in global value chains. Furthermore, economies in its recession phrase will experience larger spillovers from advanced countries' monetary policy.

Fiscal Policy Spillover

Regarding fiscal policy spillovers, there are still limited studies and most of these focused on fiscal policy spillover of Euro area to other countries in the region. The first strand of this literature calibrates macroeconomic models to quantify the possible spillover effects of fiscal policies (Taylor, 1993; OECD, 2009; Ivanova & Weber, 2011). They found that an increase in fiscal spending increases GDP of other members countries.

Another strand of the literature uses a GVAR model to examine fiscal spillovers in the EU countries (see Hebous & Zimmermann, 2013; Ricci-Risquete & Ramajo-Hernández, 2015; Dragomirescu-Gaina & Philippas, 2015; Caporale & Girardi, 2011; Nickel & Vansteenkiste, 2013; Belke & Osowski, 2016). Their results generally showed that there exist significant spillover effects of fiscal policy shocks within EMU countries and these effects are stronger for EMU than non-EMU countries in Europe. Hence, they suggested a need for policy coordination among EMU countries.

Additionally, there are some studies which focus on fiscal spillovers in OECD countries. Auerbach and Gorodnichenko (2012and 2013) estimated a large cross-border effect of government spending on output growth in OECD countries by constructing trade-weighted fiscal spillovers. Their findings suggested that cross-country spillovers have an important impact, and the impact is especially larger when the affected country is in recession.

In contrast to the study of Auerbach and Gorodnichenko (2013), Goujard (2013) examined the output effects of fiscal consolidation in OECD countries. Fiscal consolidation spillovers are found to slow domestic growth and decrease employment.

Spillovers of fiscal consolidations on growth are found to be initially larger between countries belonging to currency unions. Spillovers of fiscal consolidation are also found to be more detrimental to domestic growth during economic downturns in export markets.

Despite the vast number of studies on policies spillovers, there is no study focusing on ASEAN countries and employing multinational countries model to estimate and analyze the international spillovers in ASEAN countries comprehensively. Hence, we will employ a multinational country approach to fill this knowledge gap.

Data and Research Methodology

Data

Given the objectives of this study, the real GDP, inflation rate, interest rate, exchange rate, and real government expenditure are chosen as the main variables of interest. Additionally, to account for possible common factors, we also include the global oil price into the model.

The datasets are mostly obtained from the International Financial Statistics (IFS) database and include the quarterly data from 2001 to 2015.

Twenty countries from three regions, that is, Asia-Pacific, Europe, and America, and one sub-region (ASEAN) are considered in the global VAR models. Table 1 presents countries and regions included in our study.

As Austria, Belgium, Finland, France, Germany, Italy, Netherlands, and Spain participate in the Euro area which applies a common currency and monetary policy interest rate, they are grouped together and treated as a single economy, while the remaining 12 countries are modeled individually. The time series data for the Euro Area was constructed by cross-section weighted averages of all variables over eight Euro-area countries using the average purchasing power parity GDP weights.

The GVAR Model

In this study, we followed the GVAR approach proposed by Pesaran, Schuermann, and Weiner (2004) and Dees, di Mauro, Pesaran, and Smith (2007). The GVAR model consists of two steps: in the first step, country-specific models are estimated, and then these separate country-specific models will be combined in the second step. The core variables within each economy are linked through the corresponding trade-weighted foreign variables.

Country-specific models. Assuming that there are n+1 countries in the world economy and one country is chosen as country 0 representing the reference country—generally, the most powerful economy is chosen. In our study, there are 13 countries included (i.e., n is equal to 12 and one country is 0) and the United State is chosen as country 0, consistent with the existing GVAR literature.

Using an augmented vector autoregressive model (VARX*) specification, all other n countries are modeled as small open economies in which a set of domestic variables ($\boldsymbol{x_{it}}$) is related to its lagged values and a set of country-specific foreign variables, $\boldsymbol{x^*_{it}}$.

Table 1
Lists of Regions and Sub-Region Used in the GVAR Model

ASIA-Pacific	EUROPE	AMERICA
Australia	Austria	United States
China	Belgium	
Japan	Finland	
India	France	
Korea	Germany	
ASEAN-5:	Italy	
Indonesia	Netherlands Spain	
Malaysia	UK	
Philippines		
Singapore		
Thailand		

Specifically, for each country i, the VECMX* for individual economies is represented as following equation

$$\boldsymbol{x_{it}} = \boldsymbol{a_{i0}} + \boldsymbol{a_{i1}t} + \sum_{l=1}^{\boldsymbol{p_i}} \boldsymbol{\phi_i x_{t-l}} + \boldsymbol{\Lambda_{i0} x_{it}^*} + \sum_{l=1}^{\boldsymbol{q_i}} \boldsymbol{\Lambda_{il} x_{i,t-l}^*}$$

$$+\boldsymbol{D_{i0}\omega_t} + \sum_{l=1}^{s_i} \boldsymbol{D_{il} d\omega_{t-1}} + \boldsymbol{\varepsilon_{it}} \quad (1)$$

With $t = 1,2, ..., T$; x_{it} is a $k_i x1$ vector; x_{it}^* is $k_i^* x1$ vector of foreign variable specify to country i; ϕ_i is $k_i x k_i$ matrix of coefficient for the lagged domestic variables; Λ is $k_i x k_i^*$ matrix of coefficients associated with the coefficients of the foreign variables in contemporaneous and lagged form; ω_t is global oil price; ε_{it} is country specific shock. ε_{it} is assumed to be serially uncorrelated with a zero mean and non-singular covariance matrix ($\varepsilon_{it} \backsim i.i.d\,(0, \sum_{ij}$).

In the GVAR methodology, the vector of country-specific foreign variables, x_{it}^*, plays a central role. As a way of dealing with the curse of dimensionality when n is relatively large, the weights used in the construction of x_{it} are not estimated but specified a priori, based on information that measures the strength of bilateral linkages in the global economy.

In this paper, we use trade weights. The choice of trade weights is based on two considerations. First, trade in goods represents an important channel through which shocks are transmitted across countries, especially for the case of ASEAN, trade linkage is much stronger than financial linkages. Second, trade data is more available in comparison to other alternative measures that could be used because reliable bilateral trade statistics are published annually for all countries by reliable international organizations. Data on bilateral financial flows are either nonexistent or tend to be much more volatile and less reliable, as their collection has started only more recently.

Specifically, the $\boldsymbol{x_{it}^*}$ are constructed as follows:

$$x_{it}^* = y_{it}^* = \sum_{j=0}^{n} w_{ij}^x x_{jt} \quad (2)$$

where w_{ij} is based on trade shares, namely, the share of country *j* in the total trade of country *i* and measured in US dollar.

In combining with the relations linking the exogenous variables of the country-specific models to the variables in the rest of the global model—presented in equation 2—the n+1 country-specific VECM models provide a complex system. Hence, even country-specific models are estimated separately. A general specification for the correlation of shocks across different countries/regions, nevertheless, can be maintained.

The global VAR model. In the next step, the GVAR model is set up by stacking the estimated individual country-specific models and linking them with a matrix of predetermined cross-country linkages.

Due to the contemporaneous dependence of the domestic variable x_{it} on foreign variables x_{it}^*, the country-specific VAR models need to be solved simultaneously for all domestic variables x_{it} (for i=1,2,…n). The domestic and foreign variables are grouped as a $(k_i + k_i^*)x1$ vector, $z_{it} = \binom{x_{it}}{x_{it}^*}$ to rewrite the country-specific VECM models (1):

$$A_i z_{it} = a_{i0}^* + \sum_{l=1}^{p} A_{il} z_{i,t-1} + \varepsilon_{it} \quad (3)$$

where $a_{i0}^* = a_{i0} + D_{i0}\omega_t + \sum_{l=1}^{s_i} D_{il} d\omega_{t-1}$; $A_i = (I_{ki}, -\Lambda_{i0})$; $B_i = (\phi_i, \Lambda_{i1})$; the dimensions of A_i and B_i are k_i x $(k_i + k_i^*)$. (and has a full column rank k_i.

Then, gathering the variables from all countries in a global vector the system

$$z_{it} = (x'_{it}, x_{it}^{*\prime})' = W_i x_t \quad (4)$$

where is a *(ki +ki*)x k* matrix of fixed known constants defined in terms of the country-specific weights w_{ij}^x. It can be viewed as "link" matrix that allows the country-specific models to be written in terms of global variable vector x_t

Combining equations (3) and (4), we get

$$A_{i0} w_i x_t = a_{i0}^* + \sum_{l=1}^{p} A_{il} w_i x_{t-l} + \varepsilon_{it} \quad (5)$$

By stacking individual models:

$$G_0 z_t = a_0^* + a_1 t + \sum_{l=1}^{p} H_l x_{t-l} + \varepsilon_t \quad (6)$$

where: $G_0 = \begin{bmatrix} A_{00}W_0 \\ \dots \\ A_{n0}W_n \end{bmatrix}$; $a_0^* = \begin{bmatrix} a_{00}^* \\ \dots \\ a_{n0}^* \end{bmatrix}$; $a_1 = \begin{bmatrix} a_{01} \\ \dots \\ a_{n1} \end{bmatrix}$;

$$H_l = \begin{bmatrix} A_{0l}W_0 \\ \dots \\ A_{nl}W_n \end{bmatrix}; \quad \varepsilon_i = \begin{bmatrix} \varepsilon_{0t} \\ \dots \\ \varepsilon_{nt} \end{bmatrix};$$

Since G is a *kxk* dimensional matrix and in general will be full rank and non-singular. Then by multiplying by from the left, the solution to the GVAR model is obtained:

$$x_t = G^{-1}a_0^* + G^{-1}a_1 + \sum_{l=1}^{p} G^{-1}H_l x_{t-l} + G^{-1}\varepsilon_t \quad (7)$$

Let $F_l = G^{-1}H_l$

$$x_t = G^{-1}a_0^* + G^{-1}a_1 + \sum_{l=1}^{p} F_l x_{t-l} + G^{-1}\varepsilon_t \quad (8)$$

The dynamics of the system are explored by impulse response analysis. In general, the main function of impulse responses is to trace out the response of current and future values of each variable to a one-unit increase in the current value of one error in the VAR model. It will be estimated to answer for our research question (what is the impact of internal and external fiscal and monetary spillover on ASEAN countries real GDP?).

