MACROECONOMIC LINKAGE AND POLICY COORDINATION IN ASEAN: A GLOBAL VAR ANALYSIS

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ABSTRACT

Title of Dissertation	Macroeconomic Linkage and Policy Coordination in ASEAN: a Global VAR Analysis
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This dissertation aims to comprehensively investigate international macroeconomic linkages among ASEAN-5 countries as well as among ASEAN-5 countries with the rest of the world in a multinational system. Through estimating Global VAR models, the results show several key findings:

1) Generally, ASEAN-5 economies generally respond strongest to real GDP shocks from China, Japan and the United State; especially, China has played an increasing role to ASEAN-5 economy over the study period. However, the responsiveness of ASEAN countries to external shocks varies across countries. Additionally, there exist intra-regional spillovers within ASEAN-5 economies. Regarding to the determinants of ASEAN-5 countries' economic fluctuation, East Asian countries and the United State have played an increasing role. In particular, the main determinants from East Asia countries are real factors, while those from countries outside the region are financial factors.

2) With a specific focus on external policy spillovers, it finds that both intra- and inter-regional fiscal and monetary spillovers have significant impacts on ASEAN-5 countries. External expansionary fiscal shocks generally cause a significant increase in ASEAN-5 countries' real GDP; especially, the effects of fiscal spillovers from other East Asian countries (especially, China) are much stronger than those from advanced Western countries. In contrast to fiscal spillover, the effects of monetary spillovers are inconclusive and monetary spillovers from advanced Western countries are stronger than those from East Asian countries. Interestingly, intra-

regional policy spillovers among ASEAN countries are also found; particularly, intra-regional monetary spillover seems to be stronger than intra-regional fiscal spillovers.

3) Due to inverse impact of external spillovers on ASEAN-5 countries which indicates the need of policy coordination, the study tried to investigate the impact of introducing a common interest rate on ASEAN-5 countries' real GDP. Generally, a common interest rate would lead to higher GDP growth rate in all member countries in the long run. However, how much each member country could gain depends on which interest rate is applied; such as Singapore and the Philippines seem to gain more from a relatively higher interest rate while a relatively lower common interest rate would lead higher growth rate in the case of Indonesia, Malaysia and Thailand.

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ABBREVIATIONS

Abbreviations	Equivalence
ADB	Asian Development Bank
AEC	ASEAN Economic Community
EU	European Union
ASEAN	Association of Southeast Asian Nations
GDP	Gross Domestic Product
GARCH	Generalized Autoregressive Conditional Heteroskedasticity
GVAR	Global Vector AutoRegressive
GIRF	Generalized Impulse Response Functions
GFEVD	Generalized Forecast Error Variance Decomposition
DSGE	Dynamic Stochastic General Equilibrium
PPP	Purchasing Power Parity
VAR	Vector AutoRegressive
US	The United State
UK	United Kingdom

CHAPTER 1

INTRODUCTION

1.1 Background to the Study

With globalizing progress, international economic integration has been speeding up in the past decades, in both commodity and financial markets. Many regional integration agreements have been made around the world, especially in Asia and the Pacific. The Association of Southeast Asian Nations (ASEAN) has not been out of this trend. Historically, ASEAN was established in Bangkok in 1967 in order to accelerate the economic growth and various social progresses. Until now, the ten member states of ASEAN (with original five members Indonesia, Malaysia, Philippines, Singapore and Thailand and later joined members—namely, Brunei Darussalam (1984), Vietnam (1995), Laos and Myanmar (1997) and Cambodia (1999)) have created one of the most dynamic developing regions in the global economy. Especially, after the Asian financial crisis in 1997, economic integration has been continuously enhanced within the association as well as with the rest of the world, such as ASEAN+3, ASEAN+6. The regional integration is enhanced more deeply by the establishment of the ASEAN Economic Community (AEC) at the end of 2015. The increasing economic integration in ASEAN countries has been examined and indicated in a vast of literatures; such as Kawai (2005) who suggest that economies in the region have become tightly interdependent through external liberalization, domestic structural reforms and market-driven integration with the global and regional economies and Rana (2006) who also finds that trade and financial integration have been increasing within the region.

Increasing regional economic integration unquestionably brings to ASEAN member states enormously economic opportunities and enhance the competitiveness of the region. It creates a much larger single market of about 600 million people that bring economies of scale and reduce transaction costs; therefore, ASEAN countries

can actively integrate in the global market as a significant participant, not as an insignificant small economy as before. Additionally, East Asia—of which ASEAN are an important part, has become one of three main hubs in the global value chains. This indicates that ASEAN economies are actively participating in an increasing globalized world with the presence of deepening regional economic integration. From now onward, economic integration in ASEAN framework is going to move forward from the free trade area into single market with financial liberalization in AEC framework.

However, economic integration, both theoretically and empirically, does not only bring member countries opportunities and benefits, but also various corollary and risks. As the economy becomes more regionally and globally integrated (i.e., increasing openness of domestic economy), it facilitates enormous channels through which any shock (demand shocks or policy shocks) spillover can easily transmit from one economy to the others. As results, the domestic economy becomes more vulnerable to external shock spillovers. In the presence of deeply intra-regional and inter-regional integration in South East Asia, the risk associated with global economic volatilities could be manifold for countries in the region, because their economies are not only affected by global and inter-regional but also intra-regional shock spillovers; such as shocks affecting one country in the association is likely to affect other member countries as well and this in turn may cause a domino effect of shocks in the region as a whole (Belke, Beckmann, & Czudaj, 2013). Especially, most of ASEAN countries are a small economy which does not have a strong economic fundamentals to protect the economy from the inverse effects of external spillovers. Consequently, the member states economy becomes even more vulnerable to external spillovers which possibly can be transmitted to member countries' economy through various channels.

Since regional economic integration accelerates the complexity of macroeconomic interdependence between member countries as well as between member countries themselves and the rest of the world, it is very challenging to assess risks associated with macroeconomic linkages. Furthermore, the order of the world economy has been changing rapidly, in particular the rise of some emerging economies, such as China and India. This trend may indicate some change in the order

of ASEAN global strategic partners as well. Thus, the determinants of macroeconomic variability of ASEAN countries need to be explored in order to verify this statement.

In order to reduce the vulnerability of member countries to external spillover, as well as to achieve a successful regional economic integration—in sense that its benefits outweigh risks associated, the primary condition is homogeneity of member countries in term of preferences, capacities and belief in both social and economic aspect (Kelley, 2010) (note that this dissertation only focuses on economic aspect). Generally, macroeconomic policies such as fiscal, monetary policy and exchange rate regime are used as the main tools to stabilize the economy and to reduce the vulnerability derived from economic integration. Lack of homogeneity, i.e. each member country execute their own policies separately from and differently to other member countries, will make some economies in the region become more vulnerable to external shocks, especially in time of crisis. Hence, many economists suggest that in order to reduce the negative impacts of external shock spillovers member countries should be cooperative to conduct macroeconomic policies. In the other words, harmonization in macroeconomic policies is critical for the success of economic integration (Belke, Beckmann, & Czudaj, 2013).

In fact, however, the main problem that has been hindering the accomplishment of regional economic integration in ASEAN (and will be likely to hinder the effectiveness of deeper integration—AEC) is “the conflict of self-interest”. On one hand, member countries obviously would like to gain benefits from economic integration. On the other hand, they do not want to scarify their national interest and sovereignty to support the common goal of the region. Additionally, the differences still remain among ASEAN member countries in various aspects, especially in macroeconomic policy implementation (fiscal, monetary, and exchange rate policies) despite of many agreements about macroeconomic policy coordination signed between member states. Borbugulov (2014) states that for the case of ASEAN, words and actions are not matched together. “Although ASEAN is a strictly intergovernmental body but there is no glimpse of interest in sovereignty sharing. There have been many announcements about the readiness and desirability of making the cooperation closer and even the possibility of integration, but the words have not

been made in reality and matched by action. It is not really integration but in political or economic cooperation". In fact, evidences from several past global and regional crises—during which each member country separately used its own fiscal, monetary and exchange rate policies to respond to external shocks—have supported Borbugulov's statement. In sum, it is obvious that member countries haven't been ready yet to reduce the autonomy of national macroeconomic policies to harmonize with policies of other member countries and/or to support the common goal of the region. This phenomenon is a treacherous issue, because if each ASEAN member has drastically different priorities of macroeconomic targets, spillover effects from one country to other country could easily emerge and be harmful to some ASEAN members.

1.2 Motivation of the Study

In the context of ASEAN countries which are actively participating in an increasing globalized world with the presence of deepening regional economic integration, it is crucial for the member country to timely estimate and understand both magnitude and duration of the effects of external shocks on their economy, as well as origin of these shocks and through which channels they are transmitted. All of these are important indicators to analyze and explain how economic integration affects domestic economy and its variability. The obtained information in turn can help policymakers to conduct adequate macroeconomic policies in order to closely monitor such risks, reduce and avert further increase of vulnerability and to stabilize the domestic economy of ASEAN-5 countries. However, it is indeed challenging to assess the effects of external shocks due to their exogenous nature and diversity of shocks as well as multiple layers of shocks transmission. Hence, it requires a multinational model setting in which various shocks can be inserted in order to simultaneously capture the interaction of various factors from many countries through different channels and from various sources.

1.3 Objectives of the Study

The dissertation aims to build a multi-country system which allows for investigating various aspects of economic integration and international linkages to achieve three objectives of the dissertation:

1) Identifying the geographical and factorial determinants of ASEAN-5 countries' macroeconomic variability as well as assessing the extent, speed and size of spillovers that materialize in reaction to external shocks.

2) Investigating the effects of intra-regional and inter-regional monetary and fiscal policy spillovers on the real GDP and inflation of ASEAN-5 countries,

3) Counterfactually analyzing the impact of a common monetary policy on the real GDP and inflation of ASEAN-5 countries under various scenarios.

The first objective is to obtain an overview how ASEAN-5 are actually linked with other countries and regions over the study period (from 1985 to 2012). I will primarily examine effects of intra-regional and inter-regional spillovers from external real GDP shocks as well as the transmission channels through which these spillovers are transmitted to ASEAN-5 economies. Additionally, since all ASEAN-5 countries are emerging economies which have been experienced enormous changes during the study period, the study sample is divided into 2 sub-periods based on the 1997/98 financial crisis in order to analyze how international linkages change overtime as well as obtain more accurate estimation results.

After obtaining an overview about regional economic integration and macroeconomic linkages, the second objective will focus on examining intra-regional and inter-regional policy spillovers over study period (from 2001 to 2015). In the current milieu, fiscal and monetary policies induced by other countries (especially, by large countries such as regional neighbors and other developed countries) noticeably affect ASEAN countries which in turn have only limited degrees of freedom in following an independent path (Capannelli & Houser, 2009; Auerbach & Gorodnichenko, 2013). 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 countries to countries, this in

turn may cause inverse impacts on others economies. Especially, from experience of the global financial crisis in 2008, many ASEAN countries introduced expansionary monetary and fiscal policies in response to the crisis. However, the policy responses were different across ASEAN countries. Those individual and uncooperative actions in turn may be harmful to other member countries.

Following the estimation results of the second study objective which finds inverse impacts of intra- and inter-regional policy spillovers and suggests that policy coordination may be needed to mitigate the risks arisen from those inverse impacts. However, it is difficult to define the degree of policy coordination between ASEAN countries. Hence, the third objective is to examine the impact of a counterfactual common monetary policy (i.e., a common interest rate) on member state's real GDP growth and inflation. With the availability of current research methodologies, it is difficult to estimate an optional common interest rate for every ASEAN-5 country, because each member state has been pursuing different monetary preferences. Therefore, what can be done in this dissertation is to create alternative counterfactual scenarios, in each of which it is imagined that ASEAN-5 countries would introduce the same monetary preference. This setting allows for forecasting real GDP growth and inflation of each member country under alternative scenarios, then comparing the outcomes of counterfactual forecast with those of actual forecast. The differences between counterfactual and actual forecast will provide information about the impacts of a common monetary policy on ASEAN-5 economy.

1.4 Knowledge Gap and Relevance of the Study

For the case of ASEAN, there is a vast of theoretically and empirically studies covering the related topics which are classified into three strands of literature: (1) regional economic integration, (2) the international linkages and spillovers, (3) policy coordination. However, these studies have mostly dealt with these topics separately; even in the same topic like international linkages and spillovers, financial and trade linkages are mostly investigated separately. Additionally, these studies mostly employ the bilateral countries model approaches which are not able to simultaneously capture all the interactions of factors of various countries as well as the impacts of these

factors on ASEAN-5 countries variables of interest. However, there are still no study which build a multi-country model to comprehensively examine on international economic linkages and policy coordination only for the case of ASEAN-5 countries.

Hence, this study aims to fill the knowledge gap by building a multi-country model to comprehensively investigate the impacts of external spillovers and counterfactual policy coordination on ASEAN-5 economies, their transmission channels, as well as the sources of domestic economic fluctuation.

Methodologically, there are two main approaches in modeling global economy in the existing literature. The first approach is to construct and parameterize a DSGE model and the second approach is to place identifying restrictions on a VAR model (Brinner and Naknoi, 2003). However, due to curse of dimensionality, DSGE and traditional VAR models are not suitable for this study due to the data limitation, as the model requires a vast amount of parameters in modelling interaction across different economies (Dees, Pesaran, & Smith, 2007).

In accordance with the objectives of the study, the most suitable approach for the study is the one that can model a multi-country system and overcome the curse of dimensionality. Principally, GVAR model proposed by Pesaran, Schuermann, and Weiner (2004) is constructed by combining separate models for each country and linking core variables within each economy with the corresponding trade-weighted foreign variables to simultaneously estimate interactions of all variables in the world economy. Hence, GVAR approach is able to overcome the limitation of traditional global modelling approaches (i.e. curse of dimensionality issues). Additionally, GVAR approach also provides a global modeling framework for a quantitative analysis of the relative importance of different shocks and channels of transmission mechanism as well as investigating the impact of counterfactual policy coordination on the domestic economy (Dees et al., 2007). Considering all above mentioned points, GVAR approach is used in this study.

The estimation results of data analyses of each corresponding study objective will provide several implications for policymakers. Firstly, information regarding to shock transmission channels are important for policy institutions to conduct appropriate policies to mitigate the vulnerability to foreign factors. For example, if the trade channels are important, then policymakers might need to diversify their trading

commodities as well as trading partners. Otherwise, if the financial linkages are important, they might need to impose capital controls in the financial market. Secondly, information regarding to the impacts of external spillovers and counterfactual policy coordination on ASEAN-5 countries may help policymakers to closely monitor the associated risks and to conduct appropriate monetary and fiscal policies in order to reduce the negative impacts and stabilize the domestic economy. Finally, the information regarding to the geographically and factorial determinants of domestic macroeconomic variability will help policymakers understand the importance and impacts of regional economic integration on their economy as well as change in the order of strategic global partners, so that they can conduct or adapt appropriate policies to deal with their foreign partners.

1.5 Organization of the Study

The rest of the chapters are organized as follows. Chapter two present literature review on related theories and methodologies. Chapter three describes the reasons for methodology choice as well as the details of the methodology. Chapter four, five and six present detailed literature review on topics related to each study objective and discussion on the results obtained from the data analyses. Finally chapter seven presents the conclusions and recommendations.

The dissertation is structured as following

Chapter 1: Introduction

Chapter 2: Review Related Theories and Literatures

Chapter 3: Methodology

Chapter 4: International Interdependences and the Sources of Economic Fluctuation in ASEAN

Chapter 5: Measuring Fiscal and Monetary Policies Spillovers in ASEAN

Chapter 6: What if ASEAN Member Countries Implement Common Monetary Policy: A Counterfactual Analysis?

Chapter 7: Conclusion and Policy Implication

CHAPTER 2

REVIEW RELATED THEORIES AND METHODOLOGIES

In this chapter, various strands of related literatures (especially, the ones with a special focus on the case of ASEAN countries) are reviewed in order to have a broad understanding about how external shock spillovers are empirically and theoretically transmitted and affect the domestic economy. It starts with reviewing economic integration theories to explain how countries are linked and what prize and price the member countries can get/or pay, as well as the conditions leading to a successful economic integration. Then, it continues to review the literatures explaining how economic integration affect domestic economic volatility which in turn has impact on domestic economy. Finally, research methodologies applied in studying related topics are reviewed.

2.1 Overview about Benefits and Drawbacks of Economic Integration for Member Countries and the Need of Policy Coordination

Theoretically, benefits of joining a regional economic integration are classified based on two major theories. First, based on static effect theory, economic integration creates comparative short-run growth (level effect) because of increase in economic competitiveness, better allocation of production factors, and higher economic efficiency. This, in turn, leads to relatively lower prices, higher real income and lower unemployment. Second, based on dynamic effects theory, it helps member states to achieve long-run growth due to obtaining higher capital stock, increasing economies of scale and scope, more investments in research and development, higher innovation rate, accelerated technical progress (Shad, 2011).

However, deeper economic integration comes with various drawbacks and risks for participating countries. The first drawback is the traditional trade diversion

(Balassa, 1961), which implies that trade is diverted from a non-member country to a member country despite the inefficiency in cost. For example, a country has to stop trading with a low cost manufacture in a non-member country and trade with a higher cost manufacture in a member country. And another drawback is regarding to national sovereignty. By joining in regional integration, member state is required to give up some degree of control over its key policies like trade, monetary and fiscal policies. The higher the level of economic integration, the greater the degree of controls that needs to be given up. In reality, giving up a high degree of national sovereignty is not what a nation wish for and is willing to do (Shad, 2011). From overall perspective of economic integration, homogeneity in all aspects, which can only attain if member country gives up certain degree of sovereignty, is required to achieve a success economic integration. This interest-conflict is main reason for lack of success in various regional economic integration of communities or associations.

In attempt to explain the reasons for the failures of regional economic integration in practice, Kelley (2010) also states that heterogeneity among regional members is the core challenge for regional economic integration. Heterogeneity generally takes three forms. The first form is the differences in political and policy preferences. It implies that member countries may prefer different political solutions to their common problems, or they may disagree about how to distribute the costs and benefits of cooperation among themselves (Schelling, 1997). The second form is the divergence of national capacity in implementing regional polices. Less developed countries may have less administrative capacity, or their economic or political fundamentals may not be conducive to stable coordination with other countries in the region. The last form is the differences in information and beliefs, i.e. member countries may have different political norms about domestic governance, sovereignty, and interstate interaction. These differences in beliefs hinder the member countries from adopting policies and enforcing agreements about regional economic integration (Keohane, 1984). In conclusion, heterogeneity among member countries in preferences, capacities, and beliefs is the core challenge of regional economic integration. If the member states are very diverse in national sovereignty goals, it is less likely that the integration will be successful. Like the case of ASEAN, all

member countries want to level up integration between them, but they did not ready to give up on their national sovereignty goals.

From economic perspective, regional economic integration increases the presence of foreign factors in the domestic economy, it will expose the domestic economy to larger fluctuation associated with the external factors and make domestic economy becomes more vulnerable (Belke, Beckmann, & Czudaj, 2013). Hence, in order to minimize integrated-related vulnerabilities, more coordination, and, in certain area, harmonization is needed, especially in macroeconomic policy.

The role of macroeconomic policy harmonization in the success of regional economic integration and also in reducing the effect of external shocks is implied in various literatures. Shams (2003) claims that even if all trade prerequisites are fulfilled in corresponding to an integration agreement among member countries, the difference in their macroeconomic policies in combination with the lack of coordination among member countries could reduce the potential gains of economic integration. Kahnert, Richards, Stoutjesdijk, and Thomopoulos (1969) and Hirschman (1971) also argue that to ensure the durability of trade agreements, participating countries should attempt to harmonize their internal monetary and foreign exchange policies.

2.2 The Impact of Economic Integration on Domestic Economic Volatility

In this section, I will review how increasing interdependence of economic activities between countries due to economic integration may generate more risk and uncertainty for member country's economy. Economic integration in the literature mostly refers to financial and trade integration. They are also considered as two major channels through which the impacts of global and intra-regional shocks are transmitted between countries. Hence, I will review the literatures related to the impact of financial and trade integration on economic volatility which is an indicator for the uncertainty that a member country has to confront.

Theoretically, as an economy is deeply integrated with other economies in both real and financial markets, this can lead to higher distortion of transmission mechanism and create higher economic volatility if the member countries do not have

stable fundamentals (level of development and homogeneity between countries). However, the impact of trade and financial integration on volatility is ambiguous according to the literatures.

Regarding to the impact of trade integration on domestic economic volatility, Krugman (1993) argues that the impact of trade integration on macroeconomic volatility depends significantly on patterns of trade specialization and the nature of shocks. If trade linkage is associated with increased inter-industry specialization across countries and industry-specific shocks are important in driving macroeconomic variability, then trade linkage may increase output volatility. Additionally, Razin and Kose (1994) find that if shocks are highly persistent, then they could increase the volatility. However, if increased trade linkage is associated with increased intra-industry specialization across countries, which leads to a larger volume of intermediate trade, then it could lead to a decline in output volatility.

Similar to trade linkage, the existing literatures also do not provide a clear conclusion about the theoretical impact of financial linkage on economic volatility. On one hand, greater financial integration theoretically could cause higher economic volatility because it may facilitate financial spillovers into member economies which in turn may cause inverse impacts on domestic economy. Additionally, increase in foreign capital inflows to developing countries due to higher financial integration might be misallocated into speculative or low-quality investment opportunities; this consequently leads to more volatility. Especially, in time of crisis, financial integration can also increase economic volatility as it exposes the country to large and sudden reversal of capital flows. Finally, financial integration can enhance greater production specialization in member countries which however leads to the amplification of sectorial shocks and their transmission between countries (Evans & Hnatkovska, 2006). On the other hand, many academics argue that financial integration can reduce the domestic economic volatility of member countries. Obstfeld (1994) states that financial market integration reduces short-run output volatility due to several reasons. First, greater financial integration allows for risk diversification which in turn allows for consumption smoothing (i.e. it enables countries to borrow in “bad” times and save in “good” times), therefore, it reduces consumption volatility. Additionally, less developed countries (like ASEAN-5

countries) could also benefit from financial integration by inducing capital flow from more developed countries.

To explain to the ambiguous conclusion about the relationship between financial integration and economic volatility, many academics try to investigate this matter in more comprehensive scope and find out that the effect of financial integration on economic volatility depends on various factors. According to Baxter and Crucini (1995), the growing financial integration has wealth effects on member countries which combined with the risk diversification of different asset market structures. Hence, it generally increases the volatility of output but reduce the volatility of consumption. Additionally, Obstfeld and Rogoff (1995), Senay (1998) and Buch, Dopke, and Piedzioch (2002) and Buch and Piedzioch (2005) find that the impact of financial integration on the volatility of output and consumption depends on the nature of shocks. In the presence of different policy shocks (monetary or fiscal), the impact of increasing financial integration on volatility of output and consumption are different. Nonetheless, similar to Batxer and Crucini's findings, the opposite effect of financial integration on volatility of output and consumption are also found. Finally, Kose, Terrones and Prasad (2006) add that financial development play important role in determining this relationship.

2.3 Volatility and Economic Growth

The literatures related to the relationship between volatility and economic growth are also inclusive. They can be classified into 2 strands of literatures.

In the first strand of literature, it states that an increase in volatility may cause a temporary decrease in economic activity. Bernanke (1983), Dixit and Pindyck (1994) examine the traditional mechanism—namely through irreversible investment—which changes in volatility affect economic activity. In this framework, exogenous changes in volatility cause irreversible investment to be postponed and hence a fall in the current level of economic activity. Bloom (2009) examines the relationship between volatility and output growth for the case of the U.S. He finds that increases in volatility generate a quick drop and rebound in industrial production. Hirata, Kose, Otrok, and Terrones (2012) also support Bloom's finding in their study for the case of 18

advanced economies. They find that, in response to a volatility, GDP falls and then rebounds. Additionally, it is found that advanced and emerging economies respond to uncertainty differently. Carriere-Swallow and Cespedes (2013) show that due to the presence of credit constraints the emerging economies suffer deeper and more prolonged impacts from uncertainty shocks in comparison with advanced economies. This conclusion is consistent with the recent work of Christiano, Motto, and Rostagno (2014), and Arellano, Bai, and Kehoe (2012). Finally, by observing the households' side, Leland (1968) and Kimball (1990) find that uncertainty may cause a decrease in output growth because uncertainty regarding the future stream of labor income and dividends will encourage household to increase their precautionary savings. This, in turn, leads to a decrease in consumption, hence demand and output.

In the second strand of literatures, it states that the impact of volatility on economic activity could also be positive from a theoretical perspective. Such as, Mirman (1971) suggests that if there is a precautionary motive for savings, then higher volatility should lead to higher savings rate, and hence a higher investment rate. Additionally, Oi (1961), Hartman (1976) and Abel (1983) also state that if labor can be freely adjusted, and the marginal revenue of capital is convex in price; uncertainty may increase the level of the capital stock and, therefore, investment.

To explain to reasons for the ambiguous justification about the relationship between volatility and economic growth. Persaran et al. (2014) suggest that there are two main reasons. First, it is very difficult to empirically establish the direction of causality between volatility and economic activity, because spikes in uncertainty may be the result of adverse economic conditions rather than being a driving force of economic downturns. Additionally, both uncertainty and activity may be driven by the same set of common factors (Gilchrist, Sim, & Zakrajsek, 2013). Second, in standard theoretical models, activity rebounds when uncertainty is resolved. Hence, in order to study this relationship, it requires a persistent increase in volatility to explain a persistent downturn in activity. However, in the fact, volatility is not very persistent. For example, during the recent global financial crisis, fluctuation quickly deteriorated back to normal levels after spiking in 2008, while world output growth continued to be depressed several years. Persaran et al. (2014) conclude that "volatility is a symptom rather than a cause of economic activity fluctuation."

2.4 Methodologies Employed to Investigating International Linkages

Deeper regional economic integration leads to extensive trade and financial integration not only between member countries and also between member countries and the rest of the world. Regarding to financial linkage, transmission channels are categorized of several types, such as the correlated information channel, the wake-up call hypothesis, the liquidity channel, the cross-market hedging channel, and the wealth effect channel. Regarding to trade linkages, cross-border vertical linkages, i.e., international trade in intermediate goods, play a key role in trade linkage (Yahamoto, 2014). Hence the study of spillover through trade and financial linkage will also involve in investigating the evidence from these mentioned types.

Based on the existing literature, there are various approaches to study international linkages, but three most popular approaches applied are GARCH, VARs and DSGE.

In this study, however, the main objective is to model a multi-country system to comprehensively investigate the impacts of external spillovers and counterfactual policy coordination on ASEAN-5 economies, their transmission channels, as well as the sources of domestic economic fluctuation. GARCH models seem not to be suitable, since GARCH is mostly applied in studying volatility spillover in finance. Therefore, only VARs and DSGE approaches are reviewed. Finally, I will review briefly related literature covering the case of ASEAN. The detailed review regarding to each specific topic will be presented in the corresponding chapters.

2.4.1 Dynamic Stochastic General Equilibrium Approach

2.4.1.1 Introduction about Dynamic Stochastic General Equilibrium Approach

DSGE modeling was initially developed in response to Lucas critique which suggests that the macroeconomic model should contain parameters. Basically, DSGE models are derived from microeconomic foundations and their parameters are functions of some “deep parameters” (related to preferences, technology and resource constraints), such as discount factor, elasticity of substitution among goods, elasticity of inter-temporal substitution, elasticity of labor supply, etc. These "deep parameters"

can be considered as independent of the economic (monetary) policy (Slanicay, 2010).

Historically, the dynamic equilibrium has been firstly developed since 1970s by Lucas and Prescott; however, the first model considered as a real DSGE model is formed by Kydland and Prescott (1982). After Kydland and Prescott's first DSGE model, some other macroeconomists also continued to develop it further, such as Prescott (1986) and Long and Plosser (1983). The earliest models include infinite-lived and identical households who stochastically maximize intra- and inter-temporal utility over consumption and leisure, firms which use capital and labor in production of an aggregate good under assumptions of constant-returns-to-scale technology and net investment as driving force of the change in capital stock. These early DSGE models, however, were received a lot criticism. Such as, DeJong and Dave (2007) argue that DSGE models focus only on the role of supply shocks and ignore the existence of frictions. Therefore, the predictions of macroeconomic dynamics by the early DSGE models did not fit the actual data. Ingram, Kocherlakota and Savin (1994) suggest more shocks should be added in the DSGE models because as the number of shocks is less than the number of endogenous variables, the solution to the DSGE will not represent the true data generating process.

Consequently, DSGE models have been continuously improved and become more realistic and sufficiently flexible to fit the data as more structural shocks and frictions have been added on both the real and financial factors. Nowadays, DSGE models are not only attractive from a theoretical perspective; they have also become a useful tool for forecasting and quantitative policy analysis (An & Schorfheide, 2007).

The main reasons for widely applications of DSGE models are their advantages over other approaches (Smets & Wouters, 2003).

1) Firstly, DSGE models provide a theoretical discipline on the structure of the estimated model. Hence, it is really helpful for modelling in the cases of lacking informative data.

2) Secondly, DSGE models are robust to the Lucas critique (1976) and appropriate for policy analysis, because they can relate the reduced-form

parameters to deeper structural parameters which are less likely to change in response to changes in the policy regime.

3) Finally, micro-founded DSGE models undeniably provide a theoretically consistent framework as well as a fully integrated framework for testing macroeconomic theories and for quantitative policy assessment.

However, due to the complex nature of DSGE models, there are still many limitations of DSGE models. Generally, the models are criticized mainly for their assumptions, their solution strategies, the complexity of their solutions, and for their overall implementation in the decision making process at political institutions.

1) Caballero (2010) discusses the 'pretense-of-knowledge' syndrome and argues that "the DSGE approach confuses the precision it achieved within its own narrowly defined framework with the precision it achieved about the real world." Hence, he also argues that academics should go beyond the bound that DSGE model offer, i.e. research and methodology should be diversified.