However, GVAR modeling encompasses too many countries and variables in a complex multi-country system. It is impossible to estimate the orthogonalized impulse responses proposed by Sims (1980) which requires the impulse responses to be computed with respect to a set of orthogonalized shocks. Hence, we will estimate generalized impulse response function (GIRF) which was proposed in Koop, Pesaran, and Potter (1996) for non-linear models and developed further in Pesaran and Shin (1998) for vector error correcting models. The GIRFs are invariant to the ordering of the variables and the countries in the GVAR model. The GIRFs approach considers shocks to individual errors and integrates out the effects of the other shocks using the observed distribution of all the shocks without any orthogonalization.

Empirical Results

Unit Root Tests

To examine the integration properties of the individual series, we implement the widely accepted standard augmented Dickey-Fuller (ADF) tests and weighted symmetric ADF (WS). The length employed for unit root test is selected by AIC.

The estimation results of the unit root t-statistic are reported in Tables 2 and 3 for country-specific and foreign variables respectively. Overall, the results of unit root test show that all of the country-specific and foreign series are integration at the first order, namely I(1).

Empirical Results

In this section, we present the empirical results based on the dynamic analysis of the global VAR model by estimating GIRFs.

The objective of our study is to examine how policy spillovers could affect the domestic economy of ASEAN-5 countries, explicitly, spillovers effects on the stability of domestic price and real GDP. Hence, we stimulate the shocks to foreign monetary policy variable (indicating by a sudden change in nominal short-term interest rates) and fiscal policy variable (indicating by a sudden change in real government expenditure). Specifically, we estimate GIRFs of ASEAN-5 countries' real GDP and inflation by stimulating one percentage point positive shock government expenditure and one percentage point negative shock to nominal short-term interest rates.

Generally, the transmission of fiscal and monetary shocks into ASEAN-5 countries takes place quickly, and the effects of shock are generally significant in short-run; however, the magnitude and sign of effects varied across countries. Despite the up and down fluctuation at the beginning forecast horizon, the impulse responses maintain a stable trend after 4 to 12 quarters depending on cases. This indicates that our models are stable. Therefore, we will focus on analyzing the results of only up to eight quarters.

To comprehensively examine about how internal and external fiscal and monetary spillovers affect the ASEAN-5 economies as well as compare the effects of policy shocks from different sources, we will analyze the responses of each ASEAN-5 countries' real GDP and inflation to these policy shocks separately.

Foreign fiscal spillovers.

Real GDP of ASEAN-5 countries. In general, a positive government expenditure shocks cause an immediate increase in real GDP of ASEAN-5 countries. This is illustrated by the GIRFs associated (of the first, fourth, and eighth quarter) plotted in Figures 1 to 5. However, the country member's responsiveness to fiscal shocks varies across countries and regions.

Table 2
Unit Root Test of Country-Specific Variables

	CV	AUS	CH	EURO	INDIA	INDO	JP	KR	MAL	PH	SG	TL	UK	USA
ADF test														
y	-2.89	-1.96854	-0.8699	-1.65031	-1.02126	0.222056	-1.8968	-1.6215	-0.70621	0.943982	-1.60254	-1.67476	-1.29153	-1.33474
Δy	-2.89	-4.9405	-4.42419	-3.53086	-3.0947	-5.69522	-4.8631	-4.99247	-5.56546	-5.17295	-3.9168	-6.1681	-3.66682	-3.82332
Δp	-2.89	-4.16912	-5.2009	-1.81324	-4.83514	-4.506	-2.7157	-2.84535	-4.76924	-5.00984	-6.71343	-5.49997	-2.77725	-3.08193
ΔΔp	-2.89	-5.83123	-6.83072	-8.04425	-5.77607	-6.44143	-6.02548	-6.6653	-5.99796	-7.39644	-11.6811	-5.97398	-9.99969	-7.97232
e	-2.89	-2.1958	-1.22565	-2.34976	-1.73471	-2.57766	-1.9575	-2.38868	-1.64108	-1.18515	-1.35118	-1.80297	-2.89952	
Δe	-2.89	-5.5512	-4.65697	-5.95374	-4.43395	-3.51336	-2.94113	-5.16678	-3.32592	-4.24327	-4.07825	-4.23504	-6.19177	
r	-2.89	-0.76351	-1.16606	-1.20891	-1.23401	-2.95866	-2.17938	-1.60354	-3.19935	-1.02088	-2.61055	-2.88422	-1.39499	-1.9443
Δr	-2.89	-4.76521	-2.15966	-3.42022	-5.79383	-5.04625	-3.98994	-5.03276	-4.64639	-4.80574	-2.97336	-2.97284	-3.64786	-3.05176
g	-2.89	-1.14921	-0.1912	-1.60938	-0.60295	-0.91434	-0.88944	-1.6344	-1.18008	0.12192	0.672662	-2.0532	-3.16935	-2.09107
Δg	-2.89	-7.97491	-6.23147	-6.35313	-6.08602	-5.5864	-4.19613	-6.31317	-3.69662	-9.1756	-9.29713	-6.92412	-6.61992	-2.44129
WS test														
y	-2.55	1.619342	0.91249	-0.78083	0.37734	-0.03845	-1.45123	1.420566	0.980896	1.716686	-0.19615	1.494628	1.14655	0.643707
Δy	-2.55	-5.0689	-4.65144	-3.75359	-2.96946	-4.48534	-4.98119	-4.87055	-5.5247	-5.40589	-4.02861	-6.41386	-3.92991	-3.98347
Δp	-2.55	-4.37642	-5.41183	-0.75868	-4.94004	-4.29298	-2.93301	-3.12645	-4.29598	-5.14102	-6.41538	-5.70446	-2.62765	-3.18928
ΔΔp	-2.55	-6.19431	-7.22419	-8.25462	-6.13676	-6.87414	-6.34211	-7.0719	-6.03252	-7.79292	-11.7974	-6.4318	-10.4122	-8.09733
e	-2.55	-0.49269	0.091702	-0.41209	-0.78027	-0.30087	-2.20393	-1.25994	-0.93598	-0.54057	-0.75454	-0.39588	-0.87373	
Δe	-2.55	-5.7626	-4.85646	-6.17304	-4.68855	-3.75813	-3.05296	-5.39865	-3.55064	-4.30146	-3.92733	-4.26067	-6.42963	
r	-2.55	-1.09353	-0.88252	-0.96417	-1.61985	-1.01055	-2.43125	-1.60967	-3.4272	0.388881	-2.83701	-3.13175	-1.07567	-1.9187
Δr	-2.55	-4.20962	-2.39352	-3.32124	-6.03403	-5.27712	-3.58276	-5.18509	-4.87412	-2.23903	-2.57912	-3.24293	-3.41374	-2.19225
g	-2.55	1.169037	1.393493	1.162451	1.046944	-0.74829	0.396363	0.595395	-0.30732	0.963383	1.540598	0.510812	1.114692	0.496358
Δg	-2.55	-8.22469	-6.21071	-6.5475	-6.48817	-5.26854	-4.4099	-6.5005	-3.55186	-9.30006	-9.02585	-7.00018	-6.87179	-2.61955

Source: authors' calculation

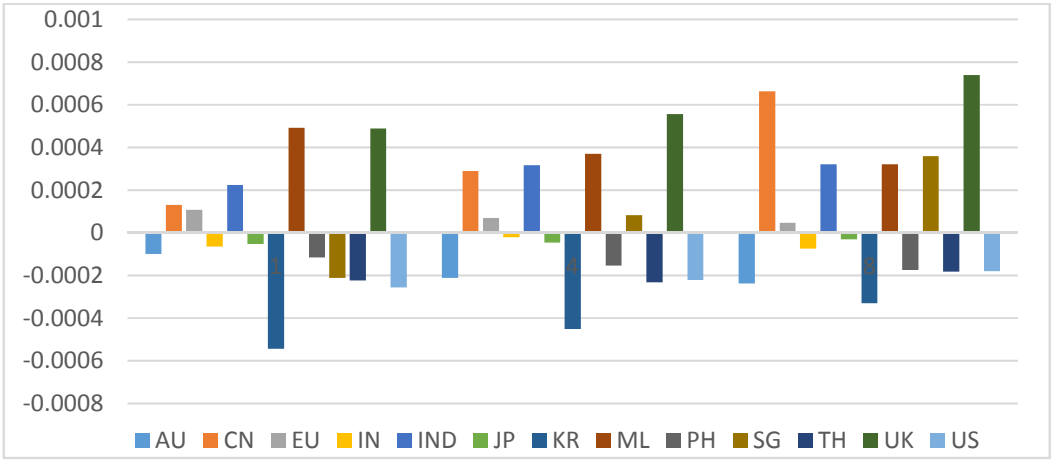
Table 3
Unit Root Test of Foreign Variables