2) De Grauwe (2010) pointed out another limitation of DSGE models. He states that the coherent framework of analysis that DSGE models provide comes with a cost of restricting acceptable behavior of agents to dynamic utility maximization and rational expectations. Furthermore, these models rely on a number of ad hoc assumptions about habit persistence, search and adjustments costs to fit the data.

3) Finally, with the rapid economic globalization, any economy in the world may be characterized as a complex system, with many interacting heterogeneous agents operating in a non-stationary environment with various weak and strong links between them, subject to occasional contagion and herding effects and other structural breaks. Persaran et al. (2014) argue that the usual micro-foundations of standard DSGE models may not capture such complexity. Additionally, they comment that "there are also a range of features of the data, such as them observed persistence of the variables, the equity premium puzzle and the forward premium puzzle, that raise fundamental questions about the basic framework. Macro DSGE models tended to respond to these features either by introducing ad hoc frictions that do not disturb the basic structure or by restricting the observed variables

included in the model to avoid confronting the puzzles directly, thus creating a protective belt of procedures around the core, that insulate them from falsification."

2.4.1.2 Empirical Literatures

In the existing literature, there are many studies that apply DSGE approach to build open economy settings in order to study the impact of international spillovers on domestic economy.

Gali´ and Monacelli (2005) builds an extended New Keynesian DSGE model to analyze the macroeconomic implications of alternative policy regimes for the small open economy, namely domestic inflation, CPI-based Taylor rules, and an exchange rate peg. The model of Gali´ and Monacelli was extended by other macroeconomists, such as Monacelli (2005)—who incorporated price-setting retailers and incomplete exchange-rate pass-through, and Justiniano and Preston (2010)—who added habit persistence in consumption and partial indexation to inflation.

Razafindrabe (2005) develops an estimated multi-country open economy DSGE model with incomplete exchange rate pass-through (ERPT) for the Euro-area to model global international linkages and to assess the international transmission of shocks.

Adolfson et al. (2005) modify the benchmark of closed economy monetary business cycle model of Christiano, Eichenbaum, and Vigfusson (2006) into a medium open economy model. In their DSGE model, they firstly introduce the incomplete pass-through of exchange rate movements, prices of import goods used in private consumption and investment in the physical capital stock, as well as to prices of export goods sold to the foreign economy. Additionally, they also add financial friction into the model based on the traditional idea that the domestic households' ability to borrow and lend at a risk-adjusted nominal interest rate in the world financial market. Finally, following Smets and Wouters (2003), they introduce a large number of shocks in the economy, and estimate the model using Bayesian techniques on Euro area data.

Smets and Wouters (2007) estimate a DSGE model for the US economy using seven macroeconomic time series by applying a Bayesian likelihood approach. The model incorporates many types of real and nominal frictions and seven types of structural shocks to investigate the relative empirical importance of the various

frictions to business cycle fluctuations as well as to estimate the cross correlation between output and inflation.

Rudolf and Zurlinden (2014) also employ Bayesian techniques to estimate a DSGE model for the Swiss economy in order to examine the effects of international factors and the trade-off between output growth and price stability. In the model, two economies—namely, a small home economy and a large foreign economy— are featured with five types of agents (households, producers of tradable commodities, producers of non-tradable commodities, retailers, and monetary authority), nominal and real frictions, and a number of shocks. Additionally, they also estimate impulse responses and variance decompositions from a DSGE-VAR model in order to evaluate misspecifications and results of forecasting experiments.

2.4.2 Vector Autoregression (VAR) Approach

2.4.2.1 Introduction about VARs approach

Another the widely acknowledged methodology for international linkage research is the VAR approach proposed by Sims (1980) and considered as an alternative to the large scale macro-econometric models. According to Sims, all variables appearing in the structural models could be endogenous in reduced-form VARs and empirical researches should use small-scale models identified via a small number of constraints.

The reduced-form in VAR models is presented as following:

$$\boldsymbol{x_t = A(L)x_{t-1} + \varepsilon_t} \qquad \textbf{(2.1)}$$

Where

1) x_t represents the vector of endogenous variables,

2) L denotes lag operator, A(L) is a matrix of reduced-form coefficients relating past variable values to current values,

3) And $\boldsymbol{\varepsilon_t}$ is a vector of reduced-form errors with covariance matrix $\sum_{\boldsymbol{\varepsilon}}$.

The applications of the VAR models in studying the international linkages—which can be measured by the fluctuation of economic variables in response to external shocks—are usually through impulse responses—measuring the

effects of the different shocks on the variables of study, and variance decomposition—measuring the relative importance of the different shocks to the variation in the different variables. Additionally, different shocks in a VAR model can be identified by using the long run restrictions. This characteristic of VARs enables researchers to decompose a non-stationary variable (like output) into a trend (the non-stationary component of variable due to shocks which have a permanent effect) and a cyclical component (the stationary component of variable due to shocks which have only short term effects). This allows for a more flexible interpretation of macroeconomic fluctuations.

However, the estimated reduced-form VARs is criticized for lack of economic structure revealed in the model. Therefore, there would be various alternative implications for the estimation results from the same data. Consequently, to overcome these limitations, two important extensions of the reduced-form VAR have been proposed: (1) Bayesian VAR (BVAR) and (2) structural VAR (SVAR).

The BVAR approach is originally developed by Litterman (1980), Doan, Litterman, and Sims (1984) and Litterman (1986). The original BVAR models imposes Theil-Goldberger inexact restrictions on the VAR coefficients through the use of hyper-parameters, so called "the Minnesota prior"—which reflects the belief that economic systems generally follow a multivariate random walk and in which the equations can be estimated separately, hence it is easy to implement. According to Bewley (2002), the BVAR has improved forecast performance over the unrestricted VAR both by reducing the inefficiency associated with over-parameterization and in correcting coefficient bias resulting from series non-stationarity.

SVAR is developed by Bernanke (1986) and Sims (1986) in attempts to make use estimated reduced-form VARs to examine macroeconomic structure. SVARs can identify the patterns from the data that will prevail across a set of incompletely specified dynamic economic models with a minimum of identifying assumptions. Additionally, SVARs also contribute to the understanding of aggregate fluctuations and clarify the importance of different economic shocks.

Recently, as the world economies becomes more integrated, it is required to construct a global macroeconomic model of a multi-country system, which must be able to include various domestic, foreign and global variables that provide

transmission channels of information and shocks across economies (Dees et al., 2007). However, the wide range of inter-connections in the world economic system poses issues of dimensionality (the curse of dimensionality), since there are certainly going to be a large number of variables and decision making units involved. Therefore, procedures that use theory and the structure of the data to overcome the curse of dimensionality are required. As result, the infinite VAR (IVAR) structure for high dimensional inter-connected systems is introduced (Chudik & Pesaran, 2011). Especially, the Global VAR (GVAR) is a particular application of the IVAR approach. The GVAR is a two-step procedure. In the first step, small-scale-country-specific model are estimated conditional on the rest of the world. These models are represented as augmented VAR models, denoted as VARX* and feature domestic variables and weighted cross-section averages of foreign variables, which are also commonly referred as "star variables" and treated as weakly exogenous (or long-run forcing). In the second step, individual country VARX* models are stacked and solved simultaneously as one large global VAR model. The core of the GVAR methodology is the trade weight matrix that relates the endogenous to the exogenous variables of the model. In sum, GVAR is constructed by combining separate models for each country linking core variables within each economy with the corresponding trade-weighted foreign variables. "In this way, we are able to provide a general, yet practical, global modeling framework for a quantitative analysis of the relative importance of different shocks and channels of transmission mechanism" (Dees et al., 2007).

The outstanding advantage of the reduced-form VARs is that they are able to describe the rich dynamic structure of the relationships between economic variables and avoid the imposition of exclusion restrictions that often were criticized as being ad hoc and untested (Sims, 1980). Additionally, they also have the advantage over traditional large-scale macro-econometric models in that the results are not hidden by a large and complicated structure (the "black box"), but are easily interpreted and available. Sims argued that VARs provide a more systematic approach to imposing restrictions and could lead one to capture empirical regularities which remain hidden to standard procedures. In contrast, the results from policy exercises on large scale macro-econometric models are hard to compare and recreate, and can

easily be amended by their users with judgmental ex-post decisions. Finally, the lack of consensus about the appropriate structural model to use has led many economists instead to favor the use of a VAR model to examine the effects of different policies.

However, VAR models have also been much criticized, although the criticism usually refers to particular applications and interpretations of empirical results, rather than the methodology itself.

1) Firstly, VARs model are criticized for lack of theoretical or statistical justifications in choosing identification—most often lagged endogenous variables. It is contrast to the traditional macro-econometric procedure where variables could be classified as either endogenous or exogenous. The exogenous variables were determined outside the system and could therefore be treated independently of the other variables. Such as, Cooley and Dwyer (1998) claim that modeling macroeconomic time series systematically as pure VARs is not justified by the underlying economic theory.

2) Secondly, Ericsson, Hendry and Doornik (1997) criticized that the VAR approach has to be estimated to low order systems; therefore all measurement errors or misspecifications of the model—such as effects of omitted variables—will also induce unexplained information left in the disturbance terms. This may lead to major distortions in the impulse responses (this may cause problem of over-interpreting the evidence from VAR models), making them of little use for structural interpretations. However, they emphasized that this problem does not imply that that impulse response is useless, but reminded instead that academics need to have a careful empirical analysis when specifying the VAR.

3) Thirdly, Faust and Leeper (1997) criticized that due to its limited number of variables and the aggregate nature of the shocks, a VAR model should be viewed as an approximation to a larger structural system. Additionally, the lack of exclusion restrictions cause a disadvantage of VARs models that the large number of parameters is required estimation in large systems, typically leading to over parameterization and poor out-of-sample forecasting performance.

2.4.2.2 Empirical Literatures

In literature, many academics have been applying VARs approach in studying the international interdependence.

The first strand of literatures consists of studies employed traditional VAR approach. Stock and Watson (2005a, 2005b) investigate the volatility of economic activity in G7 economies by using SVAR approach to separately identify common international shocks, the domestic effects of spillovers from foreign idiosyncratic shocks, and the effects of domestic idiosyncratic shocks. Canova et al. (2007) also study the properties of G-7 cycles by using a multi-country Bayesian panel VAR model with time variations, unit specific dynamics and cross country interdependences. Bagliano and Morana (2009) employ Factor Augmented Vector Autoregression (FAVAR) model to examine the international co-movements among a set of key real and nominal macroeconomic variables in the US, UK, Canada, Japan and the euro area for the 1980-2005 period. Explicitly, they analyze the relative importance of four global factors which they label "inflation factor", "output growth factor", "stock return factor" and "oil price factor". They identify structural idiosyncratic shocks by imposing exclusion restrictions on their contemporaneous effect on all national variables across countries. Following Bagliano and Morana (2009) and Belke and Rees (2014) also employ SVARs analyze co-movements among some macro variables across the G7 countries and the euro area in order to examine the importance of global factors for the transmission of monetary policy and business cycles. Different from the study of Bagliano and Morana, Belke and Rees's focus on analyzing the structural causalities between different global shocks and gauge spillover effects from global to national variables. Additionally, they implement separate VARs for each country or region and thus neglect feedback effects between countries. Hence, their approach allows a more straightforward economic interpretation of the unobservable global factors.

The second strand of literature covers studies which employ GVAR approach to examine the international linkages; such as the following studies:

1) To analyze transmission of shocks across countries with main focus on the euro area economy, Dées et al. (2007) investigate the effect of a variety of shocks, including shocks to US equity prices, oil prices, US short-term interest rates, as well as US monetary policy shocks on the euro area economy.

2) To examine impact of oil price shocks and other key factors on global inflation over time for the case study of OECD countries, Anderton, Galesi,

Lombardi, and di Mauro (2010) estimate the impact of increased imports from low-cost countries on manufacturing import prices and then Phillips curves.

3) International linkages of the Korean economy are investigated by Greenwood-Nimmo, Nguyen, and Shin (2012).

4) Feldkircher (2013) investigates the inter-linkages between emerging Europe and the global economy.

5) By combining trade and financial weights, Sun, Heinz, and Ho (2013) investigate cross-country linkages in Europe.

6) In order to investigate the sources of macroeconomic (namely, of output and inflation) variability in Latin America countries, Boschi and Girardi (2011) apply GVAR to quantify the relative contribution of domestic, regional and international factors to the fluctuation of domestic output. Bosshi et al. (2013) replicate their previous study for the case of European countries, both within and outside the European Monetary Union (i.e. Germany, Italy, Austria, the UK and Poland)

7) Recently, with the rapidly rise of emerging economies, the world order of dominating economy have been changing. Hence, GVAR has been also applied in investigating the changing role of leading countries in the world economy; such as Dées and Saint-Guilhem (2011), Chudik and Smith (2013), Feldkircher and Korhonen (2014), Cesa-Bianchi, Pesaran, Rebucci, and Xu (2012), De Waal and van Eyden (2013), Cashin, Mohaddes, and Raissi (2014). All of these studies found an increasing role of China in the global economy.

8) GVAR also allow us to investigate counterfactual scenarios of fiscal and monetary policies. Pesaran, Smith, and Smith (2007) and Dubois, Hericourt, and Mignon (2009) investigate counterfactual scenarios of a monetary union membership. Pesaran, Smith, and Smith (2007) analyze counterfactual scenarios by investigating empirically the consequences of a scenario had UK joined Euro in 1999. In the contrast, Dubois, Hericourt, and Mignon (2009) tried is to answer the counterfactual question of the consequences of no euro launch in 1999 for the case of Italy.

2.4.3 Literatures Related to ASEAN Countries

The existing literatures regarding international spillovers and transmission channels (i.e. financial and real channels) with the focus on ASEAN countries are still limited. Most of studies covered East Asia countries as a whole. Moreover, they generally examine real and financial linkages separately. Hence, these literatures will be classified into two strands

The first strand is financial linkage. In the existing literature, GARCH, VAR and DSGE approaches are most frequently employed. First, studies which employ GARCH approach mostly estimate the international financial contagion. Chiang, Jeon, and Li (2007) use a dynamic conditional-correlation approach to investigate the contagion in stock markets in Asian economies. Yiu, Ho, and Choi (2010) investigate the dynamics of correlation between 11 Asian stock markets and the US stock market. Next, using an asymmetric generalized dynamic conditional correlation model (AG-DCC), Kenourgios and Padhi (2012) also examine both equity and bond markets of emerging economies and provide evidence of contagion related to the subprime crisis of 2007. Dimitriou, Kenourgios, and Simos (2013) investigate the global financial crisis and emerging stock market contagion by using multivariate fractionally integrated asymmetric power ARCH (FIAP-ARCH) dynamic conditional correlation (DCC) framework. Similarly, using the same FIAP-ARCH DCC framework, Dimitriou and Kenourgios (2013) investigate the interdependence of US dollar exchange rates expressed in other major currencies. Second, there are some studies which employ VAR approach. Gimet (2011) uses structural VAR to specifically examine the impact of recent global financial crisis on real macroeconomic variables.

The second strand is trade linkage. Most of studies focus on international trade in intermediate goods. Pula and Peltonen (2009) employ input–output analysis to investigate the interdependence of emerging Asian countries, the United States, the EU15, and Japan via trade and production linkages. Different from input–output approach, Abeysinghe and Forbes (2005) develop a structural VAR model to examine the impact of shocks transmitted through trade channels to 11 Asian countries, the U.S. and the rest of the OECD. They use a new specification strategy that significantly reduces the number of unknowns and allows cross-country relationships to vary over time. Kim, Lee, and Park (2011) employ a panel VAR model with

identification methodology of Cholesky decomposition to investigate the degree of real economic interdependence between emerging Asia and major industrial countries. Finally, Kim and Lee (2012) adopt a panel VAR approach to investigate cross-country output inter-dependence and consumption relation, and infer the macroeconomic consequences of real and financial integration on East Asian economies, as well as compare the degree of real versus financial integration, the degree of global versus regional integration, and the extent of integration before versus after the 1997/98 financial crisis in East Asian economies. All of the above reviewed literature come with a conclusion that the interdependence of Asian economies with the world increased through trade linkage overtime.

In conclusion, most of the previous studies have dealt with financial and trade linkages separately. There are still no study which comprehensively examine on international economic linkages and policy coordination for the case of ASEAN.

For small open economies, like ASEAN member countries which are deeply integrated in both regional and global economy, it would be difficult to accurately access the external shocks spillovers as well as associated risks. Hence, in order to conduct an appropriate policy to mitigate these risks, policymakers have to solve for some critical questions regarding to international spillovers, such as how external shocks will be transmitted, what is the magnitude of the effect on domestic economy, what is the origin of these spillovers. Hence, studying this topic is extremely important because its findings can provide some policy implications to reduce and to avert further increase of vulnerability ASEAN countries to external shocks. This study therefore aims to fill the knowledge gap by comprehensively investigating external spillovers to ASEAN economies, their transmission channels as well as the sources of domestic economic fluctuation. The figure 2.1 demonstrates the theoretical framework of how shocks, factors, variables are interacted between countries.

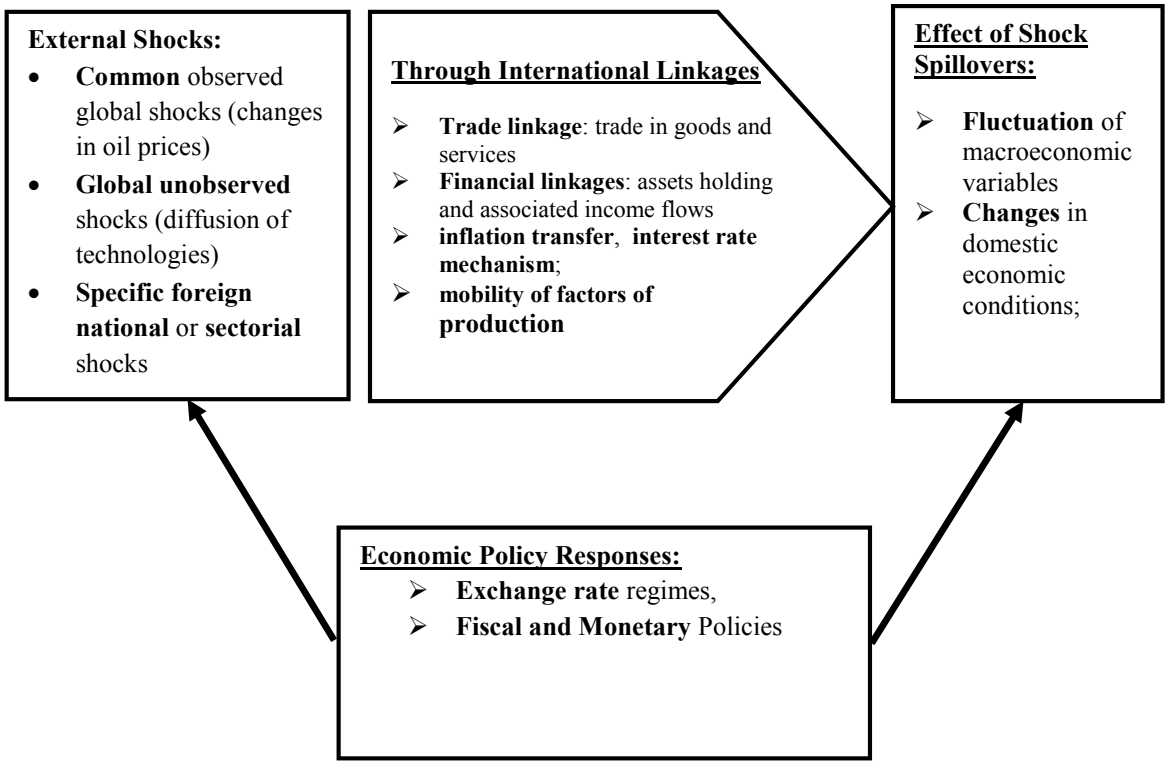

Figure 2.1 Theoretical Framework of the Study

CHAPTER 3

METHODOLOGY

3.1 Why is Global VAR the Most Suitable Approach for the Study?

In doing research, there would not exist the best approach for every study, it rather exists the most suitable approach in accordance with the objectives of each study; because every approach has its own advantages and disadvantages. With this mindset, this section mainly aims to verify the reasons for choosing GVAR approach.

As mentioned briefly in the introduction, this study has three main objectives. The first objective is to identify the sources of ASEAN-5 countries' economic variability as well as assess the extent, speed and size of spillovers that materialize in reaction to external shocks in order to have an overview how ASEAN-5 economies are internationally linked overtime. The second objective is to specifically investigate the effects of intra-regional and inter-regional monetary and fiscal policy spillovers on ASEAN-5 countries' real GDP and inflation. The third objective is to investigate the impacts of a counterfactual common monetary policy on ASEAN-5 countries' economies.

To achieve those objectives, it requires to model a multi-country system where internal and external shocks can be transmitted into ASEAN-5 member country through various channels (both financial and trade linkage). Additionally, the factors that may affect regional and individual economies are also various. They can be classified into 3 groups (Persaran et al., 2004 and Dees et al., 2007):

1) Common factor: it implies common observed shocks such as oil price and commodity price shocks

2) Unobserved factor: such as the diffusion of technological between countries

3) Specific national and sectoral shock: it includes both domestic and international factors

A global model of a multi-country system which encompasses the wide range of inter-connections in the economic system, however, poses issues of dimensionality; because there are unavoidably a large number of variables and decision making units involved. It requires procedures that use theory and the structure of the data to overcome the curse of dimensionality (Chudik & Pesaran, 2011).

In accordance with the objectives of the study, the most suitable approach for the study is the one that can model a multi-country system and can overcome the curse of dimensionality. Therefore, GVAR is the most suitable one at the current development of global modelling approaches. GVAR approach is chosen according to the following reasons:

First, GVAR model allows for estimating the intra-regional and inter-regional transmission of internal and external shocks as well as their impacts on macroeconomic variables in ASEAN-5 countries.

Second, the GVAR approach can simultaneously disentangle several shocks in the same estimation model. Consequently, GVAR can quantify the relative importance of financial and trade linkage on macroeconomic variables as well as the geographical sources of macroeconomic fluctuation of ASEAN economies.

Third, it allows for investigating the impact of a common monetary policy on macroeconomic activities under different alternative counterfactual scenarios.

Fourth, it can overcome the curse of dimensionality which happened in traditional VAR and other approaches. For example, in traditional unrestricted VAR model, the number of unknown parameters are $p(kn-1)$, where p is lags number, k is number of variables and n is number of countries. In a multi-country system, if the data set covers n countries, the number of unknown parameter will rise with n, i.e. $np(kn-1)$. Hence, it is impossible to extend the approach to model inter-relationships across different economies due to data limitation.

Finally, previous studies applied bilateral countries approaches to modeling international linkages among economies can’t observe shocks transmission between economies simultaneously while GVAR can do.

3.2 GVAR Modelling

In this study, I follow the GVAR approach proposed by Pesaran, Schuermann, and Weiner (2004) and Dees, di Mauro, Pesaran, and Smith (2007). Principally, GVAR approach consists of two steps; explicitly, country-specific models are estimated in the first step, 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.

3.2.1 Country Specific Models

Due to data limitation, it is impossible to obtain a full system estimation of the global model. Hence, Pesaran et al. (2004) proposed that parameters of country-specific models can be estimated separately and the foreign variables are treated as exogenously given with respect to the parameter of interest.

For each economy, the global economy variables which have effect on the country-specific variables are classified into three categories:

1) Country specific weighted averages of foreign variables
2) Deterministic variables such as time trend
3) Exogenously determined variable, such as oil price or commodity price

In the world economy, it is assumed that there are $n+1$ countries and one country is chosen as country 0 representing the reference country—generally, the most powerful economy is chosen. In consistent with the existing GVAR literature, the United State is also chosen as country 0 in this study.

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, $\boldsymbol{x_{it}^{*}}$. Specifically, for each country i, the vector error correction model (VECMX*) for individual economy is represented as following equation:

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

$$+\boldsymbol{D_{i0}\omega_t} + \textstyle\sum_{\boldsymbol{l=1}}^{\boldsymbol{s_i}} \boldsymbol{D_{il} d\omega_{t-1}} + \boldsymbol{\varepsilon_{it}} \qquad \textbf{(3.1)}$$

Where

1) t is the country index; $i = 1, 2, \dots, n.$; and t denotes the time; $t = 1, 2, \dots, T$

2) x_{it} is a $k_i x 1$ vector that represents domestic variables

3) ϕ_i is $k_i x k_i$ matrix of coefficient for the lagged domestic variables

4) Λ is $k_i x k_i^*$ matrix of coefficients associated with the coefficients of the foreign variables in contemporaneous and lagged form.

5) x_{it}^* is $k_i^* x 1$ vector of foreign variable specify to country i; these variables are constructed by weighted scheme relevant for the particular country.

6) ω_t is global oil price

7) ε_{it} is country specific shock. ε_{it} is assumed to be serially uncorrelated with a zero mean and non-singular covariance matrix ($\varepsilon_{it} \backsim i.i.d\left(0, \sum_{ij}\right)$.

In the VECM model, shocks are allowed to be contemporaneously correlated, both across equations for a specific country and across countries, it implies that

$$E\left(\varepsilon_{it}, \varepsilon'_{jt'}\right) = \sum_{ij} \quad for\ t = t'$$

$$= 0 \quad if\ t \neq t'$$

In this study, the country specific variables include (note that the country specific variables may vary depending on the study objectives):

$$\boldsymbol{x_{it}} = (\boldsymbol{y_{it}}, \boldsymbol{p_{it}}, \boldsymbol{q_{it}}, \boldsymbol{e_{it}}, \boldsymbol{\rho_{it}}, \boldsymbol{g_{it}})'; \boldsymbol{k_i} = 6$$

1) Real output, denoted as $\boldsymbol{y_{it}}$
2) A general price index, denoted as $\boldsymbol{p_{it}}$
3) A real equity price index, denoted as $\boldsymbol{q_{it}}$
4) Exchange rate, denoted as $\boldsymbol{e_{it}}$

5) An interest rate, denoted as $\boldsymbol{\rho_{it}}$
6) Government expenditure, denoted as $\boldsymbol{g_{it}}$

In the GVAR methodology, the vector of country-specific foreign variables, $\boldsymbol{x_{it}^*}$, 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 $\boldsymbol{x_{it}}$ are not estimated but specified a priori, based on information that measures the strength of bilateral linkages in the global economy. The weights, $w_{ij,}$ could be based on trade shares and capital flows.

Trade weights are used in this study. 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-5 countries where 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.

The foreign variables, x_{it}^*, are constructed as weighted averages with country and region specific weights. Specifically, the $\boldsymbol{x_{it}^*}$ are constructed as follows:

$$\boldsymbol{x_{it}^* = (y_{it}^*, p_{it}^*, q_{it}^*, e_{it}^*, \rho_{it}^*, g_{it}^*)'; \; k_i^* = 6} \qquad \textbf{(3.2)}$$

where

1) $y_{it}^* = \sum_{j=0}^{n} w_{ij}^{y} \, y_{it}$
2) $p_{it}^* = \sum_{j=0}^{n} w_{ij}^{p} \, p_{it}$
3) $q_{it}^* = \sum_{j=0}^{n} w_{ij}^{q} \, q_{it}$
4) $e_{it}^* = \sum_{j=0}^{n} w_{ij}^{e} \, e_{it}$
5) $\rho_{it}^* = \sum_{j=0}^{n} w_{ij}^{y} \, \rho_{it}$
6) $g_{it}^* = \sum_{j=0}^{n} w_{ij}^{m} \, g_{it}$

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 3.2 (1-6), 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 can still be maintained.