	CV	AUS	CH	EURO	INDIA	INDO	JP	KR	MAL	PH	SG	TL	UK	USA
ADF test														
y	-2.89	-1.62028	-1.38208	-1.54469	-1.35558	-1.67912	-1.05818	-0.96302	-1.65861	-1.64052	-1.42384	-1.46598	-1.04692	-1.01453
Δy	-2.89	-3.84374	-4.2194	-4.45657	-4.10821	-4.8216	-4.21366	-4.33496	-4.54746	-4.67641	-4.66512	-4.76433	-3.69774	-3.82272
Δp	-2.89	-4.97632	-2.96133	-4.6958	-4.63525	-4.97851	-4.72209	-4.93841	-4.86252	-4.88553	-4.40154	-4.66733	-4.21093	-4.98886
ΔΔp	-2.89	-6.92657	-5.61088	-6.86522	-6.76633	-7.00408	-6.82497	-6.77649	-6.13956	-6.91798	-6.30744	-6.62281	-7.56229	-6.84461
e	-2.89	-1.62319	-1.37604	-2.48671	-1.23752	-1.62624	-1.58729	-1.53108	-1.67716	-1.8802	-1.88632	-1.73951	-1.63569	-0.79807
Δe	-2.89	-4.21436	-3.7273	-5.4741	-3.56542	-4.04034	-4.3649	-4.11373	-3.40715	-3.0567	-3.67767	-3.15306	-3.16819	-4.06537
r	-2.89	-1.14666	-1.33692	-1.14216	-1.0992	-1.35661	-1.09329	-1.10048	-1.32509	-1.41918	-1.62365	-1.16643	-1.13733	-0.91138
Δr	-2.89	-2.32041	-2.59108	-3.29604	-2.43434	-2.38182	-2.38326	-2.19147	-2.16512	-2.16049	-3.80542	-3.38411	-3.32436	-3.49753
g	-2.89	-0.9294	-2.0945	-1.50157	-1.04842	-0.93651	-1.02718	-0.59658	-0.62338	-1.3051	-1.09441	-0.72418	-1.46137	-0.7377
Δg	-2.89	-5.89693	-3.59146	-5.47068	-6.09605	-5.82335	-6.01933	-5.80073	-7.11121	-6.20582	-5.55562	-5.33839	-3.46541	-5.98569
WS test														
y	-2.55	0.474405	0.707011	0.690889	0.520344	0.487298	0.704648	0.660817	0.408657	0.581126	0.521901	0.544994	0.396117	0.709459
Δy	-2.55	-4.00685	-4.37836	-4.70354	-4.25287	-5.12604	-4.41215	-4.517	-4.83869	-4.99114	-4.98472	-5.07188	-3.89628	-4.02245
Δp	-2.55	-5.16589	-3.03496	-4.89605	-4.85419	-5.01337	-4.93877	-5.14413	-5.0365	-5.01891	-4.60326	-4.83757	-4.42623	-5.19644
ΔΔp	-2.55	-7.33681	-5.82488	-7.2733	-7.16755	-7.36244	-7.22529	-7.17262	-6.60644	-7.31034	-6.67594	-7.01708	-7.85052	-7.24956
e	-2.55	-0.32261	-0.95115	-0.13674	-0.39947	-0.61943	0.13558	-0.3036	-0.42836	-0.98849	-0.41913	-0.65	-1.12801	-0.06818
Δe	-2.55	-4.38513	-3.93938	-5.6778	-3.66733	-4.18232	-4.57077	-4.29222	-3.29321	-2.94192	-3.90666	-3.12654	-3.15941	-4.27228
r	-2.55	-0.81556	-1.17932	-1.0083	-0.70705	-1.39467	-0.77011	-0.65666	-1.04166	-1.30357	-0.28647	-0.609	-0.93501	-0.53759
Δr	-2.55	-2.19148	-2.267	-2.2	-2.30928	-2.10596	-2.13496	-1.8054	-2.01842	-1.96937	-3.86518	-2.5633	-2.71705	-3.22198
g	-2.55	1.535679	1.156413	1.303339	1.602852	1.716025	1.526358	1.477339	1.392324	1.838372	1.087804	1.428514	1.624678	1.498048
Δg	-2.55	-5.88633	-3.93227	-5.49075	-5.93819	-5.68499	-6.01102	-5.67489	-6.88632	-6.0629	-5.66864	-5.18905	-3.19538	-5.96678

Source: authors' calculation

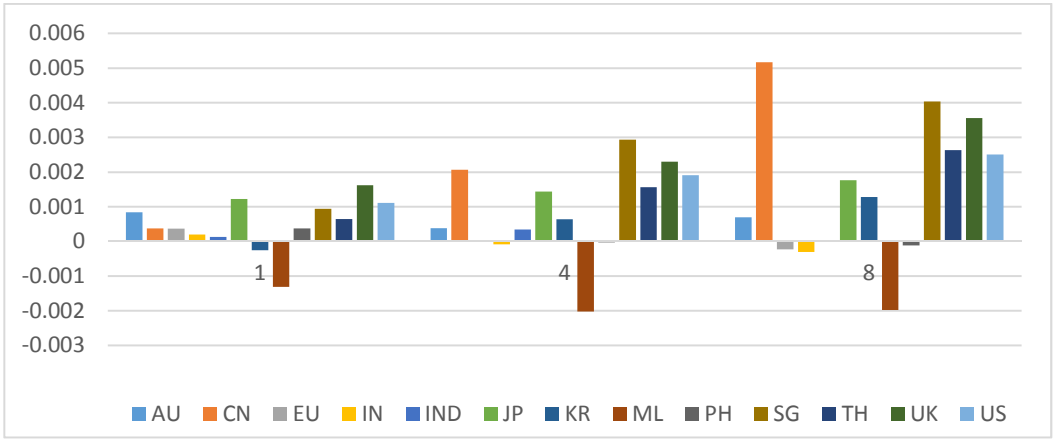
For the case of Indonesia, spillover effects on its real GDP are ambiguous. While fiscal shocks from some countries like China, Malaysia, and the United Kingdom are accompanied by an instantaneous increase in its real GDP, shocks from other countries like Korea, Thailand, and United States cause an instantaneous decrease in its real GDP. Furthermore, the magnitude of spillover effects on its real GDP is relatively small compared to the other ASEAN-5 countries'. There are only a few countries (such as China, Korea, Malaysia, and the United Kingdom) of which fiscal policy has significant impact on Indonesian real GDP. Explicitly, shocks to China's, Malaysia's and the United Kingdom's government expenditure cause a maximum increase in Indonesian real GDP of 0.05% (UK), 0.06 % (China), and 0.09% (Malaysia), respectively, and shock to Korea one causes a maximum decrease of 0.006%. While the rest of the countries, such as Australia, Euro Area, Japan, Philippine, and Thailand, have small and insignificant fiscal spillover to Indonesian real GDP.

Regarding the fiscal spillovers from specific countries to Malaysia, fiscal shocks from most countries cause an instantaneous increase in its real GDP, except for its own fiscal shock. Its real GDP responded strongest to shocks from China, Singapore, Thailand, and the United Kingdom with a maximum increase of 0.5%, 0.4%, 0.25%, and 0.35%, respectively. Fiscal spillovers from the rest of countries have little impact.



Source: authors' calculation

Figure 1. The GIRFs of Indonesia's real GDP to fiscal policies shocks.

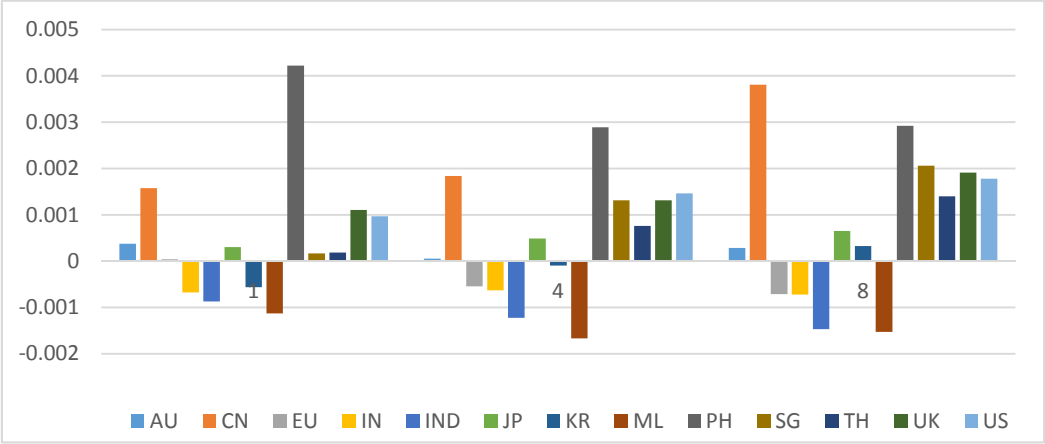


Source: authors' calculation

Figure 2. The GIRFs of Malaysia's real GDP to fiscal policies shocks.

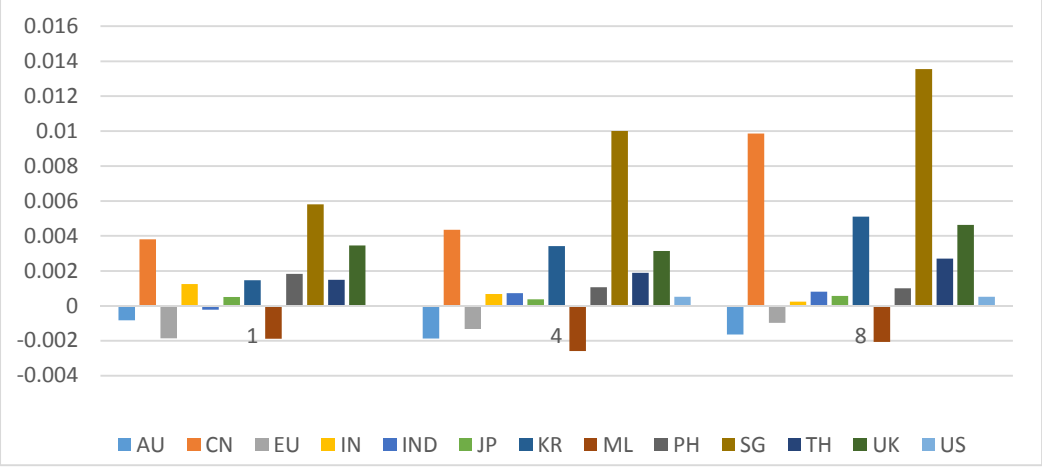
For the case of Philippines, our evidence shows that a positive fiscal shock to most of the countries is accompanied by an instantaneous increase in Philippine's real GDP, except for fiscal shocks from Indonesia and Malaysia which cause the decrease in Philippine's real GDP by 0.16% and 0.14%, respectively. However, positive responses are much stronger in comparison to negative responses. The strongest positive responses are found for shocks from China (+0.5%), Singapore (+0.2%), Thailand (+0.14%), the United Kingdom (+0.2%), and the U.S. (+ 0.17%). The magnitude of effects is the same to Malaysia's and much larger compared to Indonesia's. Finally, fiscal spillovers from other countries like Australia, the Euro Area, Japan, and India are relatively weak.

Regarding to the external fiscal spillovers to Singapore's real GDP, it increases instantaneously in response to an external positive fiscal shock from most countries, except for the ones from Australia, Euro Area, and Malaysia. Similar to Malaysia and the Philippines, Singapore's real GDP is significantly affected by fiscal spillovers from China, Korea, Thailand, and the United Kingdom with a maximum increase of 1%, 0.5%, 0.3%, and 0.5%, respectively. Although real GDP responded negatively to response to expansionary fiscal policies in some cases, they are small and insignificant.



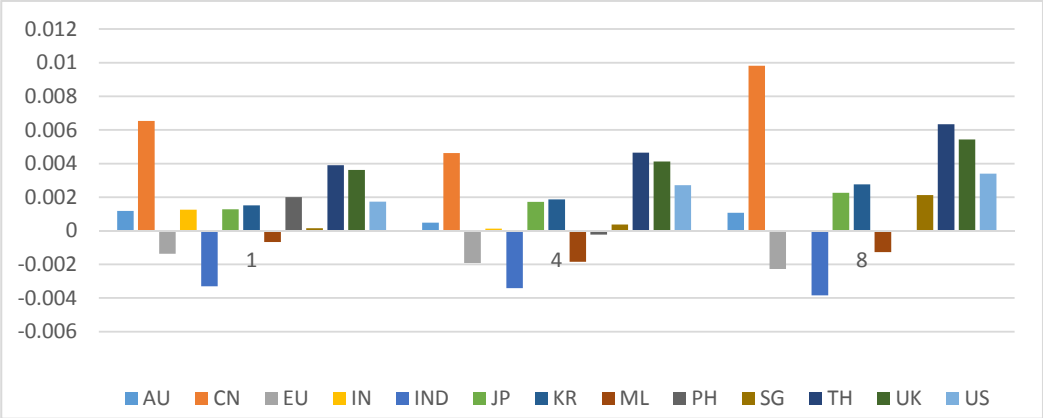
Source: authors' calculation

Figure 3. The GIRFs of the Philippines' real GDP to fiscal policies shocks.



Source: authors' calculation

Figure 4. The GIRFs of Singapore's real GDP to fiscal policies shocks.



Source: authors' calculation

Figure 5. The GIRFs of Thailand's real GDP to fiscal policies shocks.

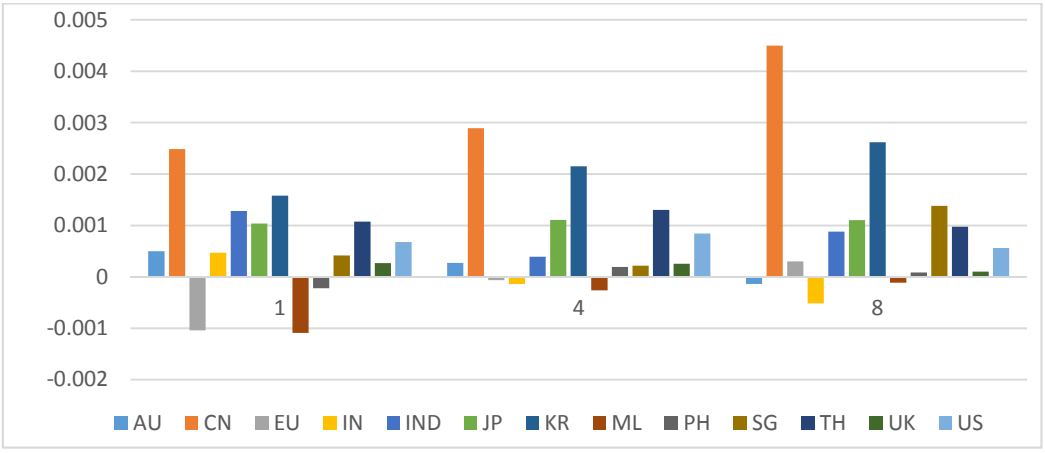
For the case of Thailand, positive shocks to other countries' government expenditure have a significant positive effect on Thai real GDP, except the one from Indonesia (-0.038%), Malaysia (-0.01%), and Euro area (-0.01%). However, different to other cases, Thai real GDP is less responsive to fiscal spillover from other ASEAN countries. Instead, Thailand's real GDP responded strongest to shocks from other East Asian countries, with an increase of 1% (by shock from China), 0.5% (by shock from Japan), and 0.5% (by shock from Korea). The U.K. is the only country outside the region which has a significant impact on Thailand's real GDP (+0.5%).

In conclusion, ASEAN-5 countries' real GDP are relatively responsive to external fiscal shocks, and positive spillover effects are found for most of the cases. Particularly, we find that all ASEAN-5 countries responded strongest to fiscal shocks from other East Asian countries, especially fiscal shock from China has strong impact on real GDP of all ASEAN-5 countries, while responsiveness to Korea fiscal policy is found significant only for Singapore and Thailand and Japan is only significant to Thailand. Other countries, except for the United Kingdom, have a very little impact. Regarding fiscal spillover between ASEAN countries, our evidence shows that the fiscal policy of member countries could cause significant spillover on some other members (not all). For instance, Indonesia's real GDP respond significantly to fiscal shock from Singapore and Malaysia, while fiscal spillovers from Singapore and Thailand have a strong impact on the Philippines, and Thailand's fiscal policy has a significant impact on Singapore's real GDP.

The inflation rate of ASEAN countries. The GIRFs (of the first, fourth, and eighth quarter) of the ASEAN-5 countries' inflation rate for one percentage point positive shock to government expenditure of all countries are presented in Figures 6 to 10. Overall, positive fiscal spillovers to specific countries also cause an immediate fluctuation in the price level of ASEAN-5 countries. However, the sign of the effects are inconclusive, and the magnitudes of the reaction vary across countries.

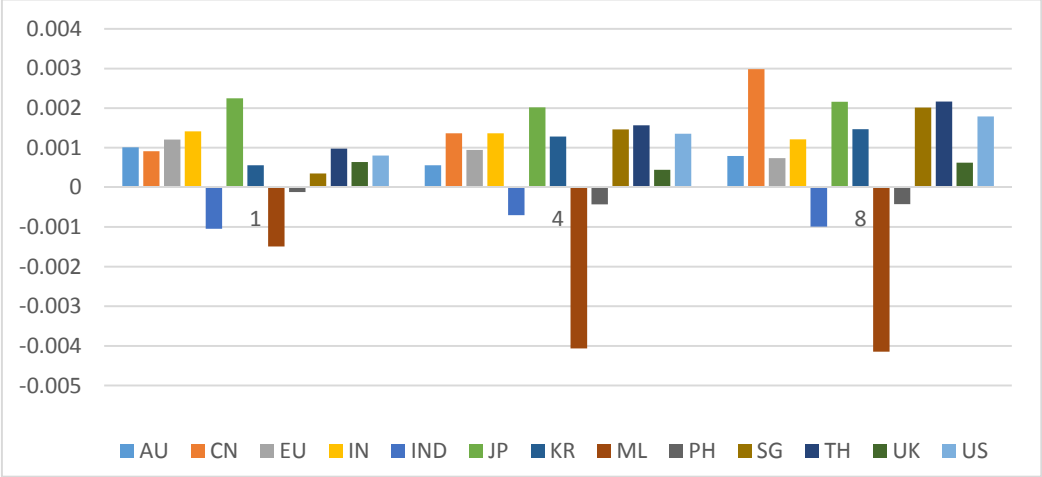
Regarding the effects on Indonesia's price, the results show that spillovers of the expansionary fiscal policy from specific countries causes an instantaneous increase in its inflation, except for some cases which causes a decrease in inflation; however, the inverse effect is relatively small. Fiscal effects from China are still dominant by causing inflation to increase by 0.4%, then followed by the U.K. (+0.2%), and Singapore (+0.1%).