In practice, data of some variables in some countries are not available for the whole sample period. Fortunately, GVAR does not require that the number of country-specific variables to be the same across *i*. Especially, in the case of the country 0 (i.e. U.S.) , $e_{it} = 0;$ hence, $x_{it} = (y_{it}, p_{it}, q_{it}, \rho_{it}, g_{it})'; k_i = 5.$

3.2.2 GVAR 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.

In general, the GVAR model allows for interactions amongst the different economies through 3 separate but inter-related channels

1) Direct dependence of x_{it} *on* x_{it}^* and its lagged value

2) Dependence of the country-specific variables on common global exogenous variables, such as oil prices

3) Non-zero contemporaneous dependence of shocks in country i on the shocks in country j, measured via the cross country covariance

$\sum_{ij} = Cov(\varepsilon_{it}, \varepsilon_{jt}) = E(\varepsilon_{it}, \varepsilon_{jt}')$

Where $\sum_{ij}$ *is* denoted by $\sigma_{ij,ls} = Cov(\varepsilon_{it}, \varepsilon_{jt})$ which is the covariance of the l^{th} variable in country *i* with the s^{th} variable in country *j*

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 (3.1):

$$\boldsymbol{A_i z_{it} = a_{i0}^* + \sum_{l=1}^{p} A_{il} z_{i,t-1} + \varepsilon_{it}} \qquad \textbf{(3.3)}$$

Where

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

Next, all the country-specific variables are collected together in the *kx1* vector

$$\boldsymbol{z_{it}'} = (\boldsymbol{y_{it}'}, \boldsymbol{p_{it}'}, \boldsymbol{q_{it}'}, \boldsymbol{e_{it}'}, \boldsymbol{\rho_{it}'}, \boldsymbol{g_{it}'})' \quad \textbf{(3.4)}$$

Where $k = \sum_{i=0}^{n} k_i$ is the total number of the endogenous variables in the global model

And

1) $y_t = (y_{0t}, y_{1t}, y_{2t}, \dots, y_{nt})'$
2) $p_t = (p_{0t}, p_{1t}, p_{2t}, \dots, p_{nt})'$
3) $q_t = (q_{0t}, q_{1t}, q_{2t}, \dots, q_{nt})'$
4) $e_t = (e_{0t}, e_{1t}, e_{2t}, \dots, e_{nt})'$
5) $\rho_t = (\rho_{0t}, \rho_{1t}, \rho_{2t}, \dots, \rho_{nt})'$
6) $g_t = (g_{0t}, g_{1t}, mg_{2t}, \dots, g_{nt})'$

In the case where all the six main variables are present across all the countries/regions then *k*=6*n*+5 (note: $e_{0t} = 0$ and e_t at most will be *n* dimensional)

Holding the variables gathered from all countries in the system, the country specific variables can be written in term of z_t

$$\boldsymbol{z_{it}} = (\boldsymbol{x'_{it}}, \boldsymbol{x_{it}^{*\prime}})' = \boldsymbol{W_i x_t} \quad \textbf{(3.5)}$$

where W_i is a *(ki +ki*)x k* matrix of fixed known constants defined in terms of the country-specific weights w_{ij}^{x} $(w_{ij}^{y}, w_{ij}^{p}, w_{ij}^{q}, w_{ij}^{e}, w_{ij}^{\rho}, w_{ij}^{m})$. 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 (3.3) and (3.5), we get

$$\boldsymbol{A_{i0} w_i x_t} = \boldsymbol{a_{i0}^{*}} + \sum_{l=1}^{p} \boldsymbol{A_{il} w_i x_{t-l}} + \boldsymbol{\varepsilon_{it}} \quad \textbf{(3.6)}$$

By stacking individual models:

$$\boldsymbol{G_0 z_t} = \boldsymbol{a_0^{*}} + \boldsymbol{a_1 t} + \sum_{l=1}^{p} \boldsymbol{H_l x_{t-l}} + \boldsymbol{\varepsilon_t} \quad \textbf{(3.7)}$$

Where:

$$G_0 = \begin{bmatrix} A_{00}W_0 \\ \cdots \\ A_{n0}W_n \end{bmatrix};\ a_0^* = \begin{bmatrix} a_{00}^* \\ \cdots \\ a_{n0}^* \end{bmatrix};\ a_1 = \begin{bmatrix} a_{01} \\ \cdots \\ a_{n1} \end{bmatrix};\ H_l = \begin{bmatrix} A_{0l}W_0 \\ \cdots \\ A_{nl}W_n \end{bmatrix};\ \varepsilon_i = \begin{bmatrix} \varepsilon_{0t} \\ \cdots \\ \varepsilon_{nt} \end{bmatrix};$$

Since G is a *kxk* dimensional matrix and in general will be full rank and non-singular. Then by multiplying by G^{-1} from the left, the solution to GVAR model is obtained:

$$\boldsymbol{x_t = G^{-1}a_0^* + G^{-1}a_1 + \sum_{l=1}^{p} G^{-1}H_l x_{t-l} + G^{-1}\varepsilon_t} \quad \textbf{(3.8)}$$

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

$$\boldsymbol{x_t = G^{-1}a_0^* + G^{-1}a_1 + \sum_{l=1}^{p} F_l x_{t-l} + G^{-1}\varepsilon_t} \quad \textbf{(3.9)}$$

The dynamics of system are explored by impulse response analysis and variance decompositions which will be presented in the next sections.

3.3 Generalized Impulse Response Functions

In order to analyze dynamics of the estimated GVAR model and to assess the effects of shocks to foreign variables on the ASEAN member state's variables, Generalized Impulse Response Function (GIRF) for vector error correcting models– proposed by Koop, Pesaran and Potter (1996) and developed further by Pesaran and Shin (1998), is applied. 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 VAR model.

Different to the Orthogonalized Impulse Responses (OIR) proposed by Sims (1980) which requires the impulse responses to be computed with respect to a set of orthogonalized shocks, the GIRF 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. It implies that the GIRF is invariant to the ordering of the variables and the countries in the GVAR model. This property of GIRF is an important consideration in applying GVAR approach, because it is very difficult to rank the order of variables and countries in a GVAR model which encompasses too many countries and variables. "Even if a suitable ordering of the variables in a given country model can be arrived at from economic theory or general

a priori reasoning, it is not clear how to order countries in the application of the OIR to the GVAR model" (Chudik and Pesaran, 2014).

Hence, without constraint on ordering of the variables and countries in the GVAR model, the GIRFs provide useful information about the dynamics of the transmission of shocks from the rest of the world to the ASEAN-5 economies with respect to changes in various factors, such as oil prices, GDP, interest rates, exchange rates and so on.

If error $\boldsymbol{\varepsilon}_t$ is assumed to have a multivariate normal distribution, the GIRF measures the effect of a standardized shock of one standard deviation at time t_0 to the j^{th} equation of the GVAR at time t_{0+n} on the expected value of x at t+n:

$$\boldsymbol{GIRF}\left(\boldsymbol{x}_{i,t}; \boldsymbol{\varepsilon}_{jt}, \boldsymbol{n}\right) = \frac{\boldsymbol{R_n G_0^{-1}} \sum_{\varepsilon} \boldsymbol{e_j}}{\sqrt{\boldsymbol{e_j'} \sum_{\varepsilon} \boldsymbol{e_j}}} \quad \textbf{(3.10)}$$

$$with\ n = 0,1,2, \ldots\ ; j = 1,2, \ldots, k$$

where e_j is a vector of dimension k^* with a 1 as the j^{th} element and zeros otherwise if one wants to simulate the responses to a country-specific shock. In case of a global shock to a specific type of variable, e_j has PPP GDP weights that sum to one at the positions of the specific variables in the GVAR and zero elements otherwise. R_n can be computed recursively by using

$$\boldsymbol{R_j} = \sum_{\boldsymbol{l=1}}^{\boldsymbol{n}} \boldsymbol{F_l R_{n-l}} \quad \textbf{(3.11)}$$

With $l = 1.2, \ldots; R_0 = I_n, R_n = 0\ for\ j < 0$

3.4 Generalized Forecast Error Variance Decomposition

To investigate geographical and factorial determinants of economic fluctuation in ASEAN, the Generalized Forecast Error Variance Decomposition (GFEVD) of variables of interest will be estimated. GFEVD is also developed by Koop et al. (1996) and Pesaran and Shin (1998). Although GFEVD can't provide an economically structural identification of the shocks, these can be interpreted as "geographically structural" (Boschi et al., 2008). By comparing the proportion of variable forecast error variance determined by factors, GFEVD allows for estimating both geographical and factorial the determinants of economic fluctuation. Similar to GIRF, The GFEVD is also invariant to the ordering of the variables. Hence, it is suitable for the GVAR framework.

Conceptually, the GFEVD measures the proportion of the variance of the n-step ahead forecast error of the variables of interest (i.e., real GDP) which is explained by conditioning on the non-orthogonalized shocks $G^{-1}\varepsilon_t, G^{-1}\varepsilon_{t+1}, \ldots., G^{-1}\varepsilon_{t+n}$ and allowing for contemporaneous correlations between these shocks and the shocks to the other equations in the system.

The GFEVD is defined as follows:

$$\boldsymbol{GFEVD}\left(\boldsymbol{x_{i,t}; \varepsilon_{jt}, n}\right) = \frac{\boldsymbol{\sigma_{jj}^{-1}} \sum_{l=0}^{h} (\boldsymbol{e_i' F^n G^{-1}} \sum_{\varepsilon} \boldsymbol{e_j})^2}{\sum_{l=0}^{n} (\boldsymbol{e_j' F^n G^{-1}} \sum_{\varepsilon} \boldsymbol{G^{-1\prime} F^{n\prime} e_j})} \qquad \textbf{(3.12)}$$

Equation (3.12) shows the percentage of the variance of the forecast error of x_t n steps ahead explained by non-orthogonalized shocks, allowing for contemporaneous correlations among the variables.

3.5 Counterfactual Analysis

In order to analyze the impact of introducing a common monetary policy in ASEAN-5 countries, different counterfactual scenarios are constructed. In each counterfactual scenarios, it is imagined that "what would happen if ASEAN-5 countries induce a certain common monetary preference".

Counterfactual scenario is created as a restriction on the space of endogenous. It implies that the country specific models of ASEAN-5 countries needs to be

transformed to explain a new set of endogenous variables x_t. In the case of introducing a common monetary policy, the restriction is the equality between ASEAN countries' interest rate.

$$\boldsymbol{\Lambda x_{T+j} = d_{T+j}; j = 1, 2, \ldots \bar{H}} \quad \textbf{(3.13)}$$

Where

1) $\bar{H}$ is commitment time horizon

2) $\Lambda \; and \; d_{T+j}$ are specified such as to ensure that ASEAN countries' interest rate are equalized for a certain periods after forming common monetary policy.

We can then calculate the unrestricted value of x_{T+h} subject to restriction

$$\boldsymbol{\mu_h = E(x_{T+h} | I_T)}$$

And the restricted value:

$$\boldsymbol{\mu_h^* = E(\ (x_{T+h} | I_T), \Lambda x_{T+j} = d_{T+j}; j = 1, 2, \ldots \bar{H})} \quad \textbf{(3.14)}$$

The difference in these expected values indicates the effects of the counterfactual scenario (i.e. introducing a certain common monetary policy) on ASEAN-5 countries' economy.

CHAPTER 4

INTERNATIONAL INTERDEPENDENCES AND THE SOURCES OF ECONOMIC FLUCTUATION IN ASEAN

4.1 Introduction

In context of ASEAN-5 countries which actively participate in an increasing globalized world with the presence of deepening regional economic integration, study on international interdependence is especially crucial because the risks associated with external shock spillovers are manifold due to the complex intra- and inter-regional integration, and the impacts of these risks could be harmful for small and open economy like most of ASEAN-5 countries.

In this chapter, I estimate and analyze the extent, speed and size of the ASEAN-5 economies' responsiveness to the external shocks, as well as the transmission channels and the sources of domestic economic fluctuations. The information regarding to these topics is crucial for policy makers to conduct the suitable fiscal and monetary policy, as well as to choose the suitable level of country's openness via trade and financial liberalization. Additionally, all ASEAN-5 countries are emerging economies which have been experienced enormous changes during the study period (from 1985 to 2012). Hence, to obtain more accurate estimation outcomes as well as analyze how international linkages change overtime, the study sample is divided into 2 sub-periods: (1) before Asian financial crisis (1985-1999) and (2) after Asian financial crisis (2000-2012). The sample division is based on the 1997/98 financial crisis which is marked as a turning point of economic integration in region (Kawai 2005; Rana, 2006; Kim & Gong, 2012). Finally, GIRFs and GFEVD are estimated through constructing GVAR model to achieve the study objectives.

The remaining structure of the chapter is organized as follows. In section 4.2, related literature will be reviewed. Section 4.3 presents the data and model

specification. Section 4.4 presents the dynamic analysis of estimated results, while section 4.5 draws some concluding remarks and policy implication.

4.2 Review of Literature

Despite of abundant literature on international economic interdependence in East Asian countries in general and in ASEAN countries in particular, there is still lack of quantitative studies which build a multi-country system to incorporate a large number of domestic and international variables in order to systematically investigate international linkages. Since the objectives of this chapter are firstly to investigate the impact of international spillovers and then to define the sources of domestic economic fluctuation. Hence, the literatures will be divided into two major strands accordingly.

The first strand of literature is to investigate external real and financial spillovers in East Asian countries. Most of studies apply bilateral countries model to investigate trade and financial linkages separately. Regarding to financial linkages, many studies focus on investigating the contagion and interdependence between economies. Chiang, Jeon, and Li (2007), Yiu, Ho, and Choi (2010), Kabigting and Hapitan (2011), Kenourgios and Padhi (2012), Dimitriou, Kenourgios, and Simos (2013) use GARCH approaches to investigate spillover and international linkages in financial market. Gimet (2011) applies SVAR approach to analyze the impact of 2008 global financial crisis on real macroeconomic variables. Hwa (2013) applies a SVAR approach to examine spillovers of three external shocks in the ASEAN-5 economies, i.e. global demand, commodity price and global financial stress. Regarding to trade linkages, Pula and Peltonen (2009) employ input–output analysis to investigate the interdependence of emerging Asian countries, the United States, the EU15, and Japan via trade and production linkages. Abeysinghe and Forbes (2005) develop a structural VAR model to measure how a shock to one country can affect the GDP of other countries by sampling 11 Asian countries, the U.S. and the rest of the OECD. Kim, Lee, and Park (2011) employ a panel VAR model to investigate the degree of real economic interdependence between emerging Asia and major industrial countries. Finally, Kim and Lee (2012) also employ a panel VAR model to investigate cross-country output inter-dependence and consumption relation in East Asian

economies by comparing the degree of real versus financial integration, the degree of global versus regional integration, and the extent of integration before versus after the 1997/98 financial crisis. These empirical studies suggest that there is a significant increase in trade and financial integration within ASEAN/East Asian region and with the rest of the world; and increased substantially after the Asian crisis, both regionally and globally. This implies increasing impact of external shock spillovers to ASEAN member states' economies.

The second strand is regarding to determinants of economic fluctuation. Park and Song (2011) examined the effects of external shocks on the output of East Asian economies. They pointed out that the factors which play an important role on domestic economic variation varied from countries to countries. Global shocks contribute to relatively large output variations only in the Philippines, whereas regional shocks tend to cause relatively large changes in the domestic output of Singapore and Thailand. The two shocks are equally important in Malaysia. Additionally, Park (2011) finds the evidences of the decoupling of East Asia from its economic interactions—both in trade and finance—with the rest of the world. This "decoupling" of East Asia Business cycle from the world's one implies a changing trend in determinants of macroeconomic variability in region, namely an increasing intra-regional dependences and decreasing inter-regional dependences.

From the existing literature, there is no comprehensive study on these two topics; namely, international spillovers and the sources of domestic fluctuation in the case of ASEAN-5 countries. To investigate such topics simultaneously and comprehensively, it requires a global model of a multi-country system which is able to capture the interaction of macroeconomic variables of many countries through different channels and from various sources in a global context and which enable various shocks to be inserted in. In the existing research methodologies, there are two main approaches in modeling global economy. The first approach is to construct and parameterize a Dynamic Stochastic General Equilibrium (DSGE) model and the second approach is to place identifying restrictions on a Vector Autoregression (VAR) model (Brinner & Naknoi, 2003). However, DSGE and traditional VAR have curse of dimensionality issue. It implies that it requires a vast amount of parameters in modeling interaction across different economies. Hence, these models can't be

applied to model a multi-countries system encompassing inter-relationships across various economies due to data limitation. Additionally, these models applied in modeling inter-linkages that exist among major world economies can't observe shocks transmission between economies simultaneously (Dees et al, 2007). In order to overcome curse of dimensionality issue, Pesaran et al (2004) introduce the infinite VAR approach, namely Global Vector Autoregression (GVAR) model which is constructed by combining separate models for each country and linking core variables within each economy with the corresponding trade-weighted foreign variables.

Since then, GVAR has been widely applied in modeling global economy to examine the international linkages. Dées et al. (2007) investigate the transmission of shocks across countries with main focus on the euro area economy, namely investigating the effect of a variety of shocks, including shocks to US equity prices, oil prices, US short-term interest rates, as well as US monetary policy shocks on the euro area economy. Feldkircher (2013) examines the inter-linkages between emerging Europe and the global economy. By combining trade and financial weights, Sun, Heinz, and Ho (2013) investigate cross-country linkages in Europe. Additionally, some researchers also employ this approach to quantify the sources of macroeconomic variability, such as Boschi and Girardi (2011) study the case of Latin America countries, apply GVAR to quantify the relative contribution of domestic, regional and international factors to the fluctuation of domestic output. Boschi et al (2013) replicate their previous study for the case of European countries, both within and outside the European Monetary Union (i.e. Germany, Italy, Austria, the UK and Poland).

Therefore, based on the current development global economic modelling, GVAR is the most suitable model in accordance with the objectives of this study, because it allows for comprehensively examining the transmission of shocks (through estimating GIRF) and quantifying the determinants of macroeconomic fluctuation of domestic economies (through estimating GFEVD at all level, namely at domestic, regional and the world level. Additionally, previous studies related to modeling inter-linkages that exist among major world economies can't observe shocks transmission between economies simultaneously while GVAR can.

4.3 Data

Given the objectives of this chapter, the real output, inflation rate, real equity price, exchange rate and interest rate are chosen as the main variables of interest. Additionally, to account for possible common factors, the global oil price is also included. In most of country-specific model, these five variables are added. Except for some models, such as Indonesia's and China's ones, real equity prices are excluded due to data constraint.

The dataset modified by Smith and Galesi (2014) is used in the study. This dataset include quarterly data from 1985 to 2012. I use fixed trade weight based on the average trade flow calculated over 1996-1998 and 2009-2011 for two sub-periods respectively.

25 countries from 3 regions, i.e. Asia-Pacific, Europe and America, and one sub-region (ASEAN) are considered in the global VAR models. Table 4.1 presents countries and regions included in the study.

Due to the process of economic integration that apply the common currency and monetary policy interest rate, the eight main countries in the euro area; Austria, Belgium, Finland, France, Germany, Italy, Netherlands and Spain, are grouped together and treated as a single economy, while the remaining 17 countries are modelled 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.

Table 4.1 Lists of Regions and Sub-region Used in the GVAR Model

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

4.4 Empirical Results

In this section, the empirical estimation based on the dynamic analysis of the global VAR model (namely through estimating GIRFs and GFEVD) will be presented. Additionally, the models are estimated over two sub-periods, namely 1985-1999 and 1999-2012 to account for the possibility of the shift in the patterns of international interdependence in Asia after the Asian financial crisis.

Unit Root Tests

To examine the integration properties of the individual series, I 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 4.2 and 4.3 for country-specific and foreign variables respectively.

Overall, the results of unit root test show that all of country-specific and foreign series are integration at the first order, namely I (1).

Table 4.2 Unit Root Test of Country Specific Variables

	CV	ARG	AUS	BRZ	CAN	CH	EURO	INDIA	INDO	JP	KR	MAL	MEX	PH	SG	SWITZ	TL	UK	USA
ADF test																			
y	**-2.89**	0.14	-0.27	0.25	-1.04	0.88	-2.32	1.49	-0.48	-3.19	-3.42	-1.36	-0.25	1.03	-1.90	-0.23	-2.51	-1.79	-1.45
Δy	**-2.89**	-4.56	-6.10	-7.77	-4.37	-3.34	-4.21	-7.57	-6.11	-4.80	-5.47	-5.46	-6.06	-8.87	-5.54	-3.94	-5.90	-3.76	-4.37
Δp	**-2.89**	-2.79	-2.76	-2.04	-5.69	-2.78	-3.35	-5.56	-5.70	-3.49	-3.77	-6.61	-2.20	-4.35	-4.06	-2.67	-5.63	-3.47	-3.41
ΔΔp	**-2.89**	-5.70	-9.76	-8.66	-8.26	-6.59	-7.07	-8.58	-7.02	-7.35	-7.31	-8.38	-5.23	-9.16	-7.63	-7.63	-7.56	-8.95	-8.68
q	**-2.89**	-2.47	-1.94	-	-1.04	-	-2.46	-1.88	-	-2.24	-2.94	-2.55	-	-6.57	-3.17	-1.89	-2.25	-2.44	-1.87
Δq	**-2.89**	-5.94	-7.69	-	-7.29	-	-4.98	-6.75	-	-6.71	-5.55	-6.02	-	-5.04	-7.21	-6.37	-7.08	-6.97	-6.18
e	**-3.45**	-2.03	-1.60	-2.13	-1.65	-2.39	-3.15	-1.27	-2.30	-3.30	-2.84	-2.01	-2.91	-1.60	-1.07	-3.56	-1.92	-3.19	-
Δe	**-2.89**	-7.07	-4.28	-7.12	-7.21	-7.10	-6.98	-6.35	-7.64	-4.68	-7.40	-6.38	-5.06	-5.41	-5.76	-5.02	-6.74	-8.28	-
r	**-2.89**	-2.38	-2.62	-2.28	-1.36	-1.12	-1.38	-3.01	-3.66	-2.91	-1.40	-1.88	-1.65	-1.18	-2.28	-1.91	-2.92	-1.30	-1.75
Δr	**-2.89**	-4.82	-6.03	-8.57	-4.70	-5.70	-4.66	-5.82	-5.88	-3.35	-8.63	-6.45	-9.70	-4.44	-7.41	-3.82	-6.12	-6.23	-4.50
WS test																			
y	**-2.55**	0.64	2.12	1.67	0.96	0.23	1.09	1.62	2.37	1.50	2.42	1.64	0.78	2.14	0.72	0.84	2.50	0.63	0.88
Δy	**-2.55**	-4.66	-5.87	-7.86	-4.59	-3.55	-4.29	-7.73	-6.24	-4.98	-5.63	-5.50	-5.92	-8.24	-5.31	-4.16	-6.07	-3.91	-4.38
Δp	**-2.55**	-2.72	-2.31	-2.29	-5.69	-2.84	-2.85	-5.70	-5.86	-3.49	-3.95	-6.63	-2.02	-4.34	-4.23	-2.71	-5.79	-3.49	-3.65
q	**-2.55**	-2.54	-0.59	-	-0.67	-	-1.17	-1.13	-	-2.29	-1.38	-1.78	-	0.19	-2.45	-0.20	-0.84	-1.13	-0.23
Δq	**-2.55**	-6.10	-7.81	-	-7.46	-	-4.93	-6.63	-	-6.87	-5.75	-5.77	-	-4.25	-7.30	-6.48	-7.25	-7.13	-6.35
e	**-3.24**	-1.89	-1.90	-1.94	-1.90	-2.16	-1.20	-1.45	-2.36	-1.36	-2.59	-2.27	-3.16	-1.90	-1.23	-1.21	-2.06	-0.99	-
Δe	**-2.55**	-7.18	-4.36	-7.25	-7.38	-7.27	-6.85	-6.28	-7.85	-4.26	-7.53	-6.52	-4.89	-5.57	-5.92	-4.51	-6.91	-7.57	-
r	**-2.55**	-1.71	-2.07	-2.52	-0.98	-1.47	-1.01	-3.23	-3.85	-1.48	-1.71	-2.11	-1.24	-0.10	-2.04	-2.17	-2.41	-0.74	-1.37
Δr	**-2.55**	-3.99	-4.16	-8.79	-4.90	-5.84	-4.88	-5.99	-6.11	-3.53	-8.80	-6.61	-9.67	-4.12	-7.55	-4.04	-6.26	-6.33	-4.50

Table 4.3 Unit Root Test of Foreign Variables

	CV	ARG	AUS	BRZ	CAN	CH	EURO	INDIA	INDO	JP	KR	MAL	MEX	PH	SG	SWITZ	TL	UK	USA
ADF test																			
y	**-2.89**	-0.23	-1.18	-0.57	-1.66	-2.25	-0.77	-1.26	-1.63	-0.87	-0.48	-1.51	-1.74	-1.89	-1.30	-2.09	-1.31	-1.80	-0.74
Δy	**-2.89**	-6.59	-5.39	-5.08	-4.78	-5.27	-5.42	-5.63	-5.15	-5.77	-5.51	-5.15	-4.80	-5.13	-5.52	-4.44	-5.55	-4.96	-5.44
Δp	**-2.89**	-1.99	-1.88	-2.48	-1.55	-2.40	-1.81	-1.90	-1.89	-2.37	-1.83	-2.68	-1.67	-2.04	-3.59	-1.67	-1.93	-1.74	-1.32
ΔΔp	**-2.89**	-8.64	-7.09	-5.69	-7.49	-9.23	-8.77	-8.91	-9.73	-7.10	-9.03	-7.26	-7.80	-7.22	-7.89	-7.06	-9.64	-10.57	-6.00
q	**-2.89**	-2.46	-3.34	-2.08	-2.06	-3.01	-2.40	-2.56	-3.25	-2.64	-3.04	-3.25	-2.05	-3.26	-2.87	-2.48	-3.28	-2.38	-2.29
Δq	**-2.89**	-6.83	-6.80	-5.59	-6.37	-6.77	-6.81	-6.91	-6.79	-7.02	-6.88	-6.88	-6.45	-6.84	-7.02	-6.65	-6.75	-6.70	-7.05
e	**-2.89**	-1.64	-0.86	-1.88	-1.37	-2.11	-1.15	-1.23	-1.05	-0.33	-0.54	-0.88	-1.15	-1.36	-0.77	-2.67	-1.20	-2.34	-0.99
Δe	**-2.89**	-6.83	-7.33	-8.03	-8.23	-6.75	-8.10	-7.23	-6.80	-6.77	-7.30	-6.70	-7.17	-6.88	-6.41	-7.17	-7.02	-7.13	-7.79
r	**-2.89**	-2.20	-1.11	-2.09	-1.10	-1.39	-1.42	-1.20	-1.23	-0.96	-1.23	-1.24	-1.08	-1.40	-1.27	-0.83	-1.00	-0.88	-1.03
Δr	**-2.89**	-8.57	-4.91	-4.74	-5.33	-10.37	-10.19	-9.97	-5.84	-9.74	-10.19	-5.22	-9.66	-4.74	-5.31	-9.07	-9.68	-9.33	-11.58
WS test																			
y	**-2.55**	2.09	1.44	1.23	1.26	1.34	1.19	1.29	1.39	1.33	1.43	1.38	1.28	1.37	1.46	1.15	1.45	1.19	1.35
Δy	**-2.55**	-6.69	-5.55	-5.20	-4.85	-5.42	-5.58	-5.83	-5.26	-5.97	-5.68	-5.26	-4.86	-5.27	-5.68	-4.54	-5.70	-5.07	-5.58
Δp	**-2.55**	-2.24	-2.13	-2.38	-1.65	-2.52	-2.02	-2.13	-2.11	-2.51	-2.08	-2.74	-1.94	-2.29	-3.74	-1.62	-2.14	-1.85	-1.26
ΔΔp	**-2.55**	-8.86	-6.54	-5.05	-7.23	-9.39	-8.91	-9.05	-9.91	-7.34	-9.20	-6.91	-8.01	-6.90	-7.57	-7.14	-9.81	-10.57	-6.17
q	**-2.55**	-0.51	-1.25	-0.68	-0.29	-0.79	-0.45	-0.60	-1.29	-0.13	-1.04	-1.10	-0.26	-1.28	-0.55	-1.00	-1.25	-0.81	-0.86
Δq	**-2.55**	-6.97	-6.96	-5.49	-6.54	-6.93	-6.98	-7.07	-6.95	-7.18	-7.04	-7.04	-6.62	-7.01	-7.18	-6.78	-6.92	-6.82	-7.21
e	**-2.55**	0.53	1.45	1.59	2.26	1.28	2.31	1.33	1.55	0.78	1.38	1.33	1.47	1.40	0.29	1.08	1.38	1.14	1.83
Δe	**-2.55**	-7.00	-7.40	-8.17	-8.29	-6.85	-7.94	-7.27	-6.92	-6.93	-7.42	-6.82	-7.26	-6.99	-6.56	-7.02	-7.12	-7.03	-7.96
r	**-2.55**	-2.43	-1.06	-1.32	-0.71	-1.49	-1.52	-1.32	-1.16	-1.07	-1.32	-1.08	-0.97	-1.20	-1.25	-0.66	-0.98	-0.79	-0.83
Δr	**-2.55**	-8.79	-5.10	-4.01	-5.50	-10.53	-10.34	-10.13	-6.00	-9.90	-10.36	-5.38	-9.73	-4.77	-5.47	-9.19	-9.82	-9.46	-11.78

4.4.1 The Response of ASEAN-5 Countries' GDP to the External Shocks

To analyze how ASEAN-5 countries respond to shocks to real GDP of other countries and regions, GIRFs are estimated through stimulating one percentage point negative shock to real GDP of other countries (China, Japan, the U.S.) and regions (ASEAN-5, other East Asian Countries (including China, Japan and Korea), Euro area, Latin America (including Argentina, Brazil and Mexico), and other developed countries (including Canada, Switzerland and the United Kingdom). The GIRFs associated are plotted in figures 4.1 and 4.2 for 2 sub-periods, namely 1985-1999 and 2000-2012 respectively.

These figures plotted the dynamic responses of ASEAN-5 countries' output over a time horizon of 5 years. In most of the case, the results show that negative shocks to real GPD of other countries and regions cause an instantaneous fall in real GDP of ASEAN-5 countries, except for Latin America's one. Additionally, the patterns of ASEAN-5 countries' responsiveness to external shocks are quite similar, this implies that dynamic behaviors of ASEAN-5's real GDP to external shock appear to be moderately correlated. This in turn may be evidence of business cycle convergence in region. Finally, these effects are significant and long lasting; however, their magnitude generally seems to be small.

1) The 1985-1999 Period

In this period, ASEAN-5 countries' outputs react strongest to shock to Japan's real GDP with a maximum decrease of 2 percent, then followed by shocks from China and the U.S. which cause a maximum decrease of 1.5 percent and 1 percent respectively. In term of regional shock, shocks from other East Asian countries have the biggest impact, followed by shock to ASEAN-5 countries. Spillovers from other countries and regions have weak impact on ASEAN5 countries' real GDP.

Comparing the responses among ASEAN-5 countries, each member country reacts differently to shocks from different origins. Indonesia reacts relative strongly to shock from East Asian countries. Moreover, Indonesia also has the highest degree of responsiveness to shocks from the U.S., while Singapore and Thailand react strongly to shock from ASEAN region. In most of the cases, the Philippines is quite unresponsive and Malaysia's responses are moderate in comparing to others.

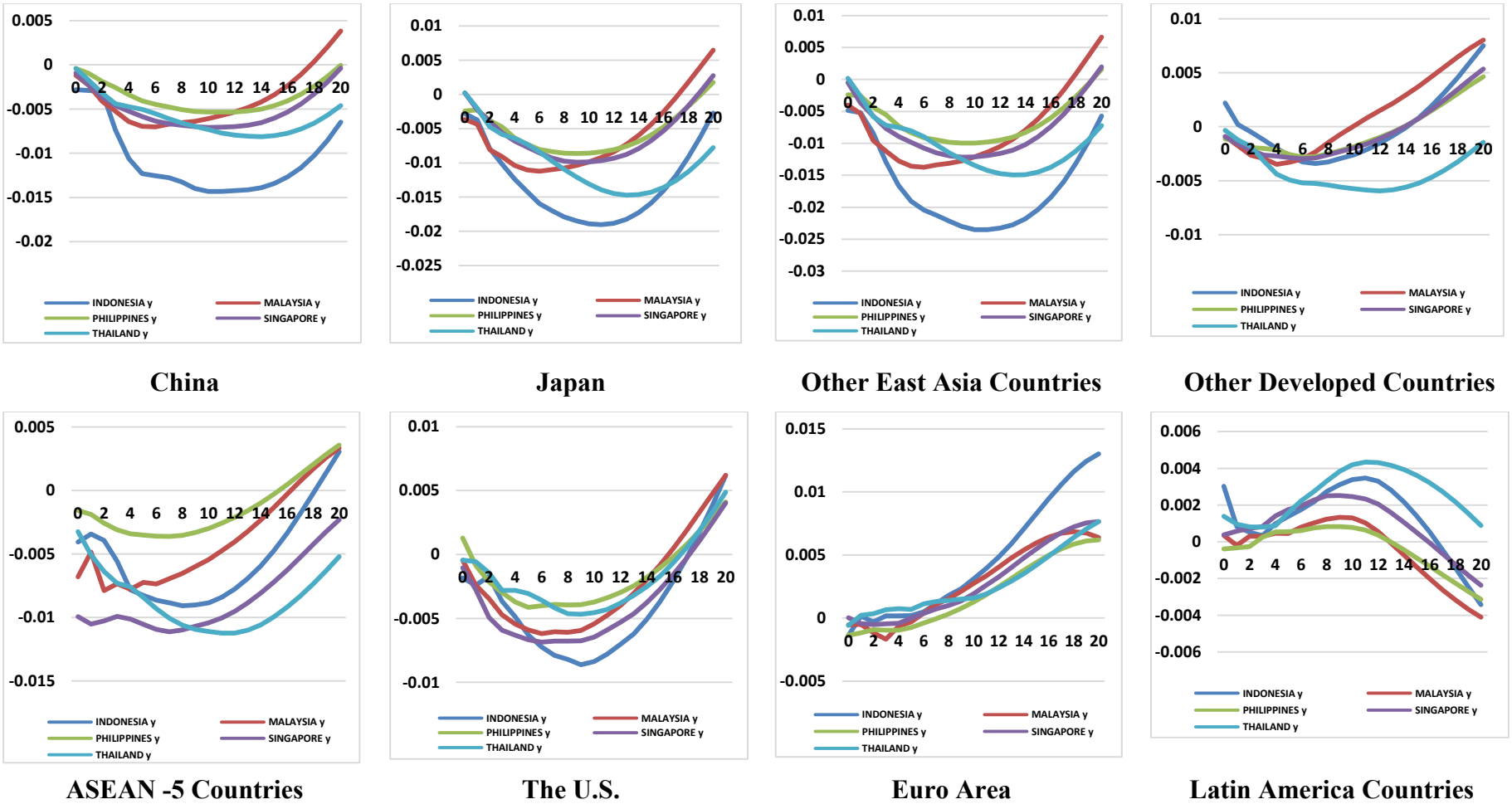

Figure 4.1 GIRFs of ASEAN-5 Countries' Real GDP (1985-1999)

2) The 1999-2012 Period

In this period, the magnitude of shock effect is smaller in comparison to the previous period. Generally, shock to U.S.'s real GDP has strongest impact on ASEAN-5 countries' real GDP (maximum decrease of 0.8 percent), then followed by China's and Japan's shocks which cause a maximum decrease of 0.6 and 0.4 percent respectively. In term of regional shock, regional shock to ASEAN-5 countries' real GDP has the biggest impact, then follow by regional shock from other East Asian countries. Regional shocks from other developed countries, Latin America and euro area have an ignorable impact on ASEAN countries' economies.

Comparing response among ASEAN-5 countries, each member state responds differently to shocks from different sources and changed in comparison to the previous period. Shock to East Asian countries' real GDP has strongest effect on Singapore's real GDP, while having the least effect on Indonesian one. Out of three East Asian Countries, Thailand is very responsive to shock from Japan. Singapore also responded to most to shock to the U.S.'s real GDP. In this sub-period, Indonesia is quite unresponsive. Finally, the Philippines and Malaysia responses are moderate in comparing to others.

In conclusion, country shocks from China, Japan and the US and regional shocks from ASEAN-5 and East Asia have a strong impact on ASEAN-5 domestic economy, while shocks from the rest of the world have a little impact. Among ASEAN-5 countries, each country responds differently to external real shocks; such as Singapore and Thailand respond strongly to external shocks while Indonesia, Malaysia and Philippines's responsiveness is just moderate. This implies that countries like Singapore and Thailand are more vulnerable to external spillovers. Finally, we also found the evidences that the dominant role of countries and regions on ASEAN-5's economies had changed overtime. In the first period, Japan played the most important role, then follows by the U.S. and China. In the second period, the U.S. has become the most influential nation, the followed by China and Japan. At regional level, regional shocks from ASEAN have also become the most important. This indicate that there in an increasing economic linkages among ASEAN-5 countries.

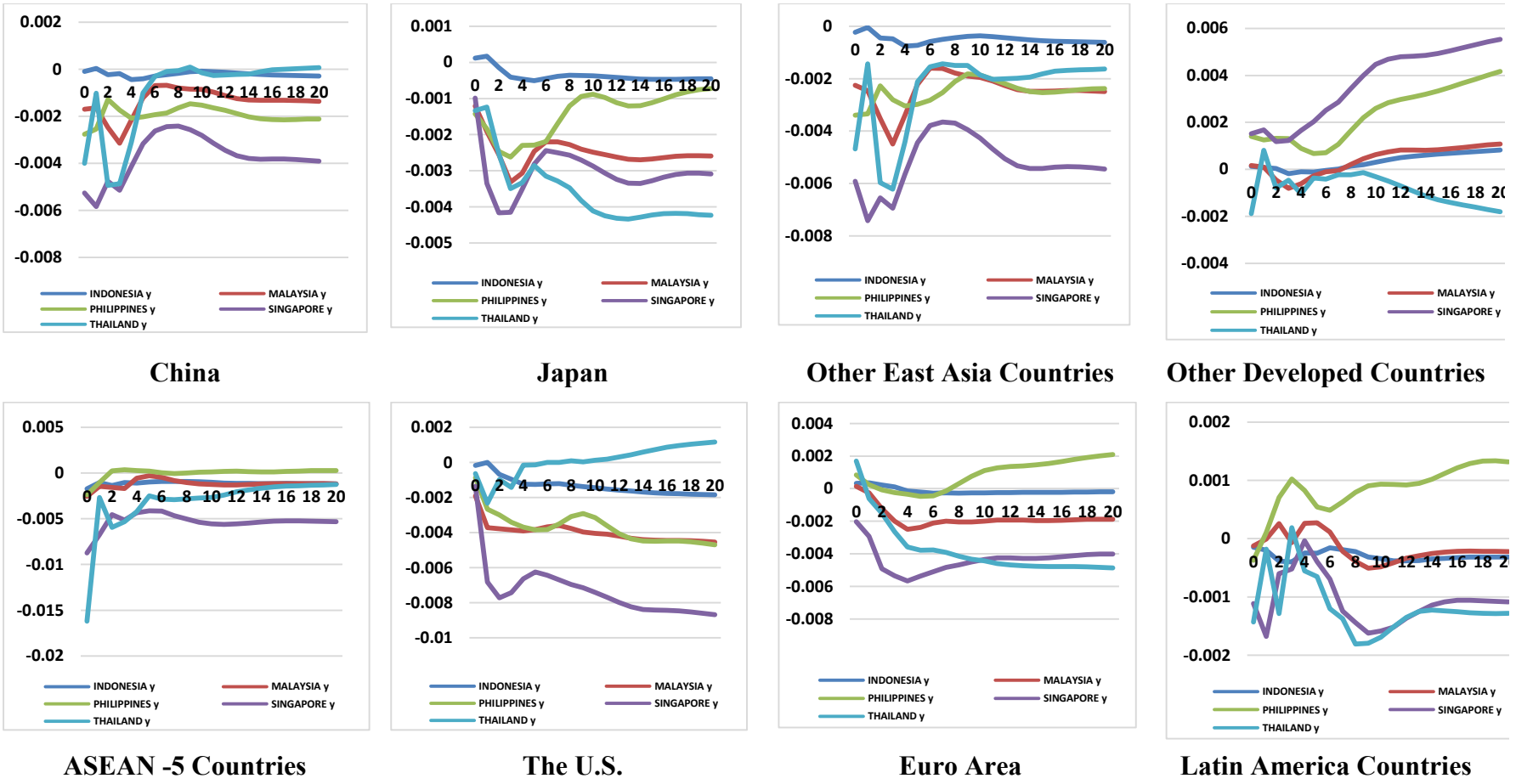

Figure 4.2 GIRFs of ASEAN-5 Countries' Real GDP (2000-2012)

4.4.2 Determinants of the ASEAN-5 Countries' Economic Fluctuation

In order to identify the source of disturbances to real GDP of ASEAN-5 countries based on their geographical origin and factorial determinants, GFEVD for real GDP of ASEAN-5 countries are estimated. It is important to notice that, given the general non-zero correlation between errors, the individual shock contributions to the GFEVD need not sum to unity (Dees et al., 2007). Hence, I normalize the estimated GFEVD which can sum to unity. The determinants classified by geographical origin are presented in tables 4.4 and 4.5, while factorial determinant of domestic fluctuation of ASEAN-5 countries' real output fluctuation are plotted in Figures 4.3 and 4.4.

Table 4.4 Geographical Determinants of ASEAN-5 Countries' Real GDP Fluctuation (1985-1999)

		Other East Asian Countries					Other Countries and Regions						
	Domestic	**ASEAN**	**China**	**Japan**	**Korea**	**Total**	**India**	**Australia**	**EURO**	**Latin America**	**Other developed countries**	**US**	**Oil**
Indonesia													
0	53.66%	4.97%	4.65%	7.03%	0.14%	11.82%	1.37%	1.11%	1.40%	10.40%	6.87%	2.83%	5.01%
4	34.08%	31.22%	4.63%	11.01%	2.80%	18.44%	1.35%	0.96%	0.91%	5.69%	2.69%	2.60%	0.48%
8	24.34%	33.14%	5.59%	12.64%	3.20%	21.42%	1.27%	0.98%	1.66%	7.26%	5.18%	2.97%	0.51%
12	20.02%	30.41%	5.01%	13.27%	2.41%	20.69%	1.59%	0.81%	3.39%	10.34%	8.46%	2.51%	0.51%
16	18.22%	26.55%	4.14%	12.67%	1.82%	18.62%	1.90%	0.76%	4.83%	11.47%	13.01%	2.63%	0.65%
20	17.62%	23.00%	3.59%	10.67%	1.72%	15.97%	2.11%	0.73%	5.40%	11.85%	17.86%	3.35%	0.72%
Malaysia													
0	38.97%	17.63%	1.23%	10.54%	2.64%	14.41%	2.62%	0.70%	1.41%	7.86%	7.56%	0.78%	7.72%
4	20.75%	32.39%	3.91%	10.34%	12.19%	26.44%	0.91%	1.15%	0.84%	6.74%	6.26%	3.63%	0.53%
8	22.83%	32.27%	4.25%	9.95%	8.71%	22.90%	0.98%	1.08%	1.72%	8.33%	6.27%	2.96%	0.33%
12	23.64%	30.30%	3.52%	9.31%	6.70%	19.53%	1.16%	1.04%	3.07%	9.71%	7.78%	2.96%	0.39%
16	23.46%	28.47%	2.92%	7.95%	5.55%	16.43%	1.29%	1.08%	3.78%	10.28%	10.84%	3.47%	0.44%
20	22.31%	26.55%	2.93%	6.63%	4.82%	14.39%	1.37%	1.07%	3.81%	11.78%	13.78%	4.11%	0.40%
Philippine													
0	54.65%	4.83%	1.51%	5.64%	2.36%	9.50%	0.51%	2.92%	1.98%	9.59%	6.26%	9.40%	0.12%
4	29.53%	16.07%	3.86%	12.78%	6.22%	22.85%	0.71%	1.75%	1.52%	9.09%	8.26%	9.43%	0.13%
8	16.74%	21.11%	4.91%	17.30%	5.03%	27.24%	1.29%	0.82%	2.92%	13.14%	9.64%	6.22%	0.07%
12	10.91%	20.82%	4.18%	18.07%	3.33%	25.58%	1.79%	0.62%	4.98%	16.75%	12.72%	4.64%	0.22%
16	7.78%	18.91%	3.34%	16.45%	2.28%	22.07%	2.11%	0.68%	6.25%	18.91%	17.35%	4.42%	0.41%
20	5.97%	17.33%	3.14%	13.16%	2.05%	18.35%	2.23%	0.76%	6.25%	20.87%	21.79%	4.90%	0.45%
Singapore													
0	53.81%	15.22%	4.77%	1.02%	4.67%	10.45%	0.97%	0.46%	1.48%	9.74%	3.54%	3.43%	0.29%
4	26.90%	27.36%	6.12%	5.42%	11.80%	23.34%	1.03%	1.09%	1.50%	6.43%	6.33%	5.23%	0.10%
8	19.43%	30.69%	6.45%	7.76%	8.74%	22.95%	1.31%	1.12%	2.05%	10.44%	7.15%	4.06%	0.05%
12	14.70%	30.75%	5.58%	8.92%	6.64%	21.14%	1.62%	1.25%	3.33%	13.61%	9.24%	3.35%	0.14%
16	11.44%	29.81%	4.58%	8.85%	5.24%	18.68%	1.84%	1.41%	4.45%	14.92%	12.76%	3.41%	0.29%
20	9.31%	28.17%	3.89%	7.72%	4.42%	16.02%	1.94%	1.47%	4.91%	15.84%	16.84%	4.07%	0.36%

Table 4.4 (Continued)

		Other East Asian Countries					Other Countries and Regions						
	Domestic	**ASEAN**	**China**	**Japan**	**Korea**	**Total**	**India**	**Australia**	**EURO**	**Latin America**	**Other developed countries**	**US**	**Oil**
Thailand													
0	65.90%	5.45%	1.01%	3.66%	3.96%	8.63%	1.77%	1.89%	2.12%	6.95%	3.24%	0.51%	3.09%
4	47.69%	20.84%	3.23%	4.62%	6.18%	14.03%	0.97%	1.05%	0.35%	5.38%	6.79%	2.22%	0.25%
8	46.53%	17.65%	3.79%	5.26%	5.17%	14.21%	0.73%	1.12%	0.38%	8.23%	8.63%	2.14%	0.12%
12	43.92%	15.89%	3.61%	6.01%	4.05%	13.67%	0.79%	1.17%	0.95%	11.79%	10.04%	1.47%	0.05%
16	42.38%	14.35%	3.13%	6.28%	3.20%	12.60%	0.87%	1.26%	1.61%	13.10%	12.20%	1.28%	0.07%
20	41.89%	13.16%	2.59%	5.87%	2.65%	11.11%	0.91%	1.32%	2.06%	12.61%	14.81%	1.74%	0.13%

Table 4.5 Geographical Determinants of ASEAN-5 Countries' Real GDP Fluctuation (2000-2012)

		Other East Asia Countries					Other countries and regions						
	Domestic	**ASEAN**	**China**	**Japan**	**Korea**	**Total**	**India**	**Australia**	**EURO**	**Latin America**	**Other developed countries**	**US**	**Oil**
Indonesia													
0	49.83%	12.44%	0.12%	0.36%	2.44%	6.79%	1.86%	0.51%	0.63%	7.30%	6.53%	4.89%	12.07%
4	47.66%	11.85%	2.06%	1.29%	1.82%	6.67%	1.61%	0.74%	0.72%	6.42%	6.04%	9.74%	9.00%
8	47.29%	12.81%	3.45%	1.65%	2.34%	9.98%	2.04%	0.85%	0.81%	5.48%	6.70%	11.56%	5.07%
12	47.39%	13.37%	2.96%	2.14%	2.56%	13.93%	2.55%	1.05%	0.81%	5.33%	6.91%	12.56%	3.53%
16	46.71%	13.88%	2.42%	2.60%	2.64%	15.14%	2.74%	1.30%	0.97%	5.37%	6.96%	13.52%	2.65%
20	46.01%	14.29%	2.11%	2.97%	2.58%	16.38%	3.01%	1.64%	1.21%	5.14%	7.05%	14.22%	2.13%
Malaysia													
0	43.33%	15.57%	8.08%	4.62%	5.05%	16.20%	0.23%	1.58%	0.60%	2.66%	8.08%	7.25%	2.80%
4	28.43%	15.68%	16.06%	5.84%	3.61%	24.08%	0.92%	1.07%	2.32%	3.92%	5.17%	10.17%	4.20%
8	27.54%	16.74%	10.51%	6.06%	2.61%	25.08%	2.47%	1.80%	2.91%	3.17%	6.47%	12.50%	2.78%
12	26.87%	18.01%	7.96%	6.44%	2.42%	24.41%	2.77%	2.23%	2.96%	2.75%	6.76%	13.88%	1.88%
16	26.36%	18.91%	6.88%	6.68%	2.31%	23.76%	2.96%	2.39%	2.99%	2.46%	6.63%	14.68%	1.42%
20	25.95%	19.49%	6.18%	6.80%	2.15%	23.60%	3.16%	2.61%	3.02%	2.28%	6.56%	15.25%	1.14%
Philippine													
0	40.66%	14.17%	10.63%	3.42%	3.47%	18.18%	2.04%	3.05%	2.58%	5.30%	11.90%	1.73%	1.10%
4	21.17%	25.66%	6.50%	5.46%	2.59%	17.84%	2.01%	3.96%	1.57%	5.06%	6.16%	19.87%	2.79%
8	13.35%	31.00%	6.30%	5.04%	2.05%	19.61%	2.09%	4.31%	2.30%	5.11%	5.74%	21.67%	4.21%
12	9.95%	33.29%	6.67%	4.44%	1.81%	20.36%	2.09%	4.60%	4.10%	4.97%	8.97%	18.65%	3.30%
16	7.76%	34.71%	6.19%	4.23%	1.71%	20.72%	2.12%	4.69%	5.38%	5.37%	10.58%	17.78%	2.18%
20	6.61%	35.14%	5.93%	4.18%	1.65%	21.05%	2.20%	4.76%	6.48%	5.27%	12.18%	16.24%	1.70%
Singapore													
0	52.16%	7.93%	4.92%	0.92%	5.00%	12.35%	0.45%	1.82%	2.30%	7.67%	14.42%	0.73%	0.27%
4	38.11%	12.55%	9.15%	2.57%	3.97%	16.70%	1.67%	1.96%	3.48%	6.34%	6.33%	10.51%	1.62%
8	37.47%	13.27%	5.78%	2.95%	2.70%	20.16%	2.97%	2.54%	4.21%	5.22%	7.21%	12.25%	0.96%
12	36.27%	14.02%	4.48%	3.32%	2.37%	20.30%	3.12%	2.77%	4.43%	4.97%	8.11%	13.16%	0.64%
16	35.46%	14.70%	3.92%	3.58%	2.24%	20.07%	3.21%	2.86%	4.60%	4.64%	8.34%	13.78%	0.48%
20	34.96%	15.02%	3.55%	3.74%	2.11%	20.26%	3.34%	3.00%	4.75%	4.38%	8.61%	14.17%	0.38%

Table 4.5 (Continued)

			Other East Asia Countries					Other countries and regions					
	Domestic	**ASEAN**	**China**	**Japan**	**Korea**	**Total**	**India**	**Australia**	**EURO**	**Latin America**	**Other developed countries**	**US**	**Oil**
Thailand													
0	46.45%	15.07%	12.00%	4.41%	1.45%	15.91%	2.52%	0.33%	2.42%	5.05%	9.70%	0.56%	0.44%
4	26.80%	15.66%	18.60%	3.98%	2.64%	31.13%	1.72%	1.55%	4.47%	4.78%	7.83%	5.25%	5.41%
8	19.93%	19.72%	13.69%	4.90%	2.56%	35.99%	2.55%	2.49%	6.22%	5.55%	7.84%	7.77%	4.03%
12	14.48%	24.47%	11.70%	6.26%	2.48%	36.31%	2.85%	2.96%	7.21%	5.60%	7.75%	7.83%	3.09%
16	11.35%	27.48%	10.49%	7.21%	2.40%	36.12%	3.07%	3.20%	8.14%	5.26%	7.70%	7.31%	2.54%
20	9.46%	29.24%	9.60%	7.87%	2.32%	35.97%	3.25%	3.40%	8.95%	5.04%	7.85%	6.84%	2.16%

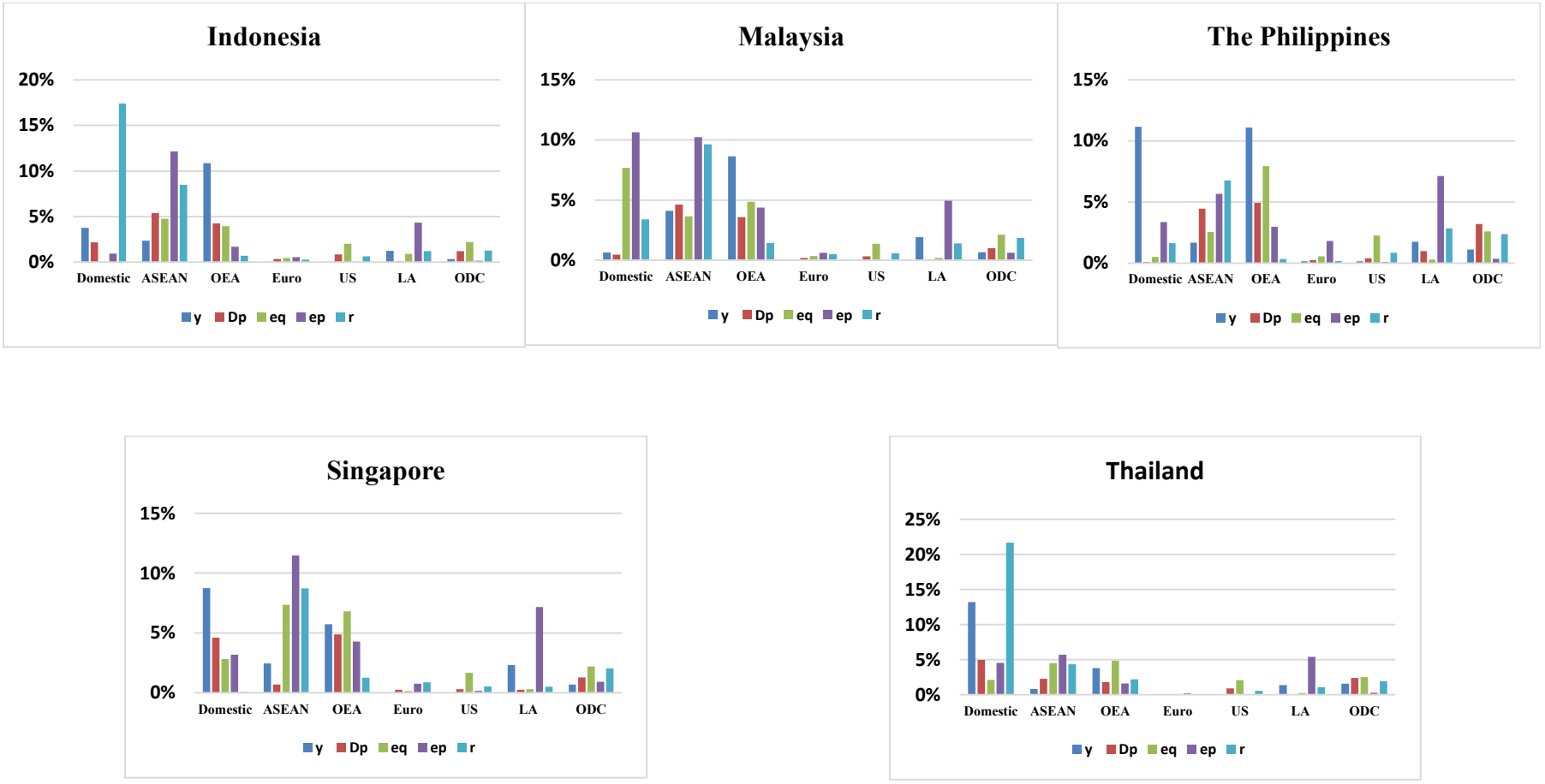

Figure 4.3 Factorial Determinants of ASEAN-5 Countries' Real GDP Fluctuation (1985-1999)

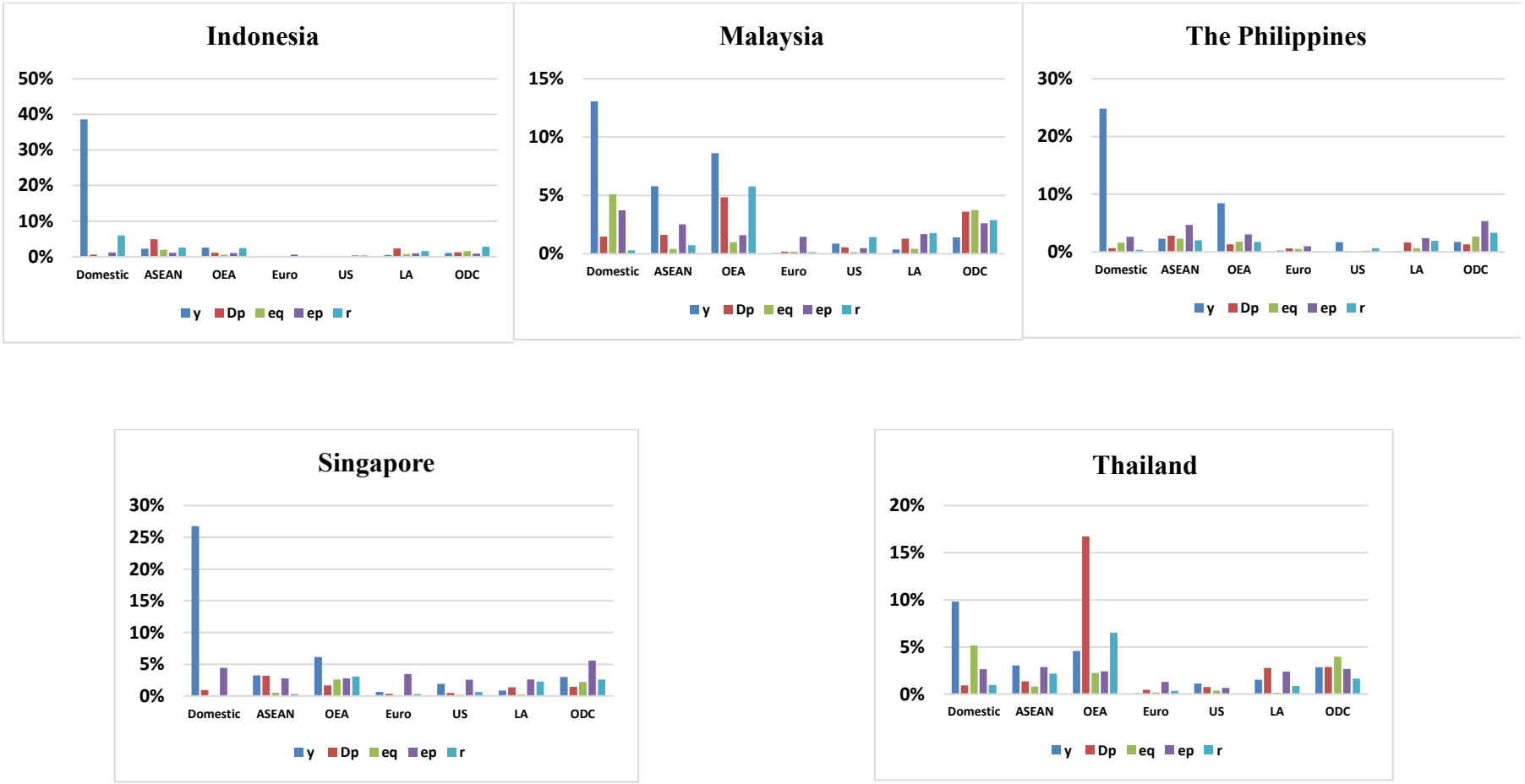

Figure 4.4 Factorial Determinants of ASEAN-5 Countries' Real GDP Fluctuation (2000-2012)

4.4.2.1 Domestic Factors

Overall of the study, the estimated outcomes provide a mixed picture of the role of domestic factors on ASEAN-5 countries' output fluctuation. In all ASEAN-5 countries, domestic factors are predominant (by contributing up to 50% of output variability) at the beginning of the forecast horizon, but their importance constantly diminishes over the 20 quarters of forecast horizon. In 1985-1999 period, domestic factors are dominant only at the contemporaneous quarter in Malaysia and Singapore, only up to 4th quarter in the Philippines and Indonesian, except for the case of Thailand in which they are dominant over the whole forecasting horizon. However, this pattern changed in the next period. Domestic determinants are dominants over the whole forecast horizon in Indonesia, Malaysia and Singapore, while they are only dominant up to 4th quarter in the Philippines and Thailand.

In order to analyze the role of real and financial factors on the domestic economy variability, domestic factors are classified into real and financial determinants. The estimation results show that real and financial factors on ASEAN-5 countries' output fluctuation are varied across countries and across study periods. During the 1985-1999 period, the Philippian and Singaporean real factors play a more important role while in Malaysia and Indonesia, financial factors are more important. In Thailand, both real and financial factors are important. However, since 2000, real factors are dominant in all ASEAN-5 countries. The changing role of real and financial factors between two sub-periods can be explained by the occurrence of 1997/1998 Asian financial crisis which is considered as a turning point of regional economic integration and development. Before the 1997/1998 Asian financial crisis, intra-regional trade is still low, hence, financial factors play important role in economic variability. However, after the crisis, regional trade liberalization has been enhanced and level of intra-regional trade is high, and hence real factors have become more important.

4.4.2.2 Regional Factors

Due to strong economic tie between ASEAN-5 and other East Asian countries (namely, China, Korea and Japan), I will also analyze the role of other East Asian countries in this section.