In the case of Malaysia, external fiscal spillovers have a significant impact on its price. Fiscal policies of countries in the region still generate the most important external fiscal spillover source to Malaysia's inflation, such as China's and Japan's causing a maximum increase in the inflation rate of 0.3% and 0.2% respectively. Additionally, fiscal policies of other countries in ASEAN (Singapore: +0.2% and Thailand: +0.2%) also generate significant spillover to Malaysia's inflation.



Source: authors' calculation

Figure 6. The GIRFs of Indonesia's inflation rate to fiscal policies shocks.

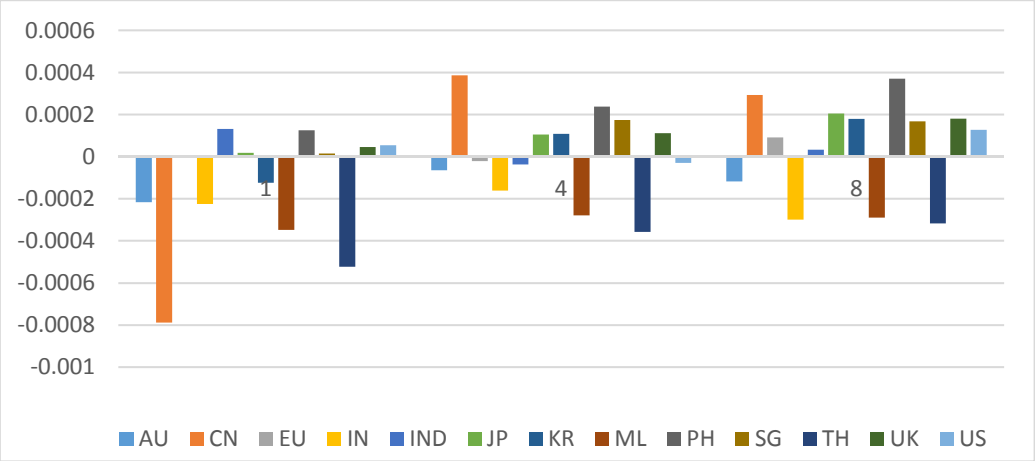


Source: authors' calculation

Figure 7. The GIRFs of Malaysia's inflation rate to fiscal policies shocks.

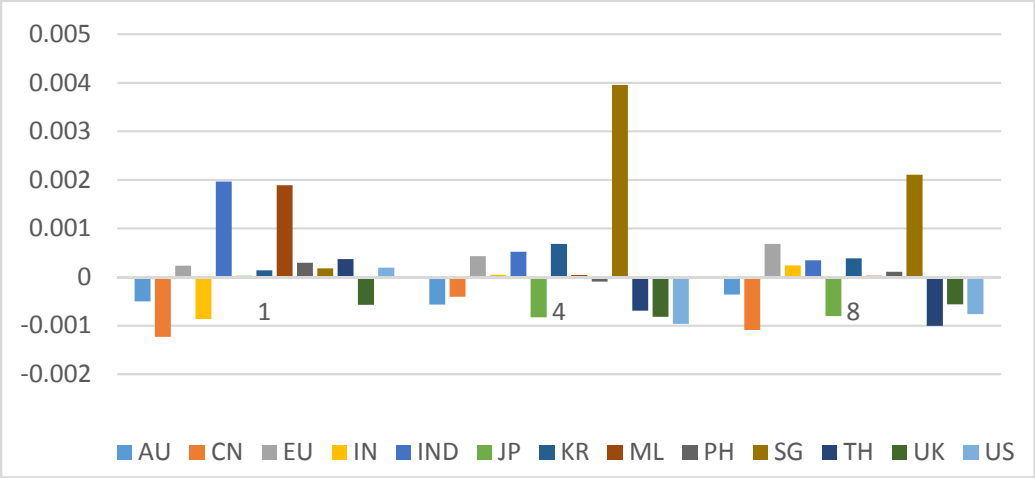
The effect of fiscal spillovers from other countries on Philippines's inflation are diverse and remains weak. The strongest positive effect are found on shocks from Singapore (+ 0.05%), Japan (+ 0.05%), the U.K. (+ 0.05%), and the U.S. (+ 0.02%). The negative response of the Philippines' inflation is found on shocks from Thailand (-0.12%), China (- 0.11%), and Malaysia (-0.06%).

In Singapore's case, foreign fiscal spillovers cause significant fluctuation of its inflation rate at the beginning of forecast horizon. The direction of fluctuation is ambiguous, and only fiscal shocks from some countries have a significant effect on its inflation. Singapore responded the most to fiscal spillovers from India (increasing by 0.23%), Indonesia (increasing by 0.2%), Malaysia (increasing by 0.2%), and Korea (increasing by 0.1%), while China and Japan cause a decrease of 0.1%.



Source: authors' calculation

Figure 8. The GIRFs of The Philippines's inflation rate to fiscal policies shocks.

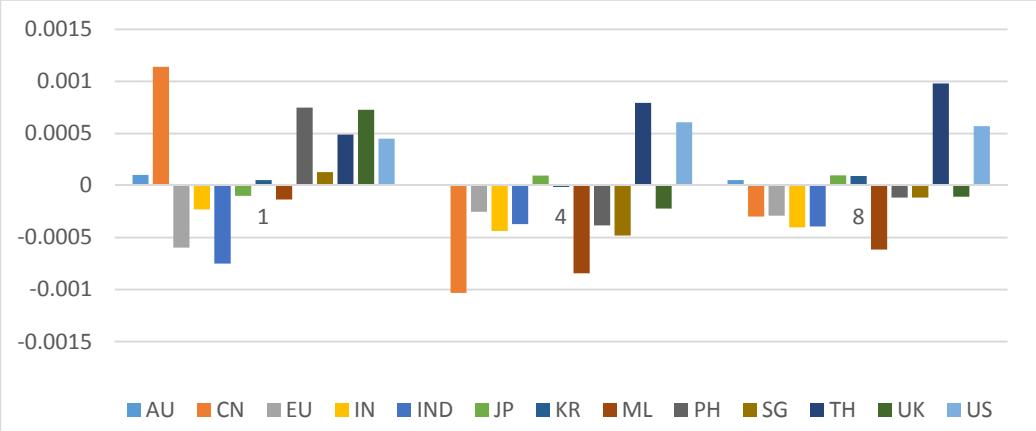


Source: authors' calculation

Figure 9. The GIRFs of Singapore's inflation rate to fiscal policies shocks.

The responsiveness of Thailand's inflation to external fiscal shocks are ambiguous. The responses on some cases fluctuate intensively at the beginning of forecast horizon. The results show that the strongest positive effect is observed from the U.S. (increasing by 0.2%), United Kingdom (increasing by 0.07%), China (increasing by 0.11%), and the Philippines (increasing by 0.08%). The US fiscal policy has a stronger impact on Thailand compared to China. Shocks from Indonesia, Malaysia, and Singapore cause a negative response, namely, an instantaneous fall in Thailand inflation by 0.13%, 0.18%, and 0.2% respectively.

In conclusion, spillovers of foreign expansionary fiscal policy on ASEAN-5 countries' inflation is ambiguous. While external and internal spillovers cause an increase in price in Indonesia, Malaysia, and Singapore, negative effects are found to be stronger in the case of the Philippines. External spillovers (from outside region) cause an increase in Thailand's inflation while internal spillover (from inside the association) cause a decrease. Similar to the responsiveness of real GDP, China's fiscal policy still generate the most important source of ASEAN-5 countries' price fluctuation, while Japan's and Korea's are only



Source: authors' calculation

Figure 10. The GIRFs of Thailand's inflation rate to fiscal policies shocks.

important for some cases. Outside the region, only fiscal spillovers from United Kingdom and the U.S. are also significant for some member countries. However, their magnitudes are smaller than China's. The rest of the countries in our sample have little fiscal spillover in ASEAN-5 countries.