The estimation results show that, during 1985-1999 period, ASEAN factors play a more significant role than those of other East Asian countries. ASEAN factors contributes about 30 percent of output fluctuation in Indonesia, Malaysia and Singapore, and 20 percent in the Philippines and Thailand. While the East Asian factors contribute approximately 20 percent of output fluctuation in Indonesia, Malaysia, Singapore and about 15 percent in Thailand. However, after 2000, the role of ASEAN factors have been decreasing in comparing to the East Asian factors. ASEAN factors contributes about 30 percent of output fluctuation in the Philippines, and 20 percent in Malaysia and Thailand, about 15 percent in Indonesia and Singapore. While East Asian factors contribute approximately 30 percent of output fluctuation in Thailand, about 20 percent in Malaysia, the Philippines and Singapore, and about 15 percent in Indonesia.

Regarding to factorial determinant, before Asian financial crisis, financial factors from ASEAN contribute the most to domestic variability, while real factors from other East Asian countries are more important. However, the pattern of the most influential factors have been changed after the crisis. Both financial and real factors from ASEAN and other East Asian countries play an important role.

Notably to emphasize that there is a change in regional determinants of ASEAN-5 countries' output fluctuation in the study period, namely the rising role of other East Asian countries comparing to ASEAN and the shift of main role from Japan to China. Additionally, the international linkages via trade channel have been increasing overtime and financial channel is always important over the study period.

4.4.2.3 Rest of the World and Global Factor

Comparing to domestic and regional factors, the contributions of the rest of the world and global factor are relative small. Nonetheless, the results also show some interesting trends. First, the contribution of other countries and region on ASEAN-5 countries' output fluctuations varied across countries and sub-periods. Second, except for the U.S., the role of other countries and regions have been decreasing over the study period. Third, financial factors of the rest of the world contribute more on the ASEAN-5 countries' output fluctuation in comparing to real factors.

In short, GFEVD's estimations suggest that the role that other countries and regions play on ASEAN-5 countries has changed over time. ASEAN's factors has always been important and the role of other East Asian countries have been increasing, especially China. Outside the region, only the United State plays an increasingly significant role in ASEAN-5 economy, while the role of other regions is limited. These findings are consistent with the findings of Kose et al. (2003, 2012) who find that a large fraction of economic fluctuations in developing countries is explained country-specific and idiosyncratic components and the "coupling" of business cycle within developed countries and within emerging markets economies and "decoupling" of business cycles between these two groups of countries.

4.5 Conclusion and Policy Implication

This chapter analyzes how and in what extent external factors affect the domestic economy of ASEAN-5 countries. The empirical results provide several main findings.

First, by comparing the effects of external shocks in real sector (real GDP) from different countries and regions, the shocks from China, Japan and the U.S. and from the East Asia region (including ASEAN-5 countries) have strongest impact on the ASEAN-5 economy. Second, the patterns of responsiveness of the ASEAN-5 countries are somewhat similar, but the magnitudes of effects vary across ASEAN-5 countries. Real GDP of Singapore reacts to foreign shocks more than those of the others; then followed by Thailand, Malaysia, the Philippines and Indonesia, respectively. Third, domestic factors are dominant source of economic fluctuation of ASEAN-5 countries in both sub-periods. Additionally, regional factors play an increasingly important role as well, especially increasing role of other East Asian countries. The shocks from the U.S. output are the only significant source of variation outside the Asian region. Fourth, there is evidence of changing role in regional strategic partners. After 2000, the most important countries have shifted from Japan to China. Finally, both regional real and financial factors are important source of fluctuation for the ASEAN-5 countries, especially the rising role of real factors.

However, financial factors are the main transmission channel of shocks from outside the Asian region.

The evidence of increasing degree of regional and global interdependence gives several important policy implications for the ASEAN's countries. First, an increasing role of the demand shock from East Asia countries shows that intra-regional trade is the important source of economic interdependence. The important roles of China and Japan suggest that the future direction of the ASEAN should emphasize on the enlarged regional collaboration. The ASEAN+3 negotiations that include China, Korea and Japan should be the most suitable scope because it covers the important countries in Asia that affect the fluctuation in most of the ASEAN countries. Second, the evidence of converging trend in dynamic response of ASEAN's real GDP to external shock implies that the regional policy coordination is important for the ASEAN's countries to tackle with the effects of external shocks. However, the common monetary and currency policies within ASEAN may still be not necessary because the magnitudes and timing of the reaction to external shocks are still different among the member's countries. Finally, financial linkage is an important transmission channel of shock from the global economy outside region. The regional collaboration in financial safeguard policy should be the important issue in the ASEAN meeting. For example, the multilateral Chiang Mai Initiative (CMI), should be effectively implemented to strengthen the regional safety net for ASEAN and other East Asian countries from future global economic crises.

CHAPTER 5

MEASURING FISCAL AND MONETARY POLICIES SPILLOVERS IN ASEAN

5.1 Introduction

As ASEAN countries are activating in an increasingly globalized world with the presence of deepening regional economic integration, the member states economy becomes more vulnerable to external policy spillovers from global, regional, and intra-regional sources which possibly can be transmitted to member countries' economy through various channels. 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. 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 (Capannelli & Houser, 2009; Auerbach & Gorodnichenko, 2013).

In this milieu, there is a rising concern about intra-regional (i.e., from any ASEAN country) as well as inter-regional (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.

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 comprehensively monitor their economic fluctuations 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. Hence, in this chapter, GVAR model and GIRFs are estimated to comprehensively examine fiscal and monetary policies spillovers from both international and intra-regional sources to the ASEAN-5 economies in a multinational system.

The remaining structure of the chapter is organized as follows. In section 5.2, related literature will be reviewed. Section 5.3 presents the data and model specification. Section 5.4 presents the dynamic analysis of estimated results, while section 5.5 draws some concluding remarks and policy implication.

5.2 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, the related literatures are classified into monetary and fiscal spillovers.

5.2.1 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 (Fic, 2013; Chen, Mancini-Griffoli, & Sahay, 2014; Albagli, Ceballos, Claro, & Romero, 2018). These papers suggest that the quantitative easing of developed countries 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, 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.

5.2.2 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 (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 (2012, 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, I will employ a multinational country approach to fill this knowledge gap.

5.3 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, the global oil price is also included 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 5.1 presents countries and regions included in the study.

Table 5.1 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		

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.

Unit Root Tests

To examine the integration properties of the individual series, I 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 5.2 and 5.3 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)

Table 5.2 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

Table 5.3 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

5.4 Empirical Results

This section presents the empirical results based on the dynamic analysis of the global VAR model by estimating GIRFs.

The objective of this chapter 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, I 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, GIRFs of ASEAN-5 countries' real GDP and inflation are estimated 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 the estimated models are stable. Therefore, I 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, the responses of each ASEAN-5 countries' real GDP and inflation to these policy shocks are analyzed separately.

5.4.1 Foreign Fiscal Spillovers

5.4.1.1 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 5.1 to 5.5. However, the country member's responsiveness to fiscal shocks varies across countries and regions.

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 the 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, the Philippines, and Thailand, have small and insignificant fiscal spillover to Indonesian real GDP.

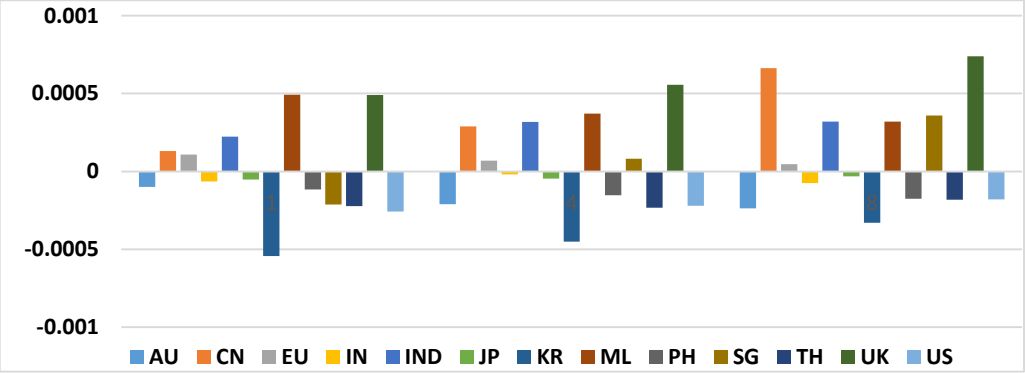

Figure 5.1 The GIRFs of Indonesia's Real GDP to Fiscal Policies Shocks

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.

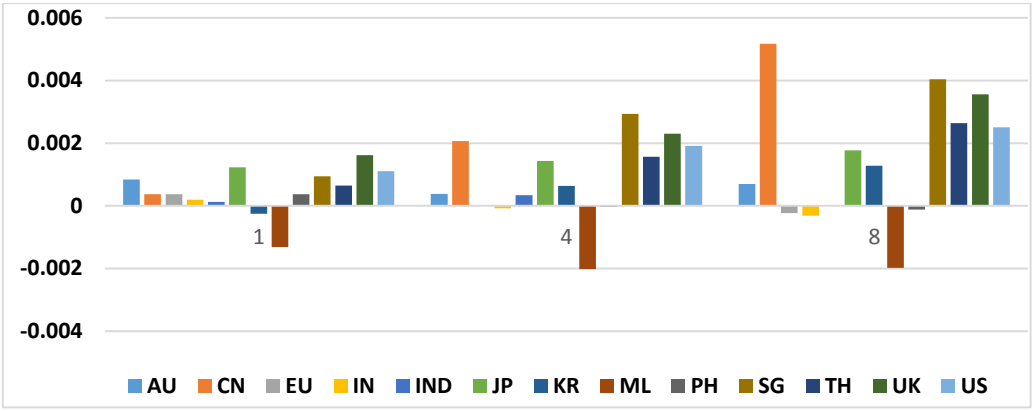

Figure 5.2 The GIRFs of Malaysia's Real GDP to Fiscal Policies Shocks

For the case of the Philippines, the 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 the Philippines' 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.

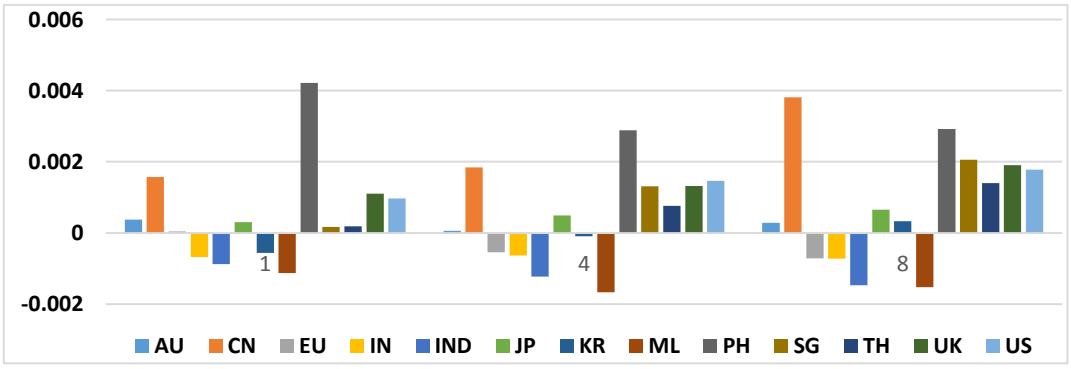

Figure 5.3 The GIRFs of the Philippines' Real GDP to Fiscal Policies Shocks

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.

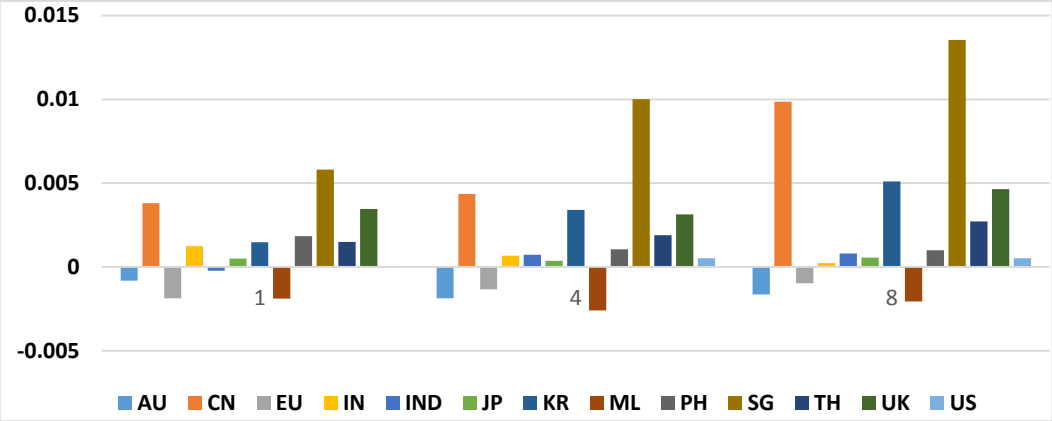

Figure 5.4 The GIRFs of Singapore's Real GDP to Fiscal Policies Shocks

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%).

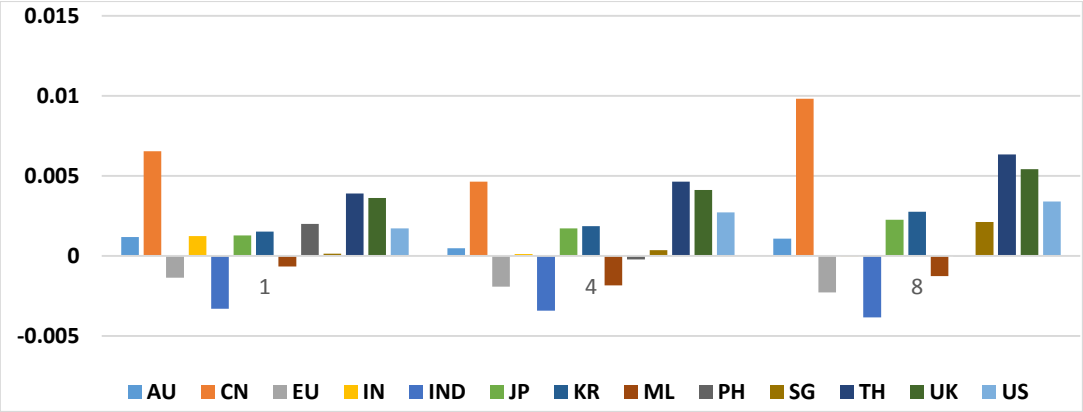

Figure 5.5 The GIRFs of Thailand's Real GDP to Fiscal Policies Shocks

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, the results show that all ASEAN-5 countries respond 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.

5.4.1.2 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 5.6 to 5.10. 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 United Kingdom (+0.2%), and Singapore (+0.1%).

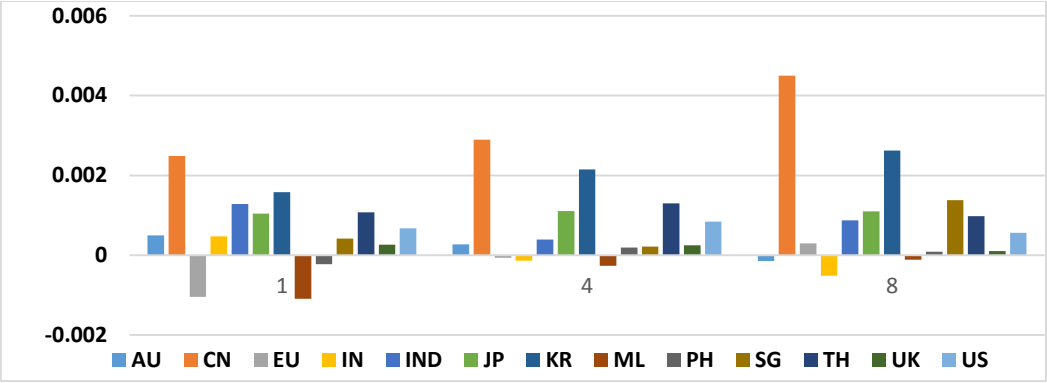

Figure 5.6 The GIRFs of Indonesia's Inflation Rate to Fiscal Policies Shocks

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.

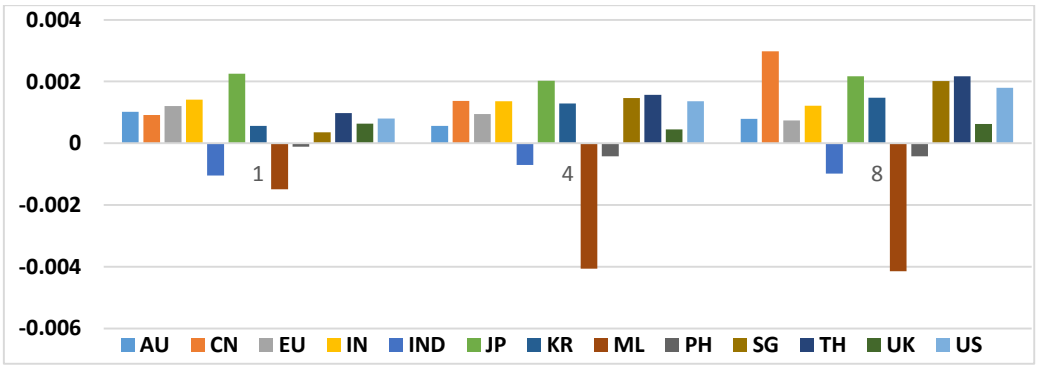

Figure 5.7 The GIRFs of Malaysia's Inflation Rate to Fiscal Policies Shocks

The effect of fiscal spillovers from other countries on the Philippines's inflation are diverse and remains weak. The strongest positive effect are found on shocks from Singapore (+ 0.05%), Japan (+ 0.05%), the United Kingdom (+ 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%).

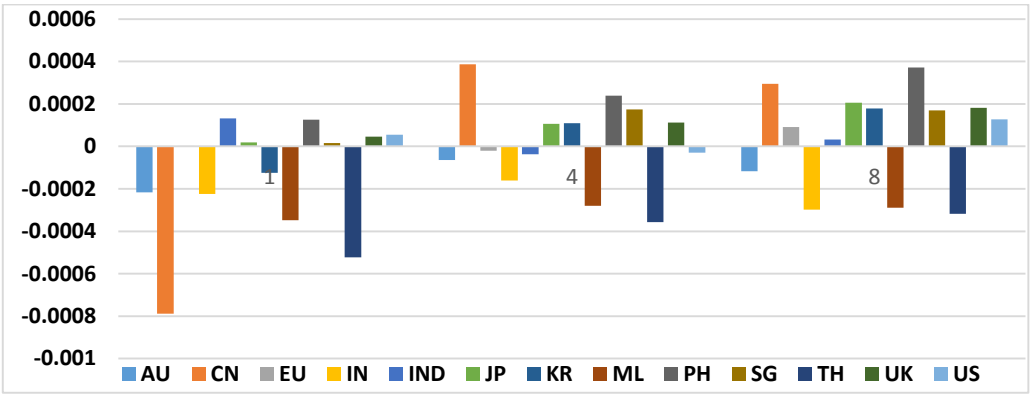

Figure 5.8 The GIRFs of the Philippines's Inflation Rate to Fiscal Policies Shocks

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 responds 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%.

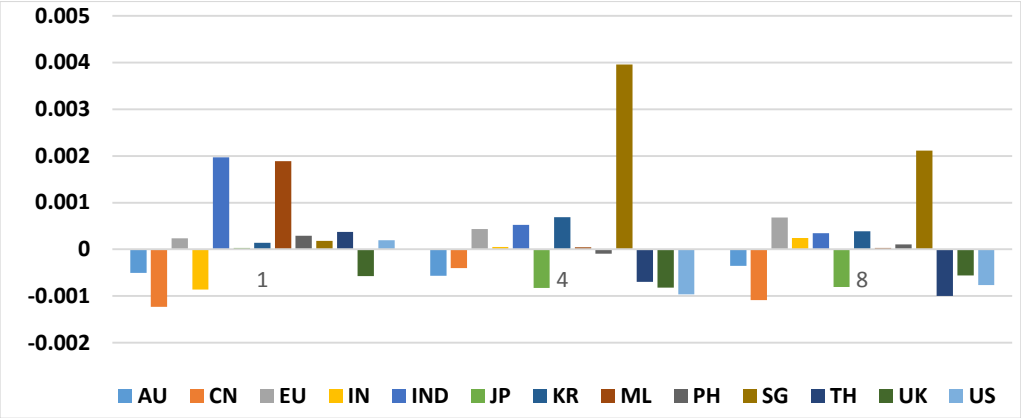

Figure 5.9 The GIRFs of Singapore's Inflation Rate to Fiscal Policies Shocks

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.

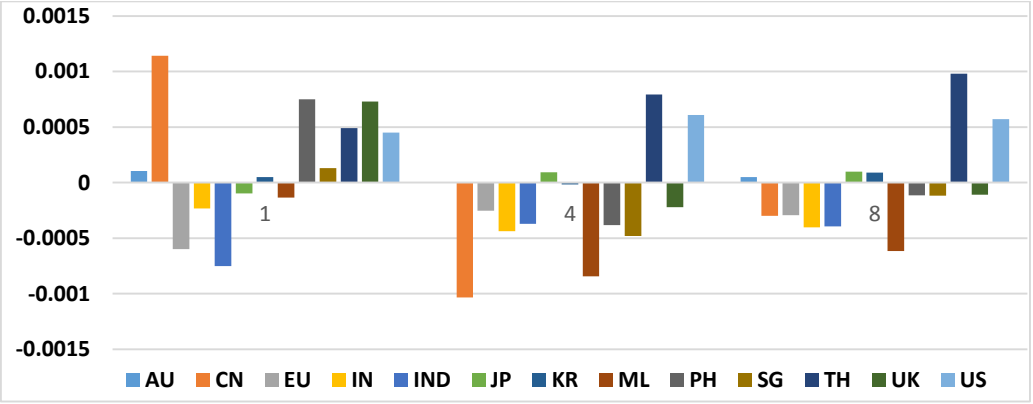

Figure 5.10 The GIRFs of Thailand's Inflation Rate to Fiscal Policies Shocks

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 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, I also find significant internal fiscal spillovers from other ASEAN-5 countries on the members' real GDP and inflation rate. 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 other ASEAN member 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.

5.4.2 Foreign Monetary Spillovers

In this section, I am 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, the estimated results are presented up to eight quarters.

5.4.2.1 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 5.11 to 5.15.

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.

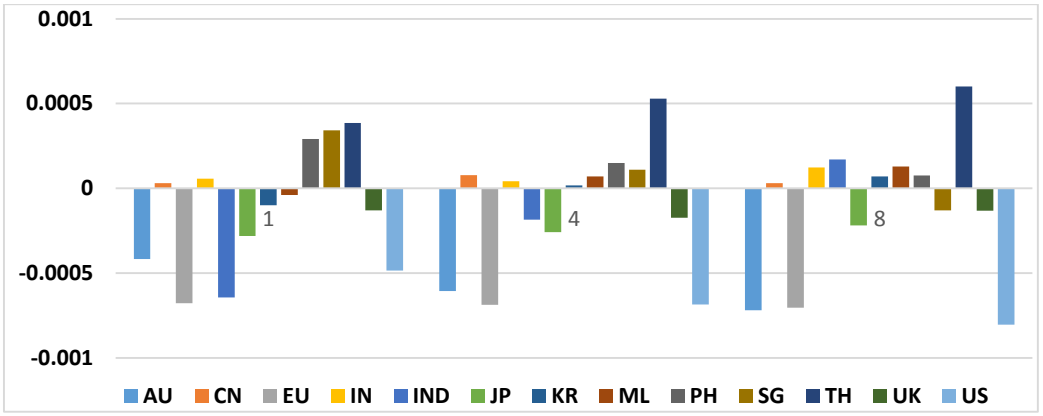

Figure 5.11 The GIRFs of Indonesia's Real GDP to Monetary Policies Shocks

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, the 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 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%).

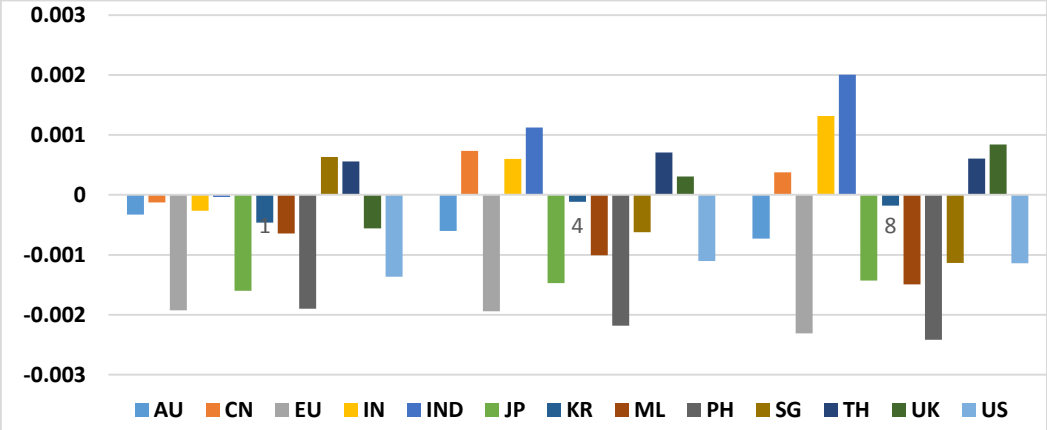

Figure 5.12 The GIRFs of Malaysia's Real GDP to Monetary Policies Shocks

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 the 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.

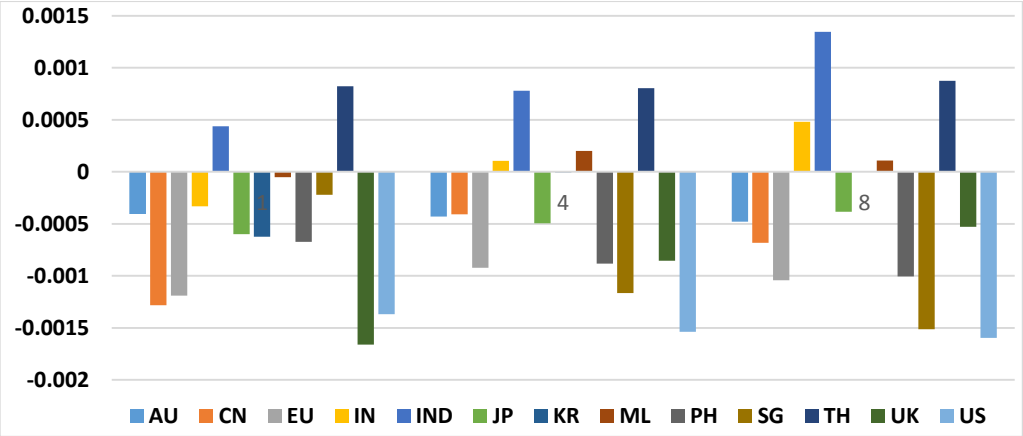

Figure 5.13 The GIRFs of the Philippines's Real GDP to Monetary Policies Shocks

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.

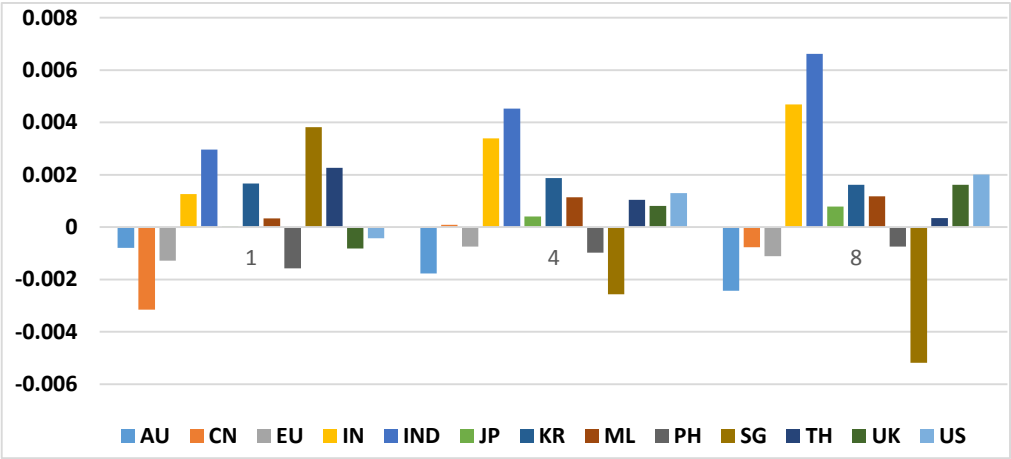

Figure 5.14 The GIRFs of Singapore's Real GDP to Monetary Policies Shocks

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%).

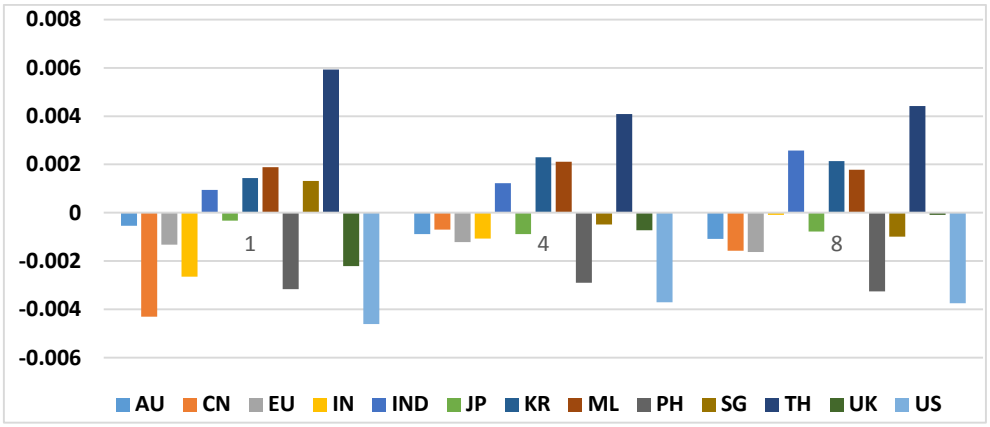

Figure 5.15 The GIRFs of Thailand's Real GDP to Monetary Policies Shocks

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, I also find the evidences of negative monetary spillovers originating from member countries to ASEAN member countries, that is, monetary spillovers from Singapore and the 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, 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.

5.4.2.2 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 5.16 to 5.20. 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.

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 Philippines (-0.1%).

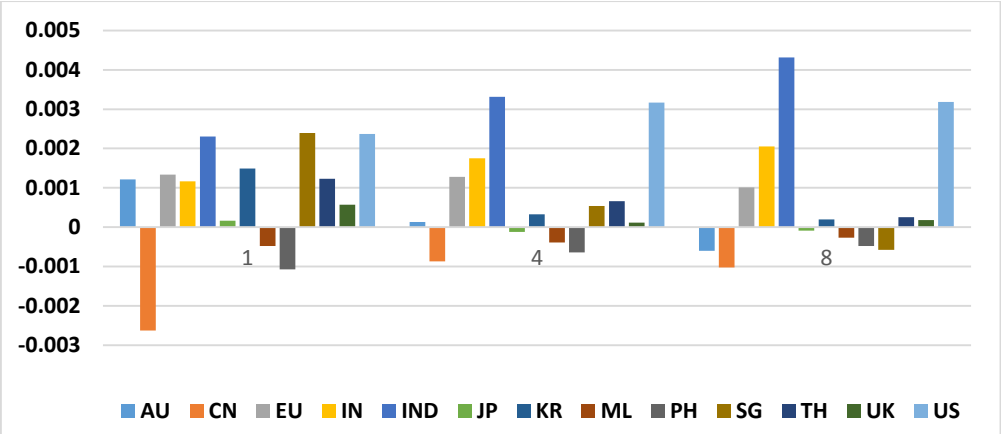

Figure 5.16 The GIRFs of Indonesia's Inflation Rate to Monetary Policies Shocks

For Malaysia, the 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%).

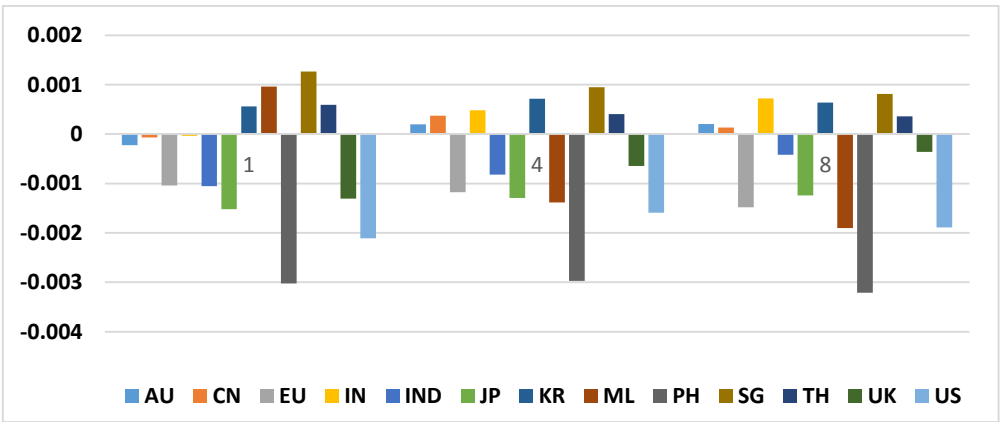

Figure 5.17 The GIRFs of Malaysia's Inflation Rate to Monetary Policies Shocks

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%).

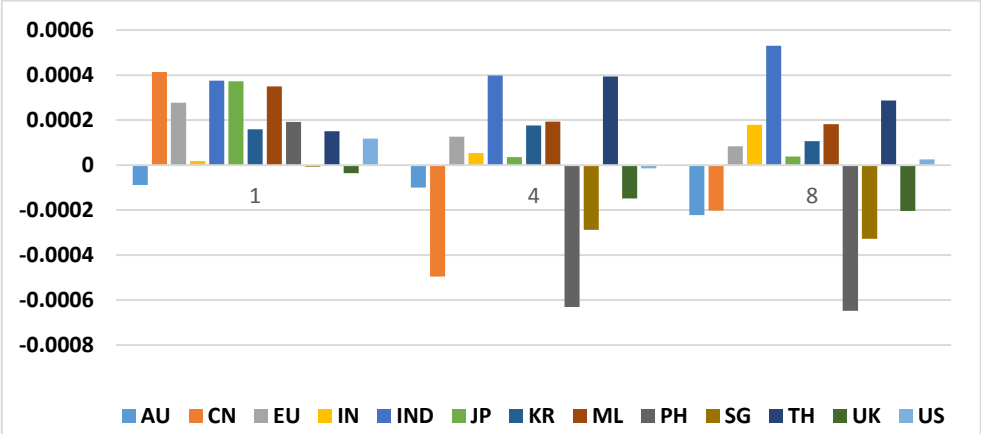

Figure 5.18 The GIRFs of the Philippines' Inflation Rate to Monetary Policies Shocks

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%).

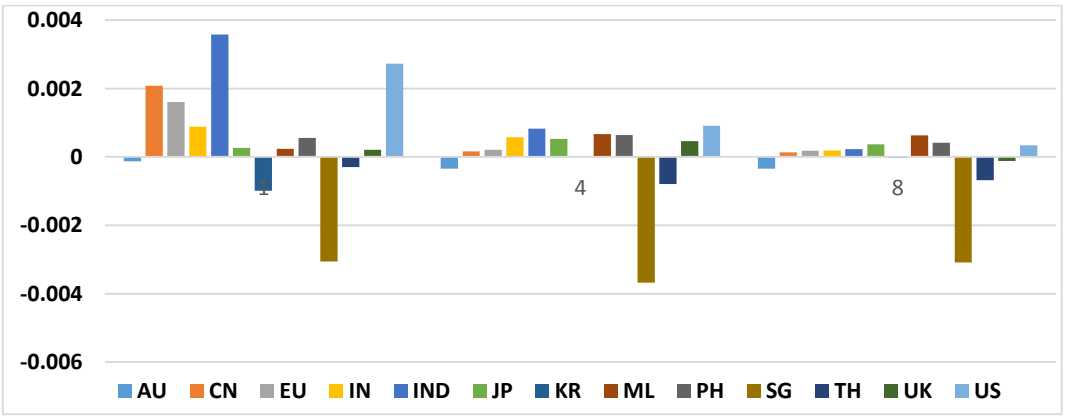

Figure 5.19 The GIRFs of Singapore's Inflation Rate to Monetary Policies Shocks

For Thailand, monetary spillovers seem to have little impact on its inflation. The 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%).

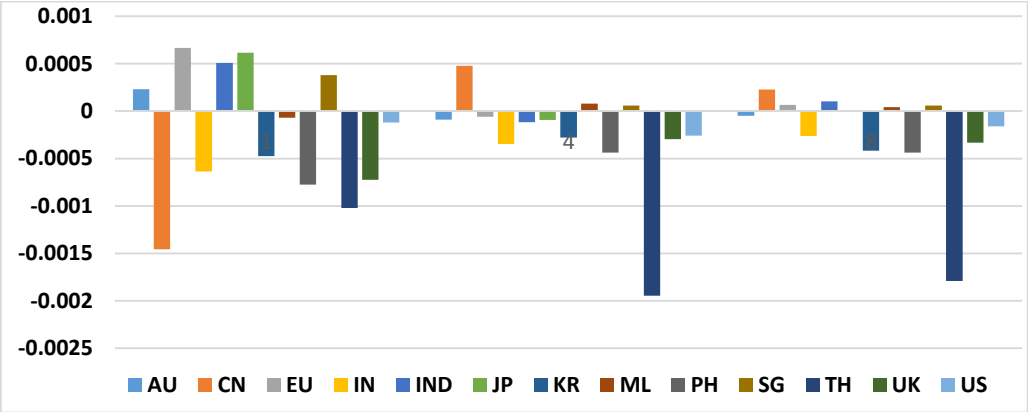

Figure 5.20 The GIRFs of Thailand's Inflation Rate to Monetary Policies Shocks

In conclusion, the 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.

5.5 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, the dynamic responses of these variables on the external fiscal and monetary spillovers are analyzed. 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, the 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, I 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 the 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, the 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 the 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.

CHAPTER 6

WHAT IF ASEAN MEMBER COUNTRIES IMPLEMENT COMMON MONETARY POLICY: A COUNTERFACTUAL ANALYSIS

6.1 Introduction

As mentioned in the previous chapter, homogeneity of member countries in term of social and economic preferences, capacities and belief is the primary condition for reducing member countries' vulnerability to external shock spillovers as well as for achieving a successful regional economic integration—in sense that its benefits outweigh risks associated (Kelley, 2010).

Despite of increasing policy coordination after the 1997/1998 Asian financial crisis, the differences still remain among ASEAN member countries in various aspects, especially in the priorities of macroeconomic targets. For example, during the 2008 global financial crisis, each member country implemented its own fiscal and monetary policies separately in order to respond to the global financial shocks. Those individual and uncooperative actions of each member country may be harmful to other member countries' economies which are also in crisis. However, there is no study in the existing literature that directly examine the possible impact of policy coordination in ASEAN countries in the context of a global macroeconomic setting, i.e. a model allows for counterfactually analyzing and comparing the impacts of a common monetary policy on ASEAN-5 economy under various monetary policy preferences. Hence, the impacts of participating a common monetary policy (i.e. a common interest rate) on the ASEAN-5 countries' real GDP growth and inflation are counterfactually analyzed in this chapter.

In fact, ASEAN-5 countries are still different in macroeconomic fundamentals as well as political objectives, it is difficult to estimate an optimal common monetary

policy for all member countries. Hence, four alternative counterfactual scenarios with monetary preferences are constructed by imposing restriction on ASEAN-5 countries' interest rate in GVAR forecasting. This approach allows for estimating the effects of common policy as well as comparing the outcomes of alternative counterfactual scenarios to these of the actual scenario.

The remaining structure of the chapter is organized as follows. In section 6.2, related literature will be reviewed. Section 6.3 presents the data and model specification. Section 6.4 presents the dynamic analysis of estimated results, while section 6.5 draws some concluding remarks.

6.2 Literature Review

In the existing literature, there are various theoretical and empirical studies examining the impacts of regional and international policy coordination on different economic aspects. However, there is still no clear conclusion regarding to this topic. The benefits of policy coordination have been proven theoretically. Empirically, however, it was shown by many researchers that the benefits are very little or even harmful in some cases. Additionally, methodology applied in these studies are mostly bilateral countries model, such as a single period stochastic model developed by Sutherland (2004); a New Open Economy Macro (NOEM) developed by Berger and Wagner (2006) and Liu and Pappa (2007). There are only a few studies analyzing the impact of policy coordination in the context of a global macroeconomic setting.

Regarding to studies focusing on ASEAN policy coordination, there are really few studies. Most of studies historically describe or empirically estimate evidences of the feasibilities and indirectly imply the benefits of policy coordination in East Asia and/or Asian in general and in ASEAN in particular. Branson and Healy (2005) analyze the feasibility and benefits of macro policy and exchange rate coordination in the ASEAN and China (ASEAN+1). They find that real effective exchange rates (REERs) of ASEAN+1 have already moved together and the movement of REERs are broadly similar for the main ASEAN countries. Additionally, similar commodity composition of trade for the larger ASEAN+1 countries is also found. These evidences indicates the feasibility of policy coordination in the region, in that sense

that they ensure a minimum autonomy loss and greater benefits from policy coordination.

Truman (2011) examines the potential coverage and the content of policy coordination in Asia and suggests that the scope for regional policy coordination in many specific areas have not been completely exploited in the Asian region, because there exists remarkably differences in size and stage of development of Asian economies; it is difficult to conceive Asian countries to voluntarily blend their interests for policy coordination. Hence, the more ambitious efforts in deepening economic integration are not likely to succeed.

Gupta (2012) conducts a study on Asian monetary and exchange rate policy coordination and he suggests the large diversity among the countries in the region in terms of institutional capability and policy frameworks further obscures the process of monetary and exchange rate coordination. Hence, it requires the establishment of certain regional institutions in order to move toward greater monetary and exchange rate cooperation.

Majuca and Pagaduan (2015) also employ VAR approach to analyze challenges for a regional macroeconomic coordination. They conclude that the intrinsic differences among the characteristics of the individual ASEAN economies is the main challenge and the impacts of external shocks to the ASEAN countries vary widely across member countries.

Sugandi (2018) uses DGSE approach to examine the feasibility of bilateral and multilateral monetary policy coordination between the ASEAN-5 countries. He finds that multilateral policy coordination between all of the ASEAN-5 countries is not feasible as the welfare value for each country would be lower than that of no policy coordination.

However, there is no study that tried to directly examine the possible impact of policy coordination in the context of a global macroeconomic setting which allow for counterfactual analysis of various alternative monetary policy preferences. Recently, GVAR approach has been employed to analyze the impact of policy coordination in multinational economic system which enables us to analyze the impact of a common interest rate on variables of interest of all ASEAN5 countries simultaneously. Pesaran el al (2007) employed GVAR to construct counterfactual scenarios to analyze the

impact of common currency and monetary policies on not-participating countries of euro area, namely the case of the United Kingdom and Sweden. They find that output could have been higher and prices lower in the United Kingdom and in the euro area as a result of the entry. While Dubois et al (2008) employ GVAR to analyze the cost and benefit of participating to euro zone by comparing the output and price of euro zone member countries between various counterfactual scenarios (in which they imagined euro zone had never launched) and the actual scenario. They find that common monetary policy encouraged higher output in most euro area economies, while an opposite outcome would arise if national monetary policies had adopted British monetary preferences after September 1992.

6.3 Data

Given the objective of the study, the real GDP, inflation rate, real equity price, exchange rate and interest rate are included in the model. Additionally, to account for possible common factors, the global oil price is also included. In most of country-specific model, these five variables are added. Except for some models, such as Indonesia's and China's ones, real equity prices are excluded due to data constraint.

The dataset modified by Smith and Galesi (2014) are used. This dataset include quarterly data from 1985 to 2012. Additionally, the fixed trade weight are based on the average trade flow calculated over 2009 -2011.

25 countries from 3 regions, i.e. Asia-Pacific, Europe and America, and one sub-region (ASEAN) are considered in the global VAR models. Table 6.1 presents countries and regions included in the study.

Table 6.1 Lists of Regions and Sub-region Used in the GVAR Model

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

Due to the process of economic integration that apply the common currency and monetary policy interest rate, the eight main countries in the euro area; Austria, Belgium, Finland, France, Germany, Italy, Netherlands and Spain, are grouped together and treated as a single economy, while the remaining 17 countries are modelled 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.

Unit Root Tests

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

Table 6.2 Unit Root Test of Country Specific Variables

	CV	ARG	AUS	BRZ	CAN	CH	EURO	INDIA	INDO	JP	KR	MAL	MEX	PH	SG	SWITZ	TL	UK	USA
ADF test																			
y	**-2.89**	0.14	-0.27	0.25	-1.04	0.88	-2.32	1.49	-0.48	-3.19	-3.42	-1.36	-0.25	1.03	-1.90	-0.23	-2.51	-1.79	-1.45
Δy	**-2.89**	-4.56	-6.10	-7.77	-4.37	-3.34	-4.21	-7.57	-6.11	-4.80	-5.47	-5.46	-6.06	-8.87	-5.54	-3.94	-5.90	-3.76	-4.37
Δp	**-2.89**	-2.79	-2.76	-2.04	-5.69	-2.78	-3.35	-5.56	-5.70	-3.49	-3.77	-6.61	-2.20	-4.35	-4.06	-2.67	-5.63	-3.47	-3.41
ΔΔp	**-2.89**	-5.70	-9.76	-8.66	-8.26	-6.59	-7.07	-8.58	-7.02	-7.35	-7.31	-8.38	-5.23	-9.16	-7.63	-7.63	-7.56	-8.95	-8.68
q	**-2.89**	-2.47	-1.94	-	-1.04	-	-2.46	-1.88	-	-2.24	-2.94	-2.55	-	-6.57	-3.17	-1.89	-2.25	-2.44	-1.87
Δq	**-2.89**	-5.94	-7.69	-	-7.29	-	-4.98	-6.75	-	-6.71	-5.55	-6.02	-	-5.04	-7.21	-6.37	-7.08	-6.97	-6.18
e	**-3.45**	-2.03	-1.60	-2.13	-1.65	-2.39	-3.15	-1.27	-2.30	-3.30	-2.84	-2.01	-2.91	-1.60	-1.07	-3.56	-1.92	-3.19	-
Δe	**-2.89**	-7.07	-4.28	-7.12	-7.21	-7.10	-6.98	-6.35	-7.64	-4.68	-7.40	-6.38	-5.06	-5.41	-5.76	-5.02	-6.74	-8.28	-
r	**-2.89**	-2.38	-2.62	-2.28	-1.36	-1.12	-1.38	-3.01	-3.66	-2.91	-1.40	-1.88	-1.65	-1.18	-2.28	-1.91	-2.92	-1.30	-1.75
Δr	**-2.89**	-4.82	-6.03	-8.57	-4.70	-5.70	-4.66	-5.82	-5.88	-3.35	-8.63	-6.45	-9.70	-4.44	-7.41	-3.82	-6.12	-6.23	-4.50
WS test																			
y	**-2.55**	0.64	2.12	1.67	0.96	0.23	1.09	1.62	2.37	1.50	2.42	1.64	0.78	2.14	0.72	0.84	2.50	0.63	0.88
Δy	**-2.55**	-4.66	-5.87	-7.86	-4.59	-3.55	-4.29	-7.73	-6.24	-4.98	-5.63	-5.50	-5.92	-8.24	-5.31	-4.16	-6.07	-3.91	-4.38
Δp	**-2.55**	-2.72	-2.31	-2.29	-5.69	-2.84	-2.85	-5.70	-5.86	-3.49	-3.95	-6.63	-2.02	-4.34	-4.23	-2.71	-5.79	-3.49	-3.65
q	**-2.55**	-2.54	-0.59	-	-0.67	-	-1.17	-1.13	-	-2.29	-1.38	-1.78	-	0.19	-2.45	-0.20	-0.84	-1.13	-0.23
Δq	**-2.55**	-6.10	-7.81	-	-7.46	-	-4.93	-6.63	-	-6.87	-5.75	-5.77	-	-4.25	-7.30	-6.48	-7.25	-7.13	-6.35
e	**-3.24**	-1.89	-1.90	-1.94	-1.90	-2.16	-1.20	-1.45	-2.36	-1.36	-2.59	-2.27	-3.16	-1.90	-1.23	-1.21	-2.06	-0.99	-
Δe	**-2.55**	-7.18	-4.36	-7.25	-7.38	-7.27	-6.85	-6.28	-7.85	-4.26	-7.53	-6.52	-4.89	-5.57	-5.92	-4.51	-6.91	-7.57	-
r	**-2.55**	-1.71	-2.07	-2.52	-0.98	-1.47	-1.01	-3.23	-3.85	-1.48	-1.71	-2.11	-1.24	-0.10	-2.04	-2.17	-2.41	-0.74	-1.37
Δr	**-2.55**	-3.99	-4.16	-8.79	-4.90	-5.84	-4.88	-5.99	-6.11	-3.53	-8.80	-6.61	-9.67	-4.12	-7.55	-4.04	-6.26	-6.33	-4.50

Table 6.3 Unit Root Test of Foreign Variables

	CV	ARG	AUS	BRZ	CAN	CH	EURO	INDIA	INDO	JP	KR	MAL	MEX	PH	SG	SWITZ	TL	UK	USA
ADF test																			
y	**-2.89**	-0.23	-1.18	-0.57	-1.66	-2.25	-0.77	-1.26	-1.63	-0.87	-0.48	-1.51	-1.74	-1.89	-1.30	-2.09	-1.31	-1.80	-0.74
Δy	**-2.89**	-6.59	-5.39	-5.08	-4.78	-5.27	-5.42	-5.63	-5.15	-5.77	-5.51	-5.15	-4.80	-5.13	-5.52	-4.44	-5.55	-4.96	-5.44
Δp	**-2.89**	-1.99	-1.88	-2.48	-1.55	-2.40	-1.81	-1.90	-1.89	-2.37	-1.83	-2.68	-1.67	-2.04	-3.59	-1.67	-1.93	-1.74	-1.32
ΔΔp	**-2.89**	-8.64	-7.09	-5.69	-7.49	-9.23	-8.77	-8.91	-9.73	-7.10	-9.03	-7.26	-7.80	-7.22	-7.89	-7.06	-9.64	-10.57	-6.00
q	**-2.89**	-2.46	-3.34	-2.08	-2.06	-3.01	-2.40	-2.56	-3.25	-2.64	-3.04	-3.25	-2.05	-3.26	-2.87	-2.48	-3.28	-2.38	-2.29
Δq	**-2.89**	-6.83	-6.80	-5.59	-6.37	-6.77	-6.81	-6.91	-6.79	-7.02	-6.88	-6.88	-6.45	-6.84	-7.02	-6.65	-6.75	-6.70	-7.05
e	**-2.89**	-1.64	-0.86	-1.88	-1.37	-2.11	-1.15	-1.23	-1.05	-0.33	-0.54	-0.88	-1.15	-1.36	-0.77	-2.67	-1.20	-2.34	-0.99
Δe	**-2.89**	-6.83	-7.33	-8.03	-8.23	-6.75	-8.10	-7.23	-6.80	-6.77	-7.30	-6.70	-7.17	-6.88	-6.41	-7.17	-7.02	-7.13	-7.79
r	**-2.89**	-2.20	-1.11	-2.09	-1.10	-1.39	-1.42	-1.20	-1.23	-0.96	-1.23	-1.24	-1.08	-1.40	-1.27	-0.83	-1.00	-0.88	-1.03
Δr	**-2.89**	-8.57	-4.91	-4.74	-5.33	-10.37	-10.19	-9.97	-5.84	-9.74	-10.19	-5.22	-9.66	-4.74	-5.31	-9.07	-9.68	-9.33	-11.58
WS test																			
y	**-2.55**	2.09	1.44	1.23	1.26	1.34	1.19	1.29	1.39	1.33	1.43	1.38	1.28	1.37	1.46	1.15	1.45	1.19	1.35
Δy	**-2.55**	-6.69	-5.55	-5.20	-4.85	-5.42	-5.58	-5.83	-5.26	-5.97	-5.68	-5.26	-4.86	-5.27	-5.68	-4.54	-5.70	-5.07	-5.58
Δp	**-2.55**	-2.24	-2.13	-2.38	-1.65	-2.52	-2.02	-2.13	-2.11	-2.51	-2.08	-2.74	-1.94	-2.29	-3.74	-1.62	-2.14	-1.85	-1.26
ΔΔp	**-2.55**	-8.86	-6.54	-5.05	-7.23	-9.39	-8.91	-9.05	-9.91	-7.34	-9.20	-6.91	-8.01	-6.90	-7.57	-7.14	-9.81	-10.57	-6.17
q	**-2.55**	-0.51	-1.25	-0.68	-0.29	-0.79	-0.45	-0.60	-1.29	-0.13	-1.04	-1.10	-0.26	-1.28	-0.55	-1.00	-1.25	-0.81	-0.86
Δq	**-2.55**	-6.97	-6.96	-5.49	-6.54	-6.93	-6.98	-7.07	-6.95	-7.18	-7.04	-7.04	-6.62	-7.01	-7.18	-6.78	-6.92	-6.82	-7.21
e	**-2.55**	0.53	1.45	1.59	2.26	1.28	2.31	1.33	1.55	0.78	1.38	1.33	1.47	1.40	0.29	1.08	1.38	1.14	1.83
Δe	**-2.55**	-7.00	-7.40	-8.17	-8.29	-6.85	-7.94	-7.27	-6.92	-6.93	-7.42	-6.82	-7.26	-6.99	-6.56	-7.02	-7.12	-7.03	-7.96
r	**-2.55**	-2.43	-1.06	-1.32	-0.71	-1.49	-1.52	-1.32	-1.16	-1.07	-1.32	-1.08	-0.97	-1.20	-1.25	-0.66	-0.98	-0.79	-0.83
Δr	**-2.55**	-8.79	-5.10	-4.01	-5.50	-10.53	-10.34	-10.13	-6.00	-9.90	-10.36	-5.38	-9.73	-4.77	-5.47	-9.19	-9.82	-9.46	-11.78

The estimation results of the unit root t-statistic are reported in tables 6.2 and 6.3 for country-specific and foreign variables respectively. Overall, the results of unit root test show that all of country-specific and foreign series are integration at the first order, namely I (1).

6.4 Empirical Results

Due to the differences in economic fundamentals and policy preferences, ASEAN-5 countries have been pursuing diverse monetary policies. This is demonstrated by the differences in interest rates that each member country applied over the study period, as it shows in the Figure 6.1. The differences are especially large before the 1997/1998 Asian financial crisis.

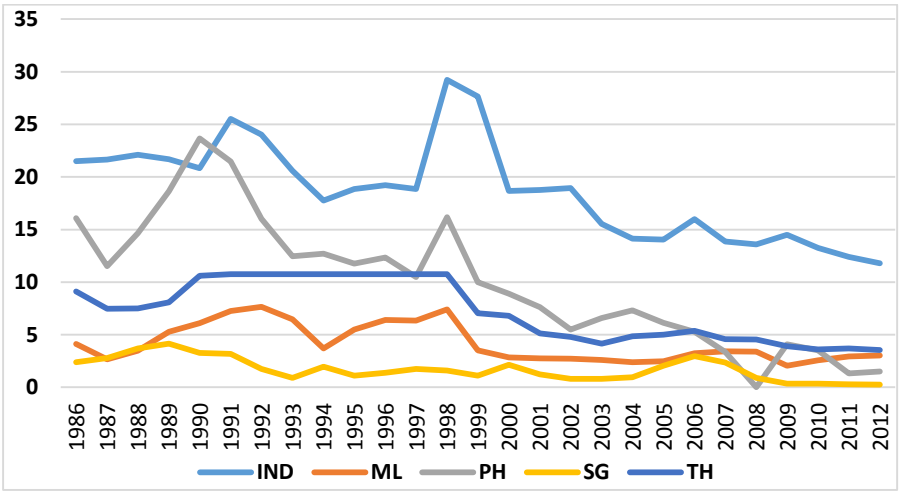

Figure 6.1 The Historical Interest Rates of ASEAN-5 Countries

Additionally, in time of economic crisis, the monetary policy responses to the crisis varied noticeably among member countries. For instant, during the 1997/1998 Asian financial crisis, Indonesia and the Philippines increased their interest rate while Malaysia, Singapore and Thailand reduced their interest rate dramatically. In the context of regional economic integration, the contrasting policy responses may cause inverse impacts on other member countries.

After the 1997/1998 Asian financial crisis, the differences in monetary policies have been significantly reduced due to increasing regional economic integration and macroeconomic coordination. Nevertheless, there still exist the differences in macroeconomic targets as well as policy preferences. Since early 2000, some member countries, such as Indonesia, the Philippines and Thailand, have started pursuing an "inflation-targeting" monetary policy, while Malaysia has been pursuing an "inflation-anchoring" monetary policy. The only exception is Singapore which has been using its unique monetary policy. Instead of using interest rate as a tool to stabilize price and boost the economic growth, Singapore uses exchange rate to influence the price as well as economic growth because it believes that exchange rate is a more effective way to manage its inflation because much of country consumer goods are imported.

Hence, to estimate and analyze the impact of a common monetary policy on member countries' economy, it is not easy to determine an optimal common interest rate is for all. Therefore, in the scope of this study, four alternative scenarios with different monetary preferences are generated. In each scenario, it is imagined that all ASEAN5 countries would have applied a common interest rate since 2013 and the results of conditional forecasting with the unrestricted forecasting will be compared to analyze the different impacts of with and without common monetary policy. Four alternative scenarios are set up as following

1) Scenario 1 "the weighted average": all ASEAN-5 countries would have adopted a weighted average interest rate as a common interest rate.

2) Scenario 2 "the highest": all ASEAN5 countries would have adopted Indonesia monetary preferences; explicitly, applying the interest rate of Indonesia.

3) Scenario 3 "the moderate": all ASEAN-5 countries would have adopted Thai monetary preferences; explicitly, applying the interest rate of Thailand.

4) Scenario 4: "the lowest": all ASEAN-5 countries would have adopted Singaporean monetary preferences; explicitly, applying the interest rate of Singapore.

The restrictions of a common interest rate are imposed on the interest rates of all ASEAN-5 countries in 5 years commitment (i.e., 20 quarters) and 5 years forecast

horizon. The estimation results of restricted and unrestricted forecasting of real GDP growth and inflation rate in each member country will be analyzed separately.

6.4.1 For the Case of Indonesia

The Figure 6.2 shows a clear trend for higher economic growth in Indonesia under a common monetary policy in ASEAN-5 countries. Explicitly, Indonesia can achieve a higher economic growth rate in most of the scenarios. A higher growth rate of approximately 2% can be achieved comparing to its GDP growth rate in absence of a common policy. Particularly, by applying the Thai (i.e. the moderate) or Singaporean (i.e. the lowest) monetary preferences, it will reach the highest growth rate of about 6 percent in the long run comparing to 3% of without common interest rate. Interestingly, if its own monetary preferences was applied as a common interest rate, Indonesia's growth rate will be lower in long run than these of other three scenarios.