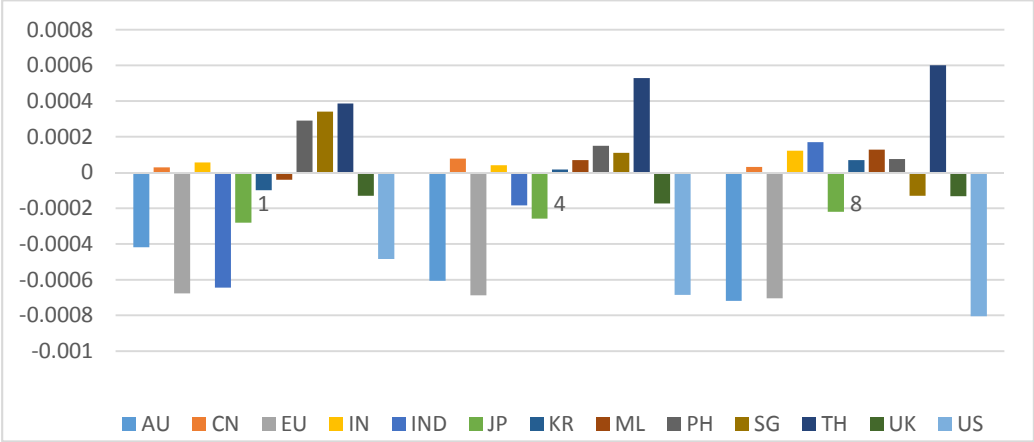
Finally, we also found significant internal fiscal spillovers from other ASEAN-5 countries on the members' real GDP and price. This finding is plausible since ASEAN-5 economies are closely linked, especially international trade between these countries. In most ASEAN-5 countries, top trading partners are ASEAN countries. This indicates trade channel becomes an important channel in fiscal spillovers into member countries. This finding suggests the importance of policy coordination between member countries.

Foreign monetary spillovers. In this section, we are going to analyze the dynamic response of ASEAN-5 countries' real GDP and inflation to spillovers of internal and external expansionary monetary policies (indicated by a negative percentage point shocks to specific countries' nominal short-term interest rate). Overall, the effects of monetary spillover on ASEAN-5 domestic real GDP and inflation are ambiguous. It may cause an increase or decrease in concerned variables depending on the cases. Additionally, the country member's responsiveness to monetary shocks varies across countries and regions. They generally become stable after eight quarters. Hence, we will present the estimated results up to eight quarters.

Real GDP of ASEAN-5 countries. The GIRFs (of the first, fourth, and eighth quarters) of ASEAN-5 countries' real GDP to internal and external monetary shocks are plotted in Figures 11 to 15.

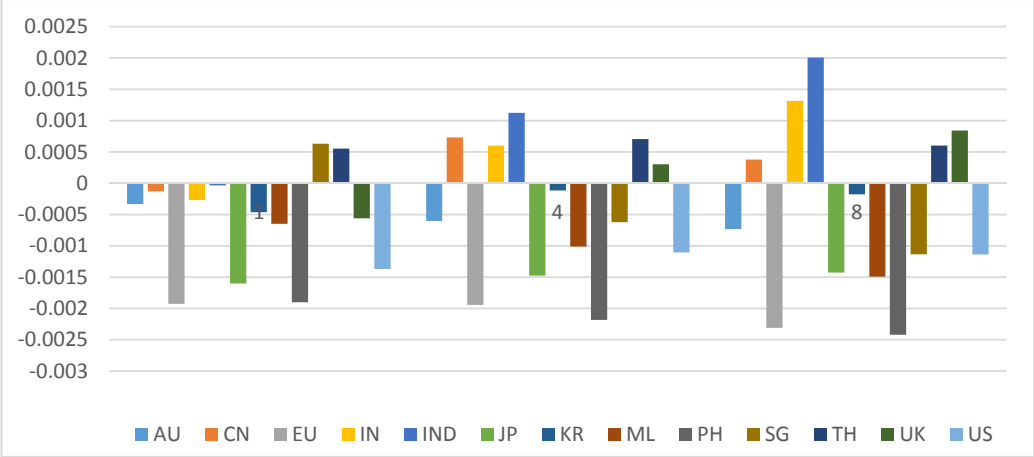
For Indonesia, a negative percentage point shocks to other advanced Western economy's short-run interest rate (Australia, Euro Area, Japan, United Kingdom, and U.S.) causes an instantaneous fall in Indonesia real GDP (from -0.02% to -0.08%), while the ones from other ASEAN+3 countries cause an instantaneous increase. Interestingly, Indonesian real GDP reacted most significantly to monetary shock from other ASEAN countries, such as the maximum increase of 0.06% caused by Thailand's monetary shock, then followed by Singapore (+0.04%), the Philippines (+0.04%), and Malaysia (+0.01%). However, the magnitude of the responsiveness is relatively small compared to the ones of other member countries.

The effects of foreign monetary spillovers to Malaysian real GDP are ambiguous. On the one hand, shocks from advanced economies (Euro Area, US, and Japan) and some ASEAN member countries (Singapore, Philippines) cause an instantaneous decrease in Malaysia's real GDP. Externally, the cause of maximum decreases of 0.24%, 0.16%, and 0.13% in Malaysia's real GDP are found on shock from the Euro Area, U.S., and Japan. Regarding the internal spillover between other ASEAN countries and Malaysia, the Philippines and Singapore monetary shocks cause a maximum decreases of 0.25% and 0.1% respectively. On the other hand, positive response of Malaysia's real



Source: authors' calculation

Figure 11. The GIRFs of Indonesia's real GDP to monetary policies shocks.



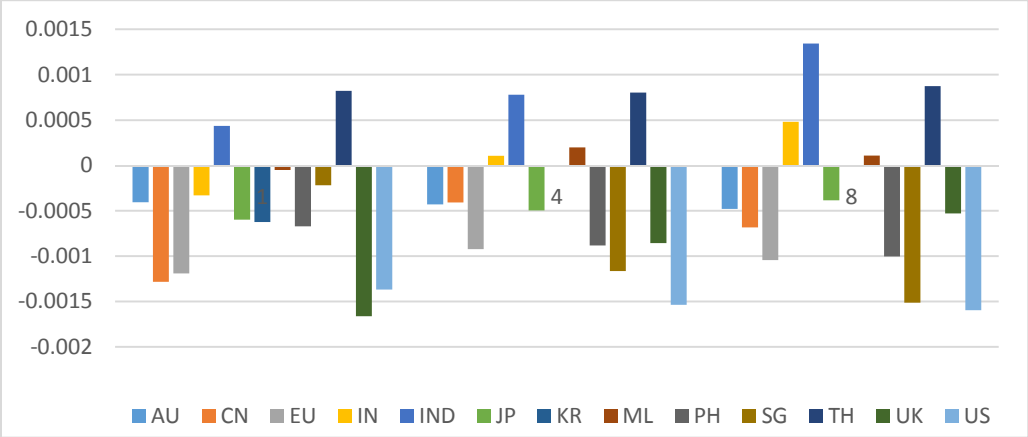
Source: authors' calculation

Figure 12. The GIRFs of Malaysia's real GDP to monetary policies shocks.

GDP to monetary shock are also found for some other countries, such as ASEAN countries (Indonesia and Thailand), India, and United Kingdom, of which, the strongest effects are found from Indonesia (+0.2%), India (+0.13%), and Thailand (+0.07%).

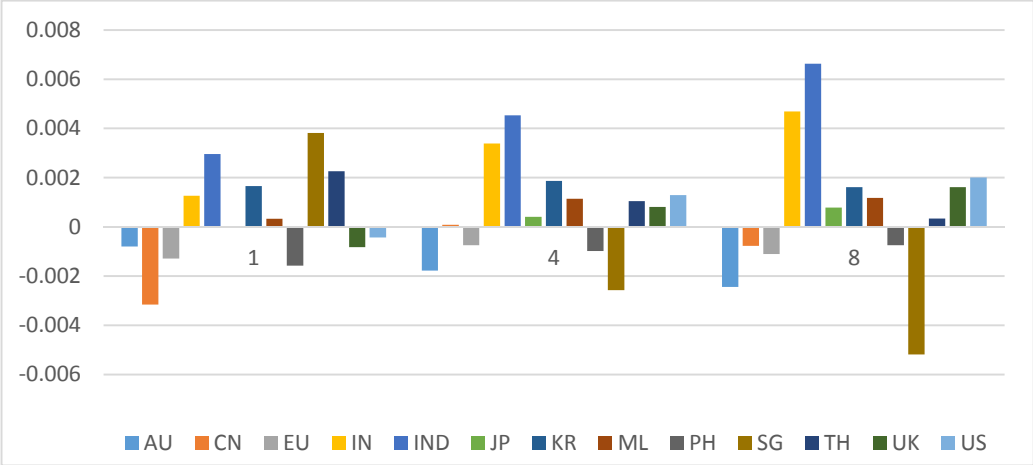
For the Philippines, the negative effect of monetary spillover seems to be much stronger than the positive ones. Its real GDP drops in response to external expansionary monetary shocks from most of the countries, except for the ones from Indonesia, India, Malaysia, and Thailand which cause an increase in Philippines's real GDP by 0.13%, 0.09%, 0.05%, and 0.03% respectively. Regarding the negative spillover effects, we found the strongest responses are to shocks from the U.S., United Kingdom, Singapore, China, Japan, and EU, with a maximum decrease of 0.16%, 0.16%, 0.15%, 0.13%, 0.11%, and 0.11% respectively.

In contrast to the case of the Philippines, foreign expansionary monetary spillovers to Singapore's real GDP seem to generate more positive effects than negative ones. Regarding the positive effects, Singapore's real GDP is the most responsive to monetary shock from Indonesia (+0.6%), India (+0.4%), Korea (+0.2%), Thailand (+0.2%), and US (+0.2%). Monetary spillovers from China, Australia, EU, and the Philippines reduce Singapore's real GDP by 0.3%, 0.2%, 0.12% and 0.15% respectively.