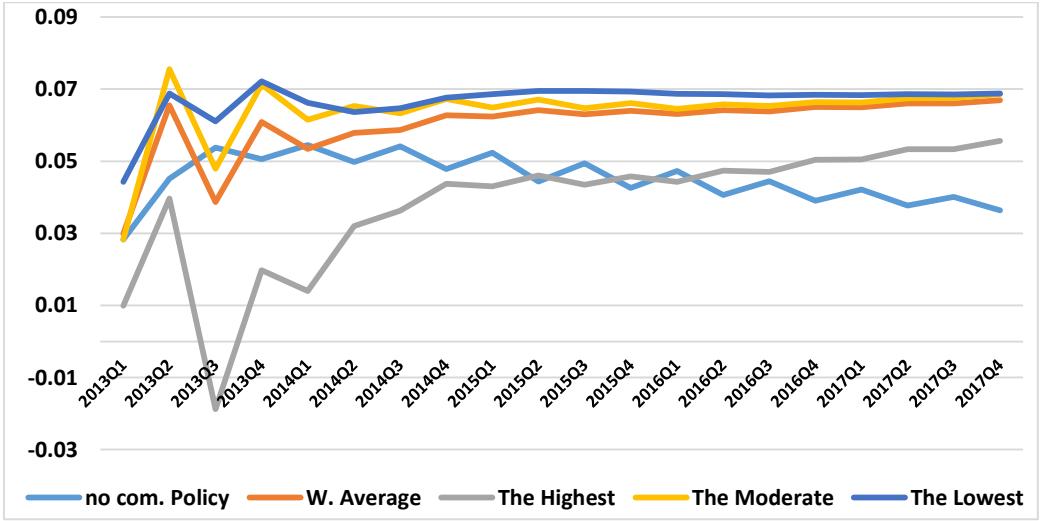

Figure 6.2 Indonesia GDP's Growth Forecast under Alternative Scenarios

The Figure 6.3 illustrates the forecast of Indonesia inflation rates under different alternative scenarios. The results shows that introducing a common interest rate would also reduce price level of Indonesia in most of scenarios, except for "the highest" scenario (in which its own monetary preference is applied). Among different

monetary preferences, applying the Thai or Singaporean ones lead to a huge decrease in its price level by about 6%. In all scenarios, the inflation rate fluctuate at the first two years and become stable after that.

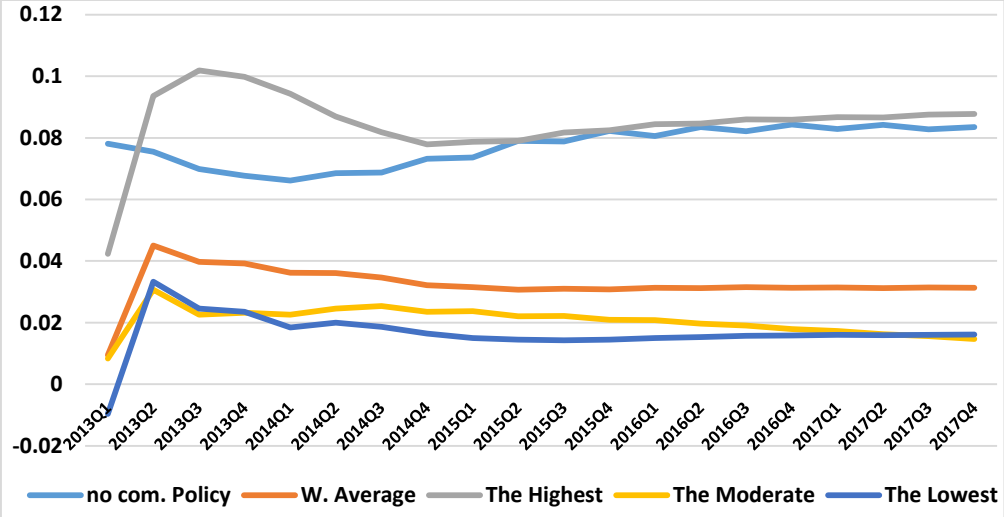

Figure 6.3 Indonesian GDP's Inflation Rate Forecast under Alternative Scenarios

In conclusion, a common monetary policy generally boost Indonesia economy as well as reduce price level, especially, Indonesia will reach to a very high growth rate if the common interest rate applied is lower than its own interest rate in absence of common monetary policy.

6.4.2 For the Case of Malaysia

As the result shows in the Figure 6.4, in the long run a common monetary policy also increase the Malaysian economic growth higher by 1-2% in average, however its impact in short-run seems to be varied depending on monetary policy preferences. The economy grows rapidly right after participating in a common monetary policy and becomes stable in the long run. Additionally, real GDP growth trends of different scenarios also tend to cluster together in the long run. Applying a relative lower common interest rate (such as the Thai and Singaporean monetary preferences) help Malaysia to reach the highest growth rate in comparing to that of others monetary preferences.

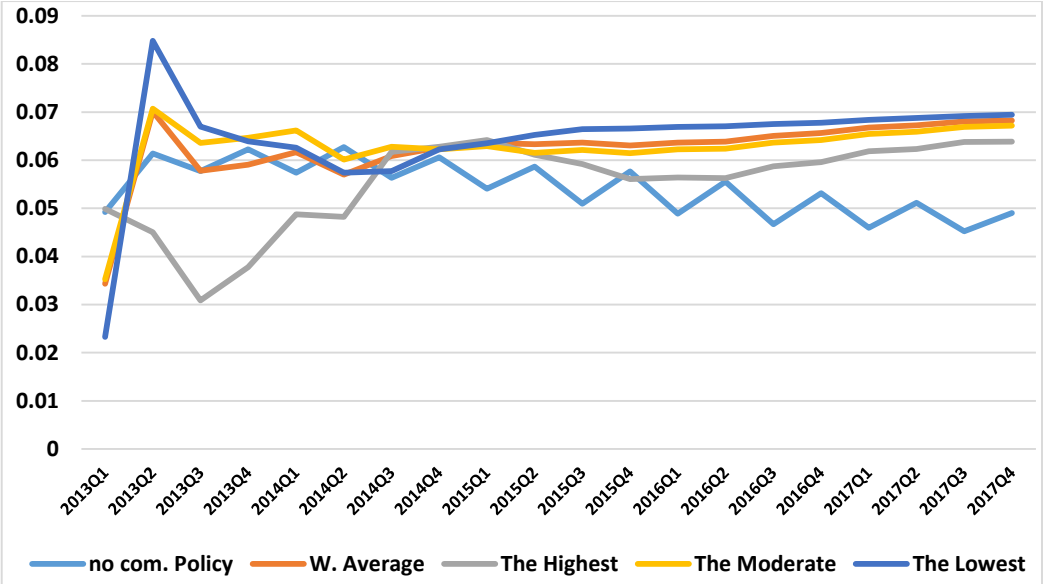

Figure 6.4 Malaysian GDP's Growth Forecast under Alternative Scenarios

The figure 6.5 illustrates the forecasts of Malaysia's inflation rate under different alternative scenarios. Generally, common monetary policy increases the Malaysian price level in most of scenarios. "The highest" common monetary policy leads to a dramatic increase in inflation rate to 8% in the first two years of forecasting horizon and to 6-7% after that, while the other monetary preferences causes only a slightly increase in inflation rate. Only in "the lowest" scenario, the inflation rate is lower than that of non-common policy case, but it is only lower in the first three years of forecasting horizon.

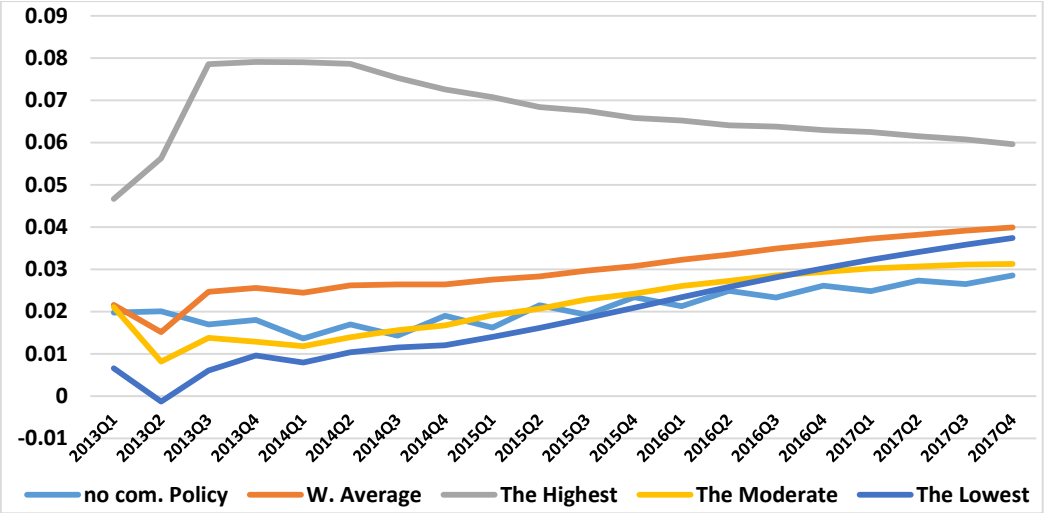

Figure 6.5 Malaysian GDP's Inflation Rate Forecast under Alternative Scenarios

In sum, participating in a common monetary policy raise the Malaysian economic growth but it also increase its price level. Similar to Indonesia, Malaysia would also reach to a relatively higher growth rate if a relatively low interest rate is applied for all ASEAN-5 countries.

6.4.3 For the Case of the Philippines

The Figure 6.6 shows that a common interest rate enhances the Philippines's economy to achieve a higher growth rate comparing to without common policy in all scenarios. Especially if the "highest interest rate" (i.e. Indonesia monetary preference) is applied, the Philippines would reach the highest growth rate to about 5% in average which is 2% higher than that of non-common policy. While other three monetary preferences also boost growth rate by about 1% higher. The output growth trend of all scenarios also becomes stable and clustered in the long run.

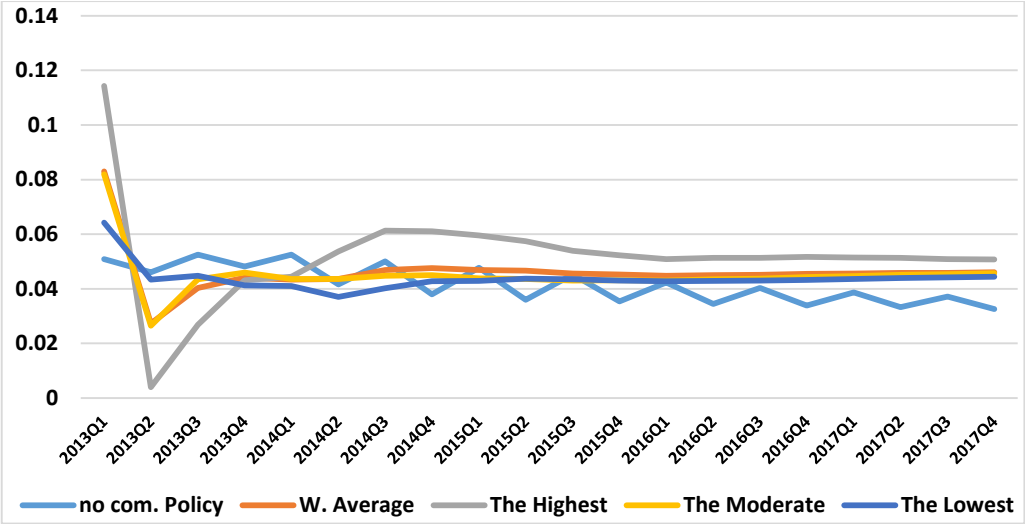

Figure 6.6 Philippines GDP's Growth Forecast under Alternative Scenarios

Regarding to price level, introducing a common interest rate increases price level of the Philippines as it's shown in the Figure 6.7. Especially, by applying the Indonesia monetary preference ("the highest" scenario), the inflation rate rises to 9% in the long-run comparing to 3% of non-common monetary policy. The other three monetary preferences also lead the inflation to increase to 6%. This implies that a common monetary policy could lead to price instability in the Philippines.

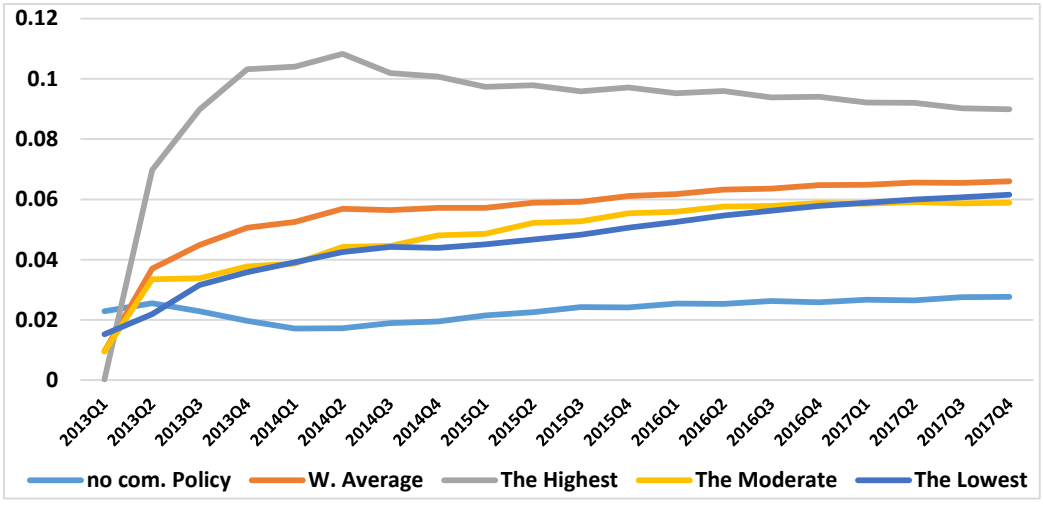

Figure 6.7 Philippines GDP's Inflation Rate Forecast under Alternative Scenarios

Different to Indonesia and Malaysia, the Philippines would reach to a higher growth rate if a relatively high interest rate is applied for all ASEAN-5 countries. Additionally, it also leads to higher price level in the Philippines.

6.4.4 For the Case of Singapore

Out of 5 ASEAN countries, Singapore seems to be the only one country which would be better off by participating in a common monetary policy in all scenarios.

The Figure 6.8 shows a clear picture of positive effects on common monetary policy on Singaporean economy; explicitly, it helps Singapore to achieve a higher growth rate by about 2- 4 % depending on different scenarios. Especially, the Indonesia monetary preference (i.e. the highest scenario) is employed as a common interest rate, Singapore would achieve a highest growth rate of 12% in the first year and of 9% in the fifth year of forecasting horizon. In the other three scenarios, it would also lead Singapore to achieve growth rate of 8% in average. The output growth trend of all scenarios also becomes stable and clustered in the long run.

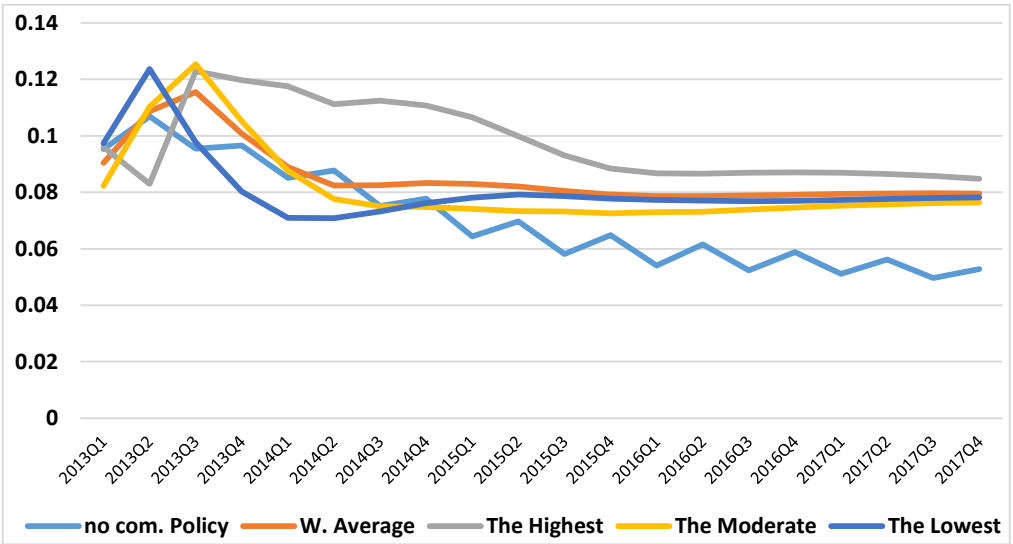

Figure 6.8 Singaporean GDP's Growth Forecast under Alternative Scenarios

Additionally, a common interest rate also decreases Singaporean price level by lower rate of 1-2 % in the long run depending on monetary preferences as it's shown

in the Figure 6.9. In all scenarios, the forecast inflation rates become stable and clustered with other after 2 years if forecasting horizon.

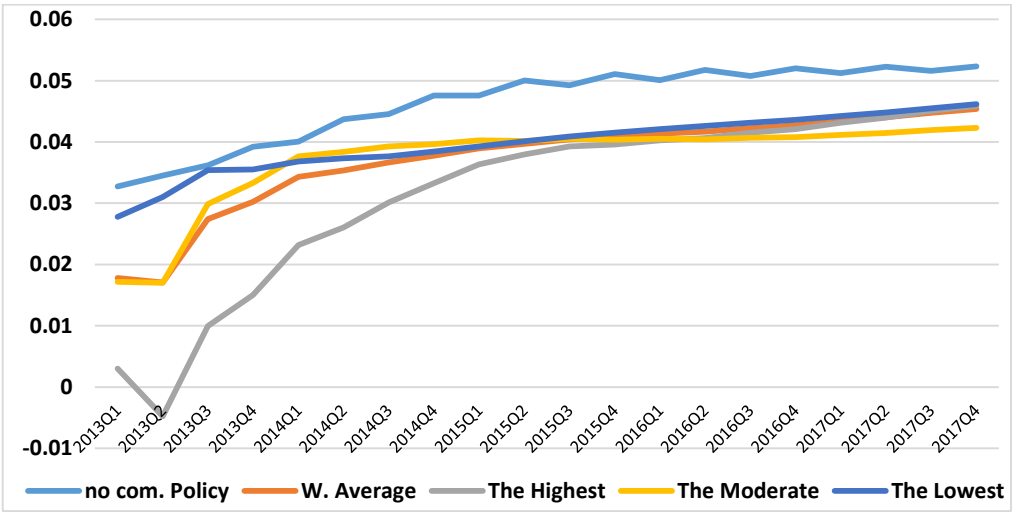

Figure 6.9 Singaporean GDP's Inflation Rate Forecast under Alternative Scenarios

Different to other member countries, common monetary policy would accelerate Singaporean economic growth and reduce the inflation in all scenarios. This evidences imply that a common monetary policy seems to be beneficial for Singapore. Interestingly, similar to the Philippines, Singapore would reach to a higher growth rate if a relatively high interest rate is applied for all ASEAN-5 countries.

6.4.5 For the Case of Thailand

In contrast to other ASEAN-5 countries, the common monetary policy seems not to be much beneficial for Thai economy, as the impacts of a common monetary policy on Thai economy are inconsiderable comparing to actual ones. The economic growth of Thailand even slows down if "the highest" interest rate (i.e. the Indonesian monetary preference) is used as the common interest rate. Interestingly, applying the Thai or Singaporean monetary preference help Thailand to reach the higher growth rate in comparing to these of others monetary preferences. Finally, the output growth trend of all scenarios also becomes stable and clustered in the long run.

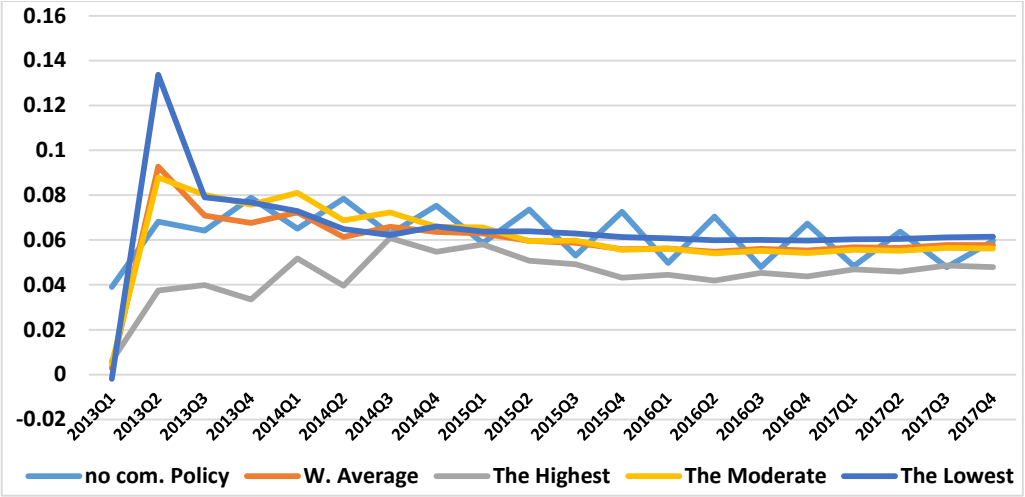

Figure 6.10 Thailand GDP's Growth Forecast under Alternative Scenarios

Regarding to price level shown in the Figure 6.11, introducing a common interest rate would increase price level of the Thailand, except for "the lowest" scenarios (i.e. the Singaporean monetary preference). Especially, applying the Indonesia interest rate as the common one (i.e. the "the highest" scenario) would increase the inflation rate by a 5% higher. In the remaining scenarios, the forecast price level only slightly differs to that of non-common policy one. Finally, the inflation rates tend to be stable in the long run.

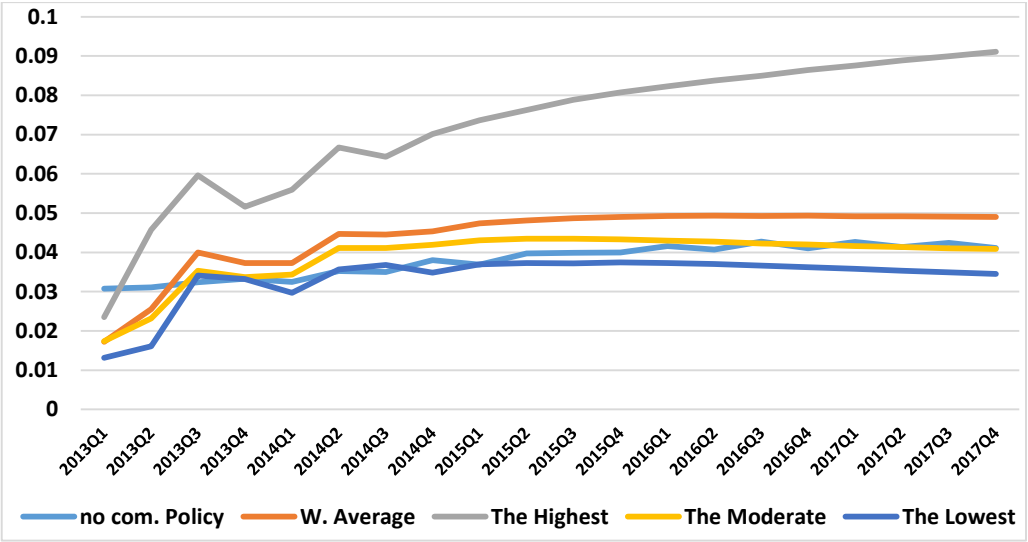

Figure 6.11 Thailand GDP's Inflation Rate Forecast under Alternative Scenarios

The impacts of common interest rate on Thailand's economic growth are generally very small while the impacts on inflation are significant. Thailand seems not to get much benefit from a common monetary policy. Similar to Indonesia and Malaysia, Thailand would also reach to a relatively higher growth rate if a relatively low interest rate is applied for all ASEAN-5 countries.

In conclusion, the effects of common interest rate estimated from four alternative scenarios in terms of real GDP growth and inflation rate are summarized the Table 6.4. The results show that there are significant differences between the forecast outcomes estimated under a common interest rate and the forecast outcomes estimated in absence of common policy. "Higher" means that real GDP growth or inflation in the world with a common interest is higher than in the actual scenario. On one hand, a common monetary policy would generally boost the economic growth for most of member countries, as three of the alternative scenarios could find a situation where all members' countries would have achieved a higher growth rate at the same time. Nonetheless, magnitude of the change in real GDP growth of each country varied differently across alternative common interest rates applied; such as, Singapore and the Philippines seem to gain more from a relatively higher common interest rate while a relatively lower common interest rate would lead higher growth rate in the case of Indonesia, Malaysia and Thailand. This indicates that country which has had a relatively lower interest rate (like the case of Singapore) could gain from a relatively higher common interest rate while country which has had a relatively higher interest rate (like the case of Indonesia) could gain from a relatively lower common interest rate. On the other hand, a common monetary policy probably has ambiguous impacts on price developments among member countries. Only for the case of Singapore and Indonesia, a lower inflation rate is found for all alternative scenarios and three scenarios respectively. While for the rest of ASEAN-5 countries, it could lead to a higher price fluctuation. Out of 5 member countries, Thailand seems to be indifferent with a common monetary policy.

Table 6.4 Summary of the Results

Scenarios	Indonesia		Malaysia		The Philippines		Singapore		Thailand	
	Real GDP Growth	**Inflation Rate**	**Real GDP Growth**	**Inflation Rate**	**Real GDP Growth**	**Inflation Rate**	**Real GDP Growth**	**Inflation Rate**	**Real GDP Growth**	**Inflation Rate**
The Lowest – Singapore's Preference	Higher	*Lower*	Higher	Higher	Higher	Higher	Higher	*Lower*	Higher	Lower
The Moderate – Thailand's Preference	Higher	*Lower*	Higher	Higher	Higher	Higher	Higher	*Lower*	Higher	Higher
The Weighted Average	Higher	*Lower*	Higher	Higher	Higher	Higher	Higher	*Lower*	Higher	Higher
The Highest – Indonesia's Preference	Higher	Higher	Higher	Higher	Higher	Higher	Higher	*Lower*	*Lower*	Higher

Additionally, the standard deviation and coefficient of variation of real GDP growth and inflation (represented in the Table 6.5 and 6.6) shows that the estimating outcomes of introducing a common interest rate in all scenarios are more variant, relative to its mean comparing to these of non-common monetary policy. This means that the fluctuation of the variables of interest from their means are generally higher than these of non-policy coordination.

Hence, a common monetary policy may be good for some countries, but not for all. This implies that ASEAN-5 countries had, and probably still have, conflicting interests regarding to the most suitable monetary policy for each member and for all; therefore, a common monetary policy seems not to be feasible and desirable at the moment due to the huge differences in economic fundamentals as well as the priorities of macroeconomic targets. The findings are consistent with several studies such as Dubois et al (2008) who also found that participating in a common monetary policy, "some will gain, and some will lose".

Table 6.5 Standard Deviation, Mean and Coefficient of Variation of GDP Growth Forecast

		no com. Policy	**W. Average**	**The Highest**	**The Moderate**	**The Lowest**
Indonesia	SD	0.006849	0.009493	0.01847	0.009774	0.005788
	Mean	0.045018	0.060062	0.037834	0.063749	0.066676
	CV	0.152151	0.158056	0.488194	0.153313	0.086807
Malaysia	SD	0.005606	0.007423	0.00925	0.006889	0.011093
	Mean	0.054232	0.062274	0.055428	0.062578	0.064284
	CV	0.103369	0.1192	0.166883	0.110089	0.172566
Philippines	SD	0.006813	0.009661	0.019514	0.009545	0.005125
	Mean	0.041834	0.046203	0.052072	0.045181	0.043789
	CV	0.162856	0.209099	0.374739	0.211251	0.117041
Singapore	SD	0.018062	0.010597	0.013605	0.014698	0.012119
	Mean	0.070675	0.085543	0.097634	0.081463	0.081142
	CV	0.255572	0.123882	0.139346	0.180424	0.149353
Thailand	SD	0.011451	0.015969	0.011253	0.01683	0.02268
	Mean	0.062213	0.059267	0.044511	0.061031	0.064472
	CV	0.184062	0.269442	0.25282	0.275763	0.351783

Table 6.6 Standard Deviation, Mean and Coefficient of Variation of Inflation Rate Forecast

		no com. Policy	W. Average	The Highest	The Moderate	The Lowest
Indonesia	SD	0.006299	0.006632	0.011825	0.004749	0.007678
	Mean	0.077276	0.032362	0.084507	0.020562	0.016492
	CV	0.081517	0.204934	0.139927	0.230965	0.465562
Malaysia	SD	0.004401	0.006481	0.008548	0.007422	0.011391
	Mean	0.021096	0.029893	0.066943	0.021764	0.018983
	CV	0.208622	0.216801	0.127687	0.341013	0.60006
Philippines	SD	0.003366	0.013178	0.022617	0.012642	0.012782
	Mean	0.023378	0.055841	0.090468	0.048215	0.046378
	CV	0.143994	0.235994	0.249999	0.2622	0.275595
Singapore	SD	0.006463	0.00819	0.014889	0.007463	0.004821
	Mean	0.046425	0.0371	0.031579	0.037145	0.039694
	CV	0.139207	0.220748	0.471492	0.20091	0.12145
Thailand	SD	0.004155	0.008766	0.017667	0.00703	0.006733
	Mean	0.037911	0.043931	0.072091	0.038804	0.033494
	CV	0.109602	0.199544	0.24506	0.18117	0.201033

6.5 Conclusion

Policy coordination is the primary condition for achieving a successful regional economic integration as well as reducing the vulnerability of individual member countries to external spillover. However, the differences still remain among ASEAN member countries in various aspects, especially in priorities of macroeconomic targets. A common fiscal or monetary policy could unavoidably generate trade-off in national benefits of ASEAN member countries. Hence, the objective of this chapter is to examine and compare the possible impacts of alternative common monetary policies on ASEAN-5 countries' real GDP growth and price level by estimating GVAR models for each member country and implementing conditional forecasts of variables of interest for four alternative scenarios.

The estimation results show several important findings. Generally, the gaps between outcomes of counterfactual forecasts and these of the actual forecast show that inducing a common interest rate to all ASEAN5 countries would generally lead to

higher growth rate in all countries in long run, however, its impact on price level are mixed across countries. On one hand, a common monetary policy would generally boost the economic growth for most of member countries, but magnitude of the change in real GDP growth of each country varied differently across alternative common interest rates applied; such as, Singapore and the Philippines seem to gain more from a relatively higher common interest rate while a relatively lower common interest rate would lead higher growth rate in the case of Indonesia, Malaysia and Thailand. On the other hand, a common monetary policy probably has ambiguous impacts on price developments on member countries. Only for the case of Singapore and Indonesia, a lower inflation rate is found for all alternative scenarios and three scenarios respectively. While for the rest of ASEAN-5 countries, it could lead to a higher price fluctuation. Out of 5 member countries, Thailand seems to be indifferent with a common monetary policy.

The findings indicate that a common monetary policy in ASEAN-5 country may be beneficial for some but unbeneficial for the others. Therefore, a common monetary policy has not been feasible and desirable yet due to the differences in economic fundamentals as well as macroeconomic policy targets. Nevertheless, it is necessary to emphasize that even a common monetary policy is not feasible for now, but coordination is still needed for ASEAN-5 countries to reduce the vulnerability from external spillovers. Theoretically, optimal cooperative policies depend on the objectives of the policymakers, on the nature of the transmission mechanism between the economies, on the policy tools that they have available, and on the nature of the disturbances that hit their economies and call for policy responses (Stanley Fisher, 1987). Thus, there is a need to further define a suitable scope for policy coordination in the region.

CHAPTER 7

CONCLUSION AND POLICY IMPLICATION

The dissertation comprehensively investigates international macroeconomic linkages among ASEAN-5 countries as well as among ASEAN-5 countries with the rest of the world by applying Global VAR approach.

The dissertation consists of three main topics. It starts with identifying the sources of ASEAN-5 countries' macroeconomic variability as well as assessing the extent, speed and size of spillovers that materialize in reaction to external shocks in order to have an overview how ASEAN-5 are actually linked with the rest of the world overtime. After that, the focus is moved to a specific aspect that many policymakers have been greatly concerned, that is policy spillovers. Explicitly, the effects of intra-regional and inter-regional monetary and fiscal policy spillovers on the key macroeconomic variables in ASEAN countries are investigated. Though this policy spillover investigation, significant inverse effects of policy spillovers among ASEAN-5 countries are found. This in turn indicates a need of policy coordination among members' countries in order to reduce the negative impact of policy spillovers on member countries. Hence, counterfactual analysis is implemented to examine the possible impacts of counterfactual common monetary policy on the key macroeconomic variables under various scenarios.

To sum up the key findings throughout the dissertation, they are presented in corresponding to three main objectives of the dissertation.

In corresponding to the first objective, the estimations results show several findings. Generally, ASEAN-5 economies respond strongest to the shocks to real GDP of China, Japan and the U.S. and of the East Asia region. By comparing between sub-periods, there is evidence of changing role in regional strategic partners. After 2000, China become more influential country to ASEAN, replacing the position of Japan from the last period. However, the magnitudes of responsiveness vary among member countries, such as Singaporean GDP reacts to foreign shocks more than those

of the others; then followed by Thailand, Malaysia, Philippines and Indonesia, respectively. Additionally, the evidences intra-regional spillovers within ASEAN-5 economies are also found. Regarding to the sources of ASEAN-5 countries' economic fluctuation, domestic factors are still dominant source in both study periods. Nonetheless, regional factors play an increasingly important role as well, especially increasing role of other East Asian countries. Interestingly, the shocks from the U.S. output are the only significant source of variation outside the Asian region. Finally, both regional real and financial factors are important source of fluctuation for the ASEAN countries. However, financial factors are the main transmission channel of shocks from outside the Asian region.

In corresponding to the second objective, the results of estimating the responses of ASEAN-5 countries' real GDP and inflation to expansionary fiscal and monetary shocks from other countries show several important findings. Generally, the overall evidence shows that both intra- and inter-regional fiscal and monetary spillovers have a significant impact on 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, the 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 other East Asian countries are more tightly integrated compared to ASEAN countries' 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. Interestingly, in contradiction to fiscal spillovers, monetary spillovers from the U.S. and European countries are larger than those from East Asian countries. Regarding intra-regional policy spillovers, monetary spillover seems to be stronger than fiscal spillovers. At country level, out of five ASEAN countries, 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 some countries and regions on ASEAN-5 real GDP; such as, ASEAN-5 countries, China, and advanced economies. This implies that in such an interconnected world where

ASEAN countries are actively participating, any national economic policy would lead to inverse international spillover effects.

In corresponding to the third objective, a GVAR model is built to estimate unconditional forecast (actual forecast) and conditional forecasts of GDP growth and inflation (by setting a common interest rate restriction on interest rate of ASEAN-countries). This allow for estimating and comparing the outcomes between actual and other four different counterfactual scenarios (namely, the weighted average, the highest, the moderate and the lowest). The results show that introducing a common interest rate to all ASEAN5 countries would generally lead to higher growth rate in all countries in long run, however, its impact on price level are mixed across countries. Additionally magnitude of the change in output growth and price level of each country vary differently across different common interest rates applied. On one hand, a common monetary policy would generally boost the economic growth for most of member countries, but the change in magnitude of real GDP growth of each country varied differently across alternative common interest rates applied; such as, Singapore and the Philippines seem to gain more from a relatively higher common interest rate while a relatively lower common interest rate would lead higher growth rate in the case of Indonesia, Malaysia and Thailand. On the other hand, a common monetary policy probably has ambiguous impacts on price developments on member countries. Only for the case of Singapore and Indonesia, a lower inflation rate is found for all alternative scenarios and three scenarios respectively. While for the rest of ASEAN-5 countries, it could lead to a higher price fluctuation. The findings indicate that a certain common monetary policy in ASEAN-5 country may be beneficial for some but unbeneficial for the others. Therefore, a common monetary policy has not been feasible and desirable yet due to the different in economic fundamentals as well as macroeconomic policy targets.

Overall, the evidence of increasing degree of regional and global interdependence gives several important policy implications for the ASEAN's countries. First, an increasing role of the real shock from East Asian countries (including ASEAN-5 countries) shows that intra-regional trade is the important source of economic interdependence. The importance roles of China and Japan suggest that the future direction of the ASEAN should emphasize on the enlarged regional

collaboration, i.e. the ASEAN+3 negotiations that include China, Korea and Japan would be the most suitable scope.

Second, the evidence of converging trend in dynamic response of ASEAN's real GDP to external shock as well as of inverse impacts of intra-regional and inter-regional policy spillovers in ASEAN-5 countries implies that the policy coordination at all level (i.e. intra-regional, regional and global) is important for the ASEAN's countries to tackle with the negative effects of external spillover. Especially, ASEAN policymakers should take into consideration the possible impacts that their policy may have on other member countries. However, the scope and degree of policy coordination still need to further investigate because common monetary policies within ASEAN may still be not necessary at the moment due to the remaining differences in magnitudes and timing of the reaction to external shocks among the member's countries, as well as the differences in economics fundamentals and priorities of macroeconomic targets.

Finally, since financial linkage is an important transmission channel of shock from the global economy, as well as, negative impacts of monetary spillovers on ASEAN-5 real GDP are found for shocks from many countries and regions, the regional and international cooperation in financial safeguard policy and in monetary policymaking should be the important for ASEAN countries; such as, the Multilateral Chiang Mai Initiative (CMI) should be effectively implemented to strengthen the regional safety net for ASEAN and other East Asian countries from future global financial crises. To realize these policy needs, the role of international organizations, such as Asian Development Bank (ADB) and International Monetary Fund (IMF), may be important, as they could create a room that member countries' policymakers can work and coordinate with each other in policy decision making.

BIBLIOGRAPHY

Abel, A. B. (1983). Optimal investment under uncertainty. *American Economic Review, 73*(1), 228-233.

Abeysinghe, T. & Forbes, K. (2005). *Trade linkage and output-multiplier effects: a Structural VAR approach with a focus on ASIA*. NBER Working Paper 8600. Cambridge, MA: National Bureau of Economic Research.

Adolfson, M., Laseén, S., Lindé, J., & Villani, M. (2005). *Bayesian estimation of an open economy DSGE model with incomplete pass-through.* Riksbank Research Paper Series no.18.

Albagli, E., Ceballos, L., Claro, S., & Romero, D. (2018). *Channels of US monetary policy spillovers into international bond markets*. BIS Working Paper No 719. Basel: Bank for International Settlements.

An, S. & Schorfheide, F. (2007). Bayesian analysis of DSGE models. *Econometric Review, 26*(2-4), 113-172.

Anderton, R., Galesi, A., Lombardi, M., & di Mauro, F. (2010). Key elements of global inflation. In R. Fry, C. Jones, and C. Kent (Eds.), *Inflation in an era of relative price shocks*, Reserve Bank of Australia Annual Conference.

Arellano, C., Bai, Y., & Kehoe, P. (2012). *Financial markets and fluctuations in uncertainty.* Retrieved from https://www.albany.edu/economics/research/seminar/files/Yan%20Bai.pdf

Auerbach, A. J., & Gorodnichenko, Y. (2012). Output spillovers from fiscal policy. In A. Alesina & F. Giavazzi (Eds.), *Fiscal policy after the financial crisis* (pp. 63-98). Chicago: University of Chicago Press.

Auerbach, A. J., & Gorodnichenko, Y. (2013). Output spillovers from fiscal policy. *American Economic Review, 103*(3), 141-146.

Bagliano, F. C., & Morana, C. (2009). International Macroeconomic Dynamics: A Factor Vector Autoregressive Approach. *Economic Modelling, 26*, 432-444.

Balassa, B. (1961). *The theory of economic integration*. Homewood, Illinois: Richard D. Irwin.

Balassa, B. (1965). *Economic development and integration*. Mexico: Centro De Estudios Monetario Latinoamericanos.

Baxter, M., & Crucini, M. (1995). Business cycles and the asset structure of foreign trade. *International Economic Review, 36*(4), 821-854.

Belke, A., Beckmann, J., & Czudaj, R. (2013). The U.S. current account and real effective dollar exchange rates. *Credit and Capital Markets-Kredit und Kapital, 46*(2), 213-231.

Belke, A., & Osowski, T. (2016). *Measuring fiscal spillovers in EMU and beyond: A global VAR approach*. CPES Working Document No. 428. Brussels: Centre for European Policy Studies.

Belke, A., & Rees, A. (2014). The importance of global shocks for national policymakers rising challenges for central banks. *The North American Journal of Economics and Finance, 29*, 306-321.

Bernanke, B. S. (1983). Non-monetary effects of the financial crisis in the propagation of the grest depression. *The American Economic Review, 73*(3), 257-276.

Bewley, T. (2002). Forecast accuracy, coefficient bias and Bayesian vector autoregressions. *Mathematics and Computers in Simulation, 59*, 163-169.

Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica, 77*(3), 623-685.

Bluedorn, J., & Bowdler, C. (2011). The open economy consequences of U.S. monetary policy. *Journal of International Money and Finance, 30*(2), 309-336.

Borbugulov, M. (2014) *Problems of the economic integration of the countries of the Central Asia in the context of globalization*. Institute for European Politic. Retrieved from http://iep-berlin.de/wp-content/uploads/2014/10/Paper_ Borbugulov.pdf

Boschi, M., & Girardi, A. (2011). The contribution of domestic, regional and international factors to Latin America's business cycle. *Economic Modelling, 28*(3), 1235-1246.

Bosshi et al. (2014). *Domestic versus international determinants of European business cycles: a GVAR approach Empirical Economics*. CAMA Working Paper Series Paper no. 28.

Branson, W. H., & Healy, C. N. (2005). *Monetary and exchange rate policy coordination in the ASEAN+1*. NBER Working Paper no. 11713. Cambridge, MA: National Bureau of Economic Research.

Brinner, A. D., & Naknoi, K. (2003). *Trade costs, market integration, and macroeconomic volatility*. IMF Working Paper, March 2003. Washington, D.C.: International Monetary Fund.

Buch, C. M., Dopke, J., & Piedzioch, C. (2002). *Financial openness and business cycle volatility.* Kiel Institute for World Economics Working Paper.

Buch, C. M., & Piedzioch, C. (2005). The integration of imperfect financial markets: Implications for business cycle volatility. *Journal of Policy Modeling, 27*(7), 789-804.

Caballero, R. J. (2010). Macroeconomics after the crisis: Time to deal with the pretense-of-knowledge syndrome. *Journal of Economic Perspectives, American Economic Association, 24*(4), 85-102.

Canova, F. (2005). The transmission of US shocks to Latin America. *Journal of Applied Econometrics, 20*(2), 229-251.

Canova, F., Ciccarelli, M., & Ortega, E. (2007). Similarities and convergence in G-7 cycles. *Journal of Monetary Economics, 54*, 850-878.

Capannelli, C., & Houser, C. (2009). Implications of a changing environment for monetary policy in East Asia. *Kobe University Economic Review, 55*, 115-129.

Caporale, G., & Girardi, A. (2011). *Fiscal spillovers in the Euro area*. DIW Discussion Paper no. 1164. Berlin: German Institute for Economic Research.

Carriere-Swallow, Y. & Cespedes, L. F. (2013). The impact of uncertainty shocks in emerging economies. *Journal of International Economics, 90*(2), 316-325.

Cashin, P., Mohaddes, K., & Raissi, M. (2014). The global impact of the systemic economies and MENA business cycles. In I. A. Elbadawi and H. Selim (Eds.), *Understanding and avoiding the oil curse in resource-rich arab economies.* Cambridge: Cambridge University Press.

Cesa-Bianchi, A., Pesaran, M. H., Rebucci, A., & Xu, T. (2012). China's emergence in the world economy and business cycles in Latin America. *Economia, 12*(2), 1-75.

Chari, V., Kehoe, P. J., & McGrattan, E. R. (2008). Are structural VARs with long-run restrictions useful in developing business cycle theory?. *Journal of Monetary Economics, 55*(8), 1337-1352.

Chen, J., Mancini-Griffoli, T., & Sahay, R. (2014). *Spillovers from United States monetary policy on emerging markets: Different this time?*. Working Papers WP/14/240. Washington, D.C.: International Monetary Fund.

Chen, Q., Filardo, A., He, D., & Zhu, F. (2015). *Financial crisis, US unconventional monetary policy and international spillovers*. Working Papers WP/15/85. Washington, D.C.: International Monetary Fund.

Christiano, L. J., Eichenbaum, M., & Vigfusson, R. (2006). *Assessing structural VARs.* Washington, D.C.: MIT Press.

Christiano, L., Motto, R., & Rostagno, M. (2014). Risk shocks. *American Economic Review, 104*(1), 27-65.

Cooley, T. F., & Dwyer, M. (1998). Business cycle analysis without much theory. A look at structural VARs. *Journal of Econometrics, 83*, 57-88.

Chudik, A., & Pesaran, M. H. (2011). Infinite-dimensional VARs and factor models. *Journal of Econometrics, 163*(1), 4-22.

Chudik, A., & Smith, V. (2013). *The GVAR approach and the dominance of the U.S. economy*. Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute Working Paper no. 136.

Dees, S., Di Mauro, F., Pesaran, M., & Smith, L. (2007). Exploring the international linkages of the Euro area: A global VAR analysis. *Journal of Applied Econometrics, 22*(7), 1-38.

Dées, S., & Saint-Guilhem, A. (2011). The role of the United States in the global economy and its evolution over time. *Empirical Economics, 41*(3), 573-591.

De Grauwe, P. (2010). *The financial crisis and the future of the Eurozone. Bruges European Economic Policy (BEEP) briefing, 21.* Retrieved from http://aei.pitt.edu/58454/1/beep21.pdf

DeJong, D., & Dave, C. (2007). *Structural macroeconometrics.* Princeton: Princeton University Press.

De Waal, A., & Van Eyden, R. (2013). *The impact of economic shocks in the rest of the world on South Africa: Evidence from a global VAR*. Working Papers 201328, University of Pretoria, Department of Economics.

Dixit, A. K., & Pindyck, R. S. (1994). *Investment under uncertainty.* Princeton: Princeton University Press.

Doan, T., Litterman, R., & Sims, C. (1984). Forecasting and conditional projection using realistic prior distributions. *Econometric Review, 3*, 1-100.

Dragomirescu-Gaina, C., & Philippas, D. (2015). Strategic interactions of fiscal policies in Europe: A global VAR perspective. *Journal of International Money and Finance, 59*, 49-76.

Dubois, E., Hericourt, J., & Mignon, V. (2009). What if the euro had never been launched? A counterfactual analysis of the macroeconomic impact of euro membership. *Economics Bulletin, 29*(3), 2241-2255.

Ericsson, N. R., Hendry, D. F., & Mizon, G. E. (1997). The Econometric Analysis of Economic Policy. *Oxford Bulletin of Economics & Statistics,* 58(4), 573-600.

Evans D. D. M., & Hnatkovska, V. (2006). *Financial integration, macroeconomic volatility and welfare.* 7th Jacques Polak Annual Research Conference, International Monetary Fund.

Faust, J., & Leeper, E. M. (1997). *When do long-run identifying restrictions give reliable results?*. *Journal of Business and Economic Statistics, 15*, 345-353.

Faust, J., & Rogers, J. (2003). Monetary policy's role in exchange rate behavior. *Journal of Monetary Economics, 50*(7), 1403-1424.

Faust, J., Rogers, J., Swanson, E., & Wright, J. (2003). Identifying the effects of monetary policy shocks on exchange rates using high frequency data. *Journal of the European Economic Association, 1*(5), 1031-1057.

Feldkircher, M. (2013). *A global macro model for emerging Europe*. Working Papers no. 185, Oesterreichische National Bank, Austrian Central Bank.

Feldkircher, M., & Korhonen, I. (2014). The rise of China and its implications for the global economy: Evidence from a global vector autoregressive model. *Pacific Economic Review, 19*, 61-89.

Fernández-Villaverde, J. (2009). *The econometrics of DSGE models*. NBER Working Paper no. 14677. Cambridge, MA: National Bureau of Economic Research.

Fic, T. (2013). *The spillover effects of unconventional monetary policies in major developed countries on developing countries*. Working Paper no. 131 ST/ESA/2013/DWP/131. New York: UN/DESA.

Fleming, J. M. (1962). *Domestic financial policies under fixed and floating exchange rates.* Staff Papers, Washington, D.C.: International Monetary Fund.

Gali´, J. & Monacelli, T. (2005). Monetary policy and exchange rate volatility in small open economy. *Review of Economic Studies, 72*(3), 707-734.

Ganelli G., & Tawk, N. (2016). *Spillovers from Japan's unconventional monetary policy to emerging Asia: a global VAR approach*. Working Paper no. 16/99. Washington, D.C.: International Monetary Fund.

Georgiadis, G. (2015a). Examining asymmetries in the transmission of monetary policy in the Euro area: Evidence from a mixed cross-section global VAR model. *European Economic Review, 5*, 195-215.

Georgiadis, G. (2015b). *Determinants of global spillovers from US monetary policy*. Working Paper Series no. 1854. Frankfurt: European Central Bank.

Gong, C., & Kim, S. Y. (2013). *Economic integration and business cycle synchronization in Asia.* Asian Economic Paper, 12.

Goujard, A. (2013). *Cross-country spillovers from fiscal consolidations*. OECD Economics Department Working Papers no. 1099 ECO/WKP(2013)91. Paris: OECD.

Greenwood-Nimmo, M., Nguyen, V. H., & Shin, Y. (2012). *International linkages of the Korean economy: The global vector error-correcting macroeconometric modelling approach*. Melbourne Institute Working Paper Series wp2012n18, Melbourne Institute of Applied Economic and Social Research, The University of Melbourne.

Gupta, S. (2012). *Exchange rate coordination in Asia: Evidence using the Asian currency unit*. ADB Working Paper Series, 356.

Hartman, R. (1976). Factor demand with output price uncertainty. *American Economic Review, 66*(4), 388-399.

Hebous, S., & Zimmermann, T. (2013). Estimating the effects of coordinated fiscal actions in the Euro area. *European Economic Review, 58*, 110–121.

Hendry, D. F. (1995). Econometrics and business cycle empirics. *The Economic Journal, 105*, 1622-1636.

Hirata, H., Kose, M. A., Otrok, C. & Terrones, M. E. (2012). *Global house price fluctuations: Synchronization and determinants.* NBER Working Paper no. 18362. Cambridge, MA: National Bureau of Economic Research.

Hirschman, A. (1971). Introduction: Political economics and possibilism. In *A bias for hope: Essays on development in Latin America.* New Haven: Yale University Press.

Hosny, A. S. (2013). Theories of economic integration: A survey of the economic and political literature. *International Journal of Economy, Management and Social Sciences, 2*(5), 133-155.

Ingram, B., Kocherlakota, N. & Savin, N. E. (1994). Explaining business cycles: A multiple-shock approach. *Journal of Monetary Economics, 34*(3), 415-428.

Ivanova, A., & Weber, S. (2011). *Do fiscal spillovers matter?*. Working Paper no. 11/211. Washington, D.C.: International Monetary Fund.

Justiniano, A., & Preston, B. (2010). Monetary policy and uncertainty in an empirical small open-economy model. *Journal of Applied Econometrics, 25*(1), 93-128.

Kahnert, F, Richards, P., Stoutjesdijk, E., & Thomopoulos, P. (1969). *Economic integration among developing countries*. Paris: Development Center of the Organization for Economic Co-operation and Development (OECD).

Kawai, M. (2005). East Asian economic regionalism: progress and challenges. *Journal of Asian Economics, 16*(1), 29-55.

Kelley, J. (2010). *The role of membership rules in regional organizations.* Working Paper Series on Regional Economic Integration. Retrieved from https://aric.adb.org/pdf/workingpaper/WP53_Membership_Rules.pdf

Keohane, T. (1984). *After hegemony: Cooperation and discord in the world political economy.* Princeton, NJ: Princeton University Press.

Kim, S. (2001). International transmission of U.S. monetary policy shocks: Evidence from VAR's. *Journal of Monetary Economics, 48*, 339-372.

Kim, S., & Roubini, N. (2000). Exchange rate anomalies in the industrial countries: A solution with a structural VAR approach. *Journal of Monetary Economics, 45,* 561-586.

Kimball, M. (1990). Precautionary saving in the small and in the large. *Econometrica, 58*(1), 53-73.

Koop, G., Pesaran, M. H., & Potter, S. M. (1996). Impulse response analysis in nonlinear multivariate models. *Journal of Econometrics, 74*, 119-147.

Korinek, A. (2017). *Currency Wars or Efficient Spillovers? A General Theory of International Policy Cooperation*. Working Papers no 17/25. Washington, D.C.: International Monetary Fund.

Kose, M.A., Otrok, C., & Whiteman, C. H. (2005). *Understanding the evolution of world business cycles*. IMF Working Paper 05/211. Washington, D.C.: International Monetary Fund.

Kose, M. A., Terrones, M. E., & Prasad, E. S. (2006). *How does financial globalization affect risk-sharing? Patterns and channels.* Paper presented at the 7th Jacques Polak Annual Research Conference, The International Monetary Fund Wadhington, DC-November 9-10, 2006.

Krugman, P. (1993). Lessons of Massachusetts for EMU. In F. Giavazzi, and F. Torres (Eds), *The Transition to Economic and Monetary Union in Europe* (pp. 241-261). Cambridge: Cambridge University Press.

Kydland, F. E., & Prescott, E. C. (1982). Time to build and aggregate fluctuations. *Econometrica, 50,* 1345-1370.

Leland, H. E. (1968). Saving and uncertainty: The precautionary demand for saving. *The Quarterly Journal of Economics, 82*(3), 465-473.

Litterman, R. (1980). *A bayesian procedure for forecasting with vector autoregressions.* MIT Working Paper. Washington, D.C.: International Monetary Fund.

Litterman, R. (1986). Forecasting with bayesian vector autoregressions-five years of experience. *Journal of Business and Economic Statistics, 4*, 25-38.

Long, J., & Plosser, C. (1983). Real Business cycles. *Journal of Political Economy, 91*, 39-69.

Mackowiak, B. (2007). External shocks, US monetary policy and macroeconomic fluctuations in emerging markets. *Journal of Monetary Economics, 54*(8), 2512-2520.

Machlup, F. (1977). *A history of thought on economic integration*. New York: Columbia University Press.

Majuca, R., & Jesson, P. (2015). *Transmission channels of economic shocks in ASEAN*. ERIA Policy Brief 2015-01.

Mirman, L. (1971). Uncertainty and optimal consumption dicisions. *Econometrica, 39*(1), 179-185.

Miyajima, K., Mohanty, M. S., & Yetman, J. (2014). *Spillovers of US unconventional monetary policy to Asia: The role of long-term interest rates*. BIS Working Papers no. 478. Basel: Bank for International Settlements.

Monacelli, T. (2005). Monetary policy in a low pass-through environment. *Journal of Money, Credit, and Banking, 37*(6), 1047-1066.

Mundell, R. A. (1963). Capital mobility and stabilization policy under fixed and flexible exchange rates. *Canadian Journal of Economic and Political Science. 29*(4), 475-485.

Nickel, C., & Vansteenkiste, I. (2013). *The international spillover of fiscal spending on financial variables*. In F. di Mauro & H. E. Pesaran (Eds.), *The GVAR handbook: structure and applications of a macro model of the global economy for policy analysis* (pp. 182-192). Oxford: Oxford University Press.

Nobili, A., & Neri, S. (2006). *The transmission of monetary policy shocks from the US to the Euro area*. Discussion Paper. Rome: Bank of Italy.

Obstfeld, M. (1994). Risk-taking, global diversification, and growth. *American Economic Review, 84*(4), 1310-1329.

Obstfeld, M., & Rogoff, K. (1995). The mirage of fixed exchange rates. *Journal of Economic Perspectives, 9*(4), 73-96.

OECD. (2009). The effectiveness and scope of fiscal stimulus. In OECD Economic Outlook, *Interim Report March 2009* (pp. 105-150). Paris: OECD Publishing.

Oi, W. (1961). The desirability of price stability under perfect competition. *Econometrica, 29*(1), 58-64.

Pesaran, M. H., & Shin, Y. (1998). Generalized impulse response analysis in linear multivariate models. *Economics Letters, 58*, 17-29.

Pesaran, M. H., Schuermann, T., & Weiner, S. M. (2004). Modelling regional interdependencies using a global error-correcting macroeconometric model. *Journal of Business and Economics Statistics*, *22*, 129-162.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2000). Structural analysis of vector error correction models with exogenous I(1) variables. *Journal of Econometrics, 97*, 293-343.

Pesaran, M. H., Smith, L. V., & Smith, R. P. (2007). What if the UK or Sweden had joined the euro in 1999? An empirical evaluation using a Global VAR. *International Journal of Finance & Economics, 12*(1), 55-87.

Pesaran, M. H., & Smith, R. (2006). Macroeconometric modelling with a global perspective. *Manchester School, 74*, 24-49.

Prescott, E. (1986). Theory ahead of business-cycle measurement. *Carnegie-Rochester Conference Series on Public Policy, 25*, 11-44.

Rana, Pradumna B. (2006) *Economic Integration in East Asia: Trends, Prospects, and a Possible Roadmap.* Working Paper Series on Regional Economic Integration no 2. Asian Development Bank.

Razafindrabe, T. M. (2016). A multi-country DSGE model with incomplete exchange rate pass-through: An application for the Euro-area. *Economic Modelling*, *52*, 78-100

Razin, A., & Rose, A. K. (1994). Business-cycle volatility and openness: An exploratory cross-sectional analysis. In L. Leiderman, & A. Razin (Eds.), *Capital mobility: The impact on consumption, investment, and growth*. (pp. 48-76). Cambridge: Cambridge University Press.

Ricci-Risquete, A., & Ramajo-Hernández, J. (2015). Macroeconomic effects of fiscal policy in the European Union: A GVAR model. *Empirical Economics, 48*, 1587-1617.

Rudolf, B., & Zurlinden, M. (2014). *A compact open economy DSGE model for Switzerland*. Zurich: Swiss National Bank.

Schelling, T. (1997). *The strategy of conflict.* Boston, MA: Harvard University.

Senay, O. (1998). The effects of goods and financial market integration on macroeconomic volatility. *The Manchester School of Economic & Social Studies, 66*, 39-61.

Shad, M. (2011). *Economic and monetary integration.* Retrieved from https://www.uni-ulm.de/fileadmin/website_uni_ulm/mawi.inst.150/lehre/ss11/isp/Economic_and_Monetary_Integration.pdf

Shams, R. (2003) *Regional integration in developing countries: Some lessons based on case studies.* HWWA (Hamburg Institute of International Economics) Discussion Papers 251.

Sims C. (1980). Macroeconomics and reality. *Econometrica, 48*, 1-48.

Slanicay, M. (2014). Some notes on historical, theoretical, and empirical background of DSGE models. *Review of Economic Perspectives, 14*(2), 145-164.

Smets, F. & Wouters, R. (2003). An estimated dynamic stochastic general equilibrium model of the euro area. *Journal of the European Economic Association, 1*(5), 1123-1175.

Smets, F. & Wouters, R. (2007). Shocks and frictions in US business cycles: A bayesian DSGE approach. *American Economic Review, 97*(3), 586-606.

Staley, C. E. (1977). Review of A history of thought on economic integration.by Fritz Machlup. *Annals of the American Academy of Political and Social Science, 434*, 242-243.

Stock, J. H., & Watson, M. W. (2005a). *Implications of dynamic factor models for VAR analysis*. NBER Working Paper No. 11467. Cambridge, MA: National Bureau of Economic Research.

Stock, J. H., &Watson, M. W. (2005b). Understanding changes in international business cycle dynamics. *Journal of the European Economic Association, 3*, 968-1006.

Sugandi, E. A. (2018). Assessing the feasibility of international monetary policy coordination among the ASEAN-5 countries: A dynamic stochastic general equilibrium (DSGE) approach. *Journal of the Graduate School of Asia-Pacific Studies, 36*(9), 35-56.

Sun, Y., Heinz, F. F., & Ho, G. (2013). *Cross-country linkages in Europe: A global VAR analysis*. IMF Working Papers 13/194. Washington, D.C.: International Monetary Fund.

Sutherland, A. (1996). Financial market integration and macroeconomic volatility. *Scandinavian Journal of Economics, 98*, 521-539.

Tan, Sui-Lay. (2014) *Policy coordination among the ASEAN-5: An empirical investigation* (Unpublished doctoral dissertation). University of Melbourne, Melbourne.

Taylor, J. B. (1993). *Macroeconomic policy in a world economy: From econometric design to practical operation*. New York: W. W. Norton.

Truman, E. M., (2011). *Asian regional policy coordination*. Working Paper, WP 11-21. Washington, D.C.: Peterson Institute for International Economics.

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