Source: authors' calculation

Figure 13. The GIRFs of the Philippines's real GDP to monetary policies shocks.



Source: authors' calculation

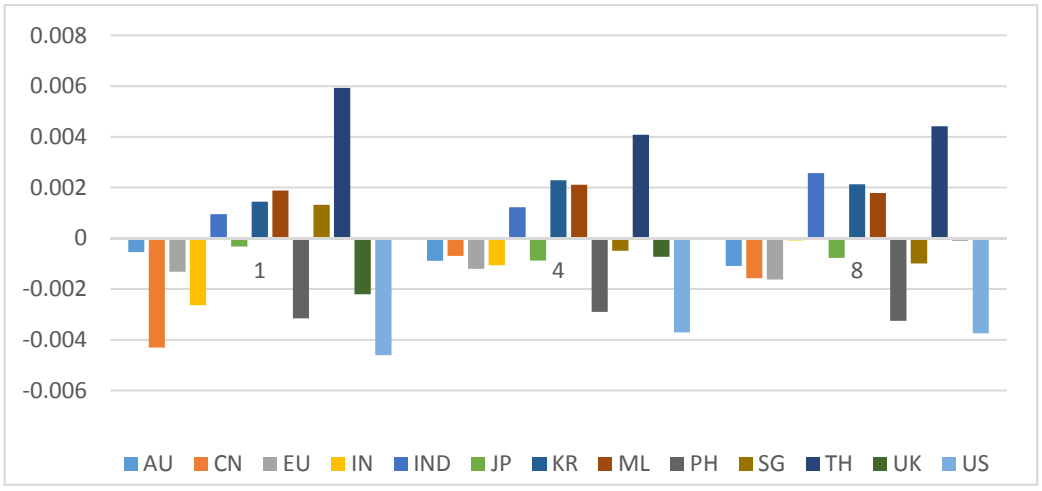
Figure 14. The GIRFs of Singapore's real GDP to monetary policies shocks.

Similar to the case of other ASEAN countries, the effect of monetary spillovers on Thai real GDP are mixed. Noticeably, a decrease in the Philippines', Euro Area's, China's, Australia's, Singapore's nominal interest rate cause a decrease in Thai real GDP, of which, U.S. has the strongest impact, a decrease of 0.5%, then following by China (-0.43%), Philippine (-0.35%), India (-0.23%), EU (-0.23%). and United Kingdom (-0.2%). Positive effect is found from shocks to nominal short-term interest rate of Indonesia (+0.28%), Malaysia (+0.32%), and Korea (+0.28%).

In conclusion, ASEAN-5 countries respond more strongly and significantly to expansionary monetary shocks from advanced economies (i.e., to a decrease in nominal short-term interest rate), such as Euro Area, Japan, United Kingdom, and U.S. than from China. However, these monetary spillover effects from both advanced economies and China on ASEAN's real GDP are generally negative. Additionally, we also found evidence of negative monetary spillovers originating from member countries to ASEAN member countries, that is, monetary spillovers from Singapore and Philippines had caused inverse impact on another member's real GDP. The dominance of negative effects of external and internal expansionary monetary policies on ASEAN economies suggest several implications: First, theoretically, according to Mundell-Flemming model (1662 and 1963), expansionary monetary policy

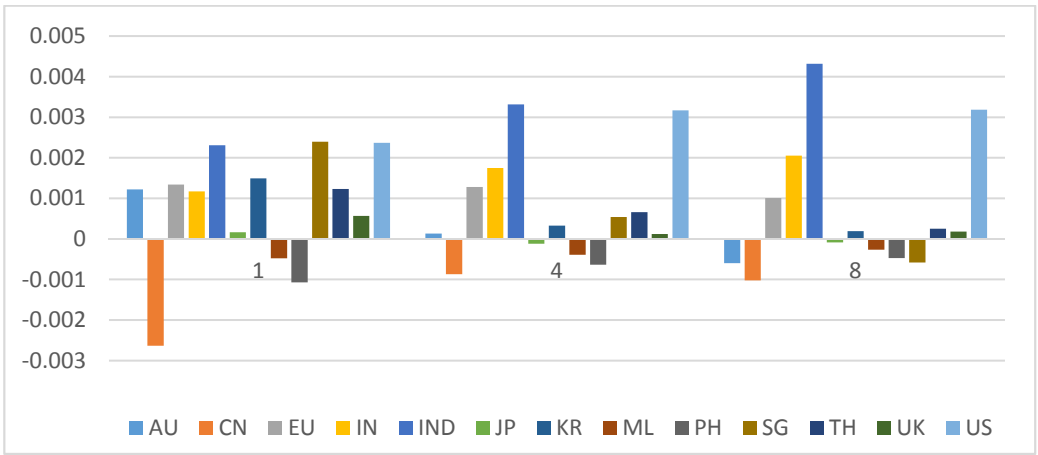
has not only a positive impact on home output but also leads to home currency depreciation. This, in turn, has two offsetting impacts on the foreign countries' output (i.e., on the one hand, the increase in home country's output will boost demand for foreign countries' output as well; on the other hand, home country' currency depreciation generates a beggar-thy-neighbor effect to foreign countries). This implies that exchange rate channels are important for shock transmission to ASEAN economies. The results are plausible since most of ASEAN economies are export-based economy and the fluctuation of exchange rate play a key role in their export. In short, monetary spillovers effect to ASEAN economy through exchange rate channels are stronger than the demand channel. Second, negative spillovers within ASEAN countries suggest a need for policy coordination in the association, especially in monetary policymaking and exchange rate regime as the monetary spillover within ASEAN countries is more significant and stronger in comparing to fiscal spillovers.

Inflation of ASEAN countries. The GIRFs (of the first, fourth, and eighth quarters) of the ASEAN-5 countries' inflation rate for one negative percentage point shock to nominal short-term interest rate of specific countries are presented in Figures 16 to 20. The monetary spillover effects on ASEAN countries are also mixed. Monetary spillovers could cause a rise or a fall in ASEAN-5 countries' inflation depending on cases. Additionally, the magnitude of the reaction remains limited and non-significant, and vary across countries.



Source: authors' calculation

Figure 15. The GIRFs of Thailand's real GDP to monetary policies shocks.



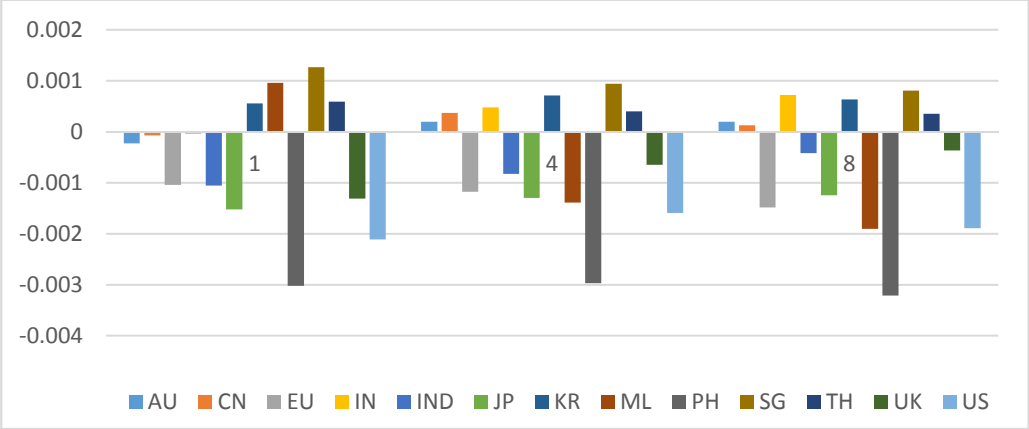
Source: authors' calculation

Figure 16. The GIRFs of Indonesia's inflation rate to monetary policies shocks.

The impact of monetary spillovers on Indonesia's inflation seems to be stronger than on its real GDP. It causes a significant instantaneous surge in domestic inflation. Like other cases, the effects are mixed. The strongest positive reactions are found for response to monetary spillover from the U.S. (+0.31%), Singapore (+0.23%), and India (+0.2%). A drop in Indonesia's inflation is observed against China (-0.26%) and the Philippine (-0.1%).

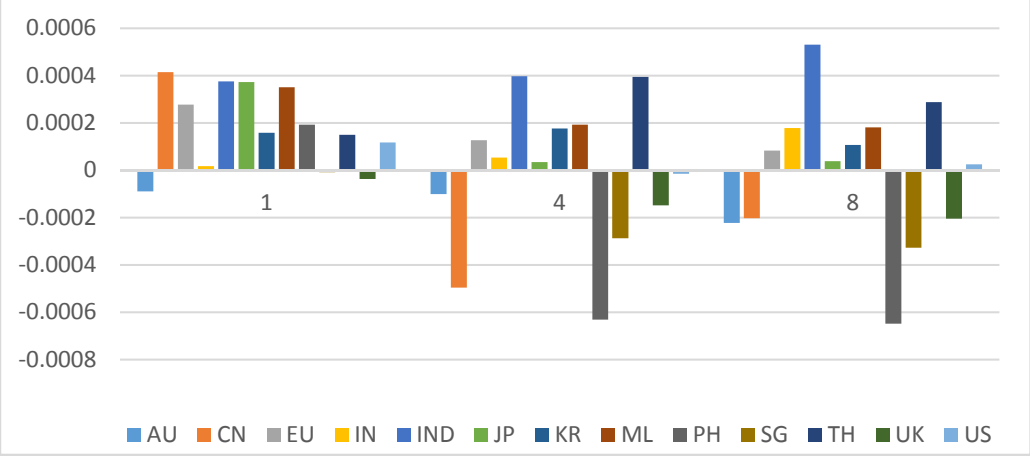
For Malaysia, our evidence suggests that the negative effects of foreign expansionary spillovers are stronger than the positive ones. The strongest negative response is found the shock from the Philippines (-0.32%), U.S. (-0.3%), Indonesia (-0.29%), the U.K. (-0.2%), Japan (-0.15%), and E.U. (-0.1%). Positive responses are found only for shocks to the nominal interest rate of Korea (+0.12%), Singapore (+0.12%), India (+0.08%), Thailand (+0.08%), and Australia (+0.02%).

Compared to the case of other ASEAN countries, the responsiveness of the Philippines' inflation to monetary shocks is relatively small. It positively responded strongest to shock from Malaysia (+0.06%), Thailand (+0.06%), Indonesia (+0.05%), and Japan (+0.04%). The negative reactions are found against the U.K. (-0.07%), China (-0.05%), the U.S. (-0.04%), and Singapore (-0.03%).



Source: authors' calculation

Figure 17. The GIRFs of Malaysia's inflation rate to monetary policies shocks.



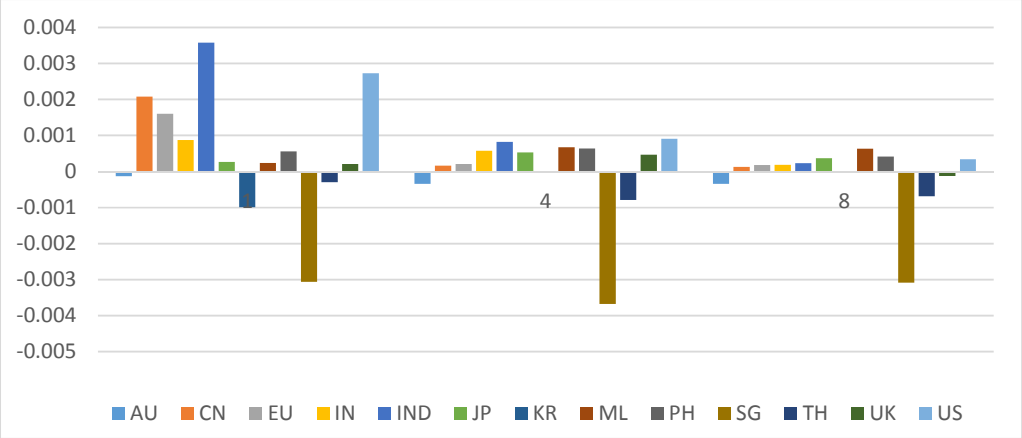
Source: authors' calculation

Figure 18. The GIRFs of the Philippines' inflation rate to monetary policies shocks.

The effects of monetary shock to specific countries on Singapore are still ambiguous. However, it shows that the positive impact is much stronger. The shock from most of the countries causes an increase in Singapore's price. The strongest impact is found for the shock from Indonesia (+0.35%), the U.S. (+0.27%), China (+0.2%), Malaysia (+0.2%), and E.U. (+0.16%).

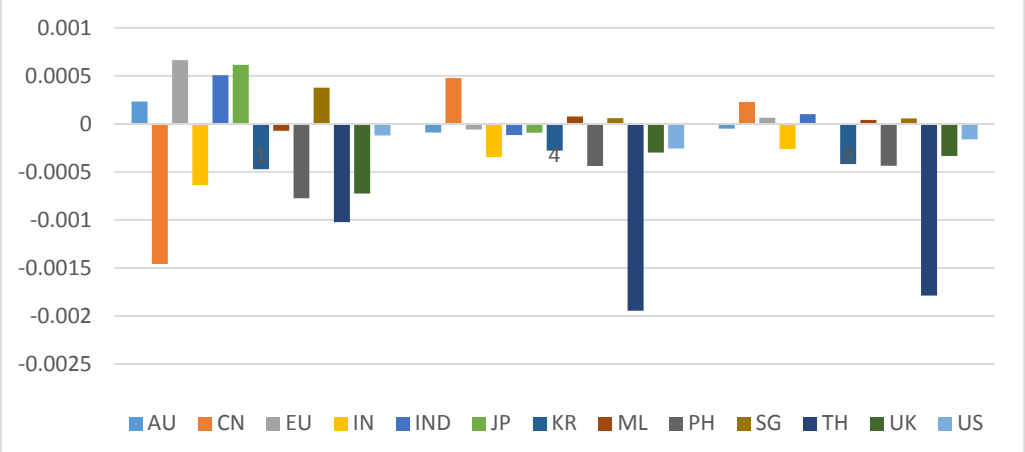
For Thailand, monetary spillovers seem to have little impact on its inflation. Our results show that the negative impact is much stronger. Positive reactions are found on shocks from Singapore (+0.11%), China (+0.11%), Indonesia (+0.06%), and Japan (+0.06%), while negative responses are observed for cases from the U.K. (-0.23%), India (-0.21%), the Philippines (-0.2%), the U.S. (-0.15%), and Korea (-0.07%).

In conclusion, our results show significant internal and external monetary spillovers to ASEAN countries' price. Explicitly, negative shock to other countries' nominal short-term interest rate cause a significant fluctuation in ASEAN countries' inflation. However, the effects are inconclusive. The two offsetting impacts of internal and external monetary spillovers indicate for a need of regional and global policy coordination. Similar to the monetary spillovers effect on real GDP, advanced economies' inflation rate is also more affected than China.



Source: authors' calculation

Figure 19. The GIRFs of Singapore's inflation rate to monetary policies shocks.



Source: authors' calculation

Figure 20. The GIRFs of Thailand's inflation rate to monetary policies shocks.

Conclusion and Policy Recommendation

By employing GVAR modeling to estimate the GIRFs of ASEAN-5 countries' real GDP and inflation to expansionary fiscal and monetary shocks to countries of interest, we can analyze the dynamic response of these variables on the external fiscal and monetary spillovers. The empirical estimations show several important findings. Generally, the overall evidence shows that both internal and external fiscal and monetary spillovers are significant for all the cases of ASEAN-5 countries.

Regarding fiscal spillovers, expansionary fiscal shocks generally cause a significant increase in real GDP of ASEAN-5 countries. However, these impacts on ASEAN-5 countries' inflation are ambiguous. Additionally, our results show that fiscal spillovers from other East Asian countries (in particular, China) to ASEAN-5 countries are much stronger than those from the other advanced Western countries. This indicates that trade is an important channel in shock transmission as trade between ASEAN countries and East Asian countries are more tightly integrated compared to its trade with the rest of the world.

In contrast to fiscal spillover, the effects of monetary spillovers are inconclusive on both ASEAN countries' real GDP and inflation. Additionally, monetary spillover from the U.S. and European countries are larger than those from East Asian countries.

Regarding policy spillovers within ASEAN countries, we find sufficient evidence of internal fiscal and monetary spillovers within ASEAN countries, although internal monetary spillover seems to be stronger than internal fiscal spillovers. At country level, out of the five ASEAN countries included in our study, Indonesia's variables of interest are less affected by external policy shocks. Last but not the least, there is a negative effect of expansionary monetary spillovers from ASEAN member countries, China, and advanced economies on ASEAN-5 real GDP. This implies that the exchange rate is an important channel of shock transmission into ASEAN economies.

As mentioned, our results show significant internal and external policy spillovers in ASEAN-5 countries' economy. The international spillovers created by national economic policies are not always negative, they can be positive. For example, Korinek (2017) found that national economic policies can create Pareto efficiency internationally as long as certain conditions are satisfied, such as national policymakers act competitively and possess a sufficient set of policy instruments to control these policies and there are no imperfections in the world market. In reality, however, it is unrealistic for such condition to be met. This implies that in such an interconnected world where ASEAN countries are actively participating, national economic policies would lead to inverse international spillover effects. Hence, there is a need for appropriate policies to mitigate the inverse impacts of policy spillovers.

First, regarding the policy coordination between the ASEAN countries, as ASEAN countries are economically linked, and evidence of internal policy spillovers between member countries are found in our study, ASEAN policymakers should take into consideration the possible impacts that their policy may have on other member countries. This emphasizes the importance of coordination among policymakers of all ASEAN countries in order to reduce to inverse impacts of intra-regional policy spillovers.

Second, at the regional and global level, the significant impacts of the regional fiscal spillover and global financial spillovers suggest that there is an urgent need of policy coordination at all level (the sub-regional, regional, and global levels). Especially, policy coordination at all levels in monetary policymaking is crucial, as negative monetary spillovers on ASEAN-5 real GDP are found for shocks from many countries and regions, such as ASEAN member countries, China, and advanced economies. To realize these policy needs, the role of international organizations, such as ADB and IMF, may be important, as they could create a room that member countries' policymaker can work and coordinate with each other in policy decision making.

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