

# GLOBAL SHOCKS AND THE NEW GLOBAL AND REGIONAL FINANCIAL ARCHITECTURE

*Asian Perspectives*



Edited by Naoyuki Yoshino, Peter J. Morgan,  
and Pradumna B. Rana



ASIAN DEVELOPMENT BANK INSTITUTE



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Asian Development Bank Institute  
Kasumigaseki Building 8F  
3-2-5, Kasumigaseki, Chiyoda-ku  
Tokyo 100-6008, Japan  
[www.adbi.org](http://www.adbi.org)

S. Rajaratnam School of International Studies  
Nanyang Technological University  
Block S4, Level B3, 50 Nanyang Avenue  
Singapore 639798  
[www.rsis.edu.sg](http://www.rsis.edu.sg)

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# List of Contributors

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Tamon Asonuma is an economist at the Research Department, International Monetary Fund, Washington, DC, United States (US).

Pornpinun Chantapacdepong is assistant director at the Monetary Policy Group, the Bank of Thailand.

Siriwan Chutikamoltham is senior lecturer and academic director (Nanyang Fellow MBA), Nanyang Business School, Nanyang Technological University, Singapore.

Zsolt Darvas is a senior fellow at Bruegel, Brussels, Belgium, at the Corvinus University of Budapest and the Institute of Economics of the Hungarian Academy of Sciences, Budapest, Hungary.

Hans Genberg is executive director of the Southeast Asian Central Banks (SEACEN) Research and Training Centre, Kuala Lumpur, Malaysia.

Tomoo Inoue is a professor at the Faculty of Economics, Seikei University, Tokyo, Japan; and a visiting fellow at the Crawford School of Public Policy, Australian National University, Canberra, Australia.

Alexei Kireyev is a senior economist at the International Monetary Fund, Washington, DC, US.

Andrei Leonidov is a head of laboratory at P.N. Lebedev Physical Institute and professor at Moscow Institute of Physics and Technology, Moscow, Russian Federation.

Matthieu Llorca is an associate professor of economics at the University of Bourgogne, Franche-Comté, France.

Peter J. Morgan is senior consulting economist and co-chair, Research, Asian Development Bank Institute, Tokyo, Japan.

Tatsuyoshi Okimoto is an associate professor at Crawford School of Public Policy, Australian National University, Canberra, Australia, and a visiting fellow at RIETI, Tokyo, Japan.

Pradumna B. Rana is associate professor at the Centre for Multilateralism Studies, S. Rajaratnam School of International Studies, Nanyang Technological University, Singapore.

Dirk Schoenmaker is a senior fellow at Bruegel, Brussels, Belgium, and professor of banking and finance at Rotterdam School of Management, Erasmus University, Rotterdam, Netherlands.

Nicolas Véron is a senior fellow at Bruegel, Brussels, Belgium, and a visiting fellow at the Peterson Institute for International Economics, Washington, DC, US.

Naoyuki Yoshino is the dean of the Asian Development Bank Institute and emeritus professor at the Department of Economics, Keio University, Tokyo, Japan.

# Preface

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In the postwar period, the global economic architecture was dominated by the advanced economies in the West. They designed the international monetary system, international development financing frameworks, and global trade liberalization schemes. They also dominated the leadership of key global institutions related to economic and financial stability, the International Monetary Fund (IMF) and, more recently, the Financial Stability Board (FSB). However, events in the past 2 decades have posed a number of significant challenges to this now somewhat aged system. The Asian financial crisis of 1997–1998 raised questions about the appropriateness of the IMF’s diagnosis of the problems and its recommended policy remedies in those countries that requested IMF programs—Indonesia, the Republic of Korea, and Thailand. This experience left a bitter taste in the region referred to as the “IMF stigma,” which made Asian economies loathe to apply for an IMF program if they could possibly avoid it. One reaction to this was the creation of the Chiang Mai Initiative, which later became the Chiang Mai Initiative Multilateralization (CMIM), as a regional safety net. In fact, however, when the global financial crisis hit in 2007–2008, the CMIM was not activated, and those countries experiencing liquidity problems turned instead to bilateral swap arrangements. This development underlines the need to strengthen the functioning and attractiveness of the CMIM.

Second, the eurozone sovereign debt and banking crisis ushered in a new example of cooperation among global and regional institutions to deal with large-scale financial crises in a number of countries. The “Troika,” composed of the IMF, the European Central Bank, and the European Commission, coordinated surveillance, assessment, and bailout arrangements for the crisis-hit countries. The need for such cooperation was clear, as none of these institutions had sufficient resources on their own to deal effectively with the crisis. However, the crisis experience also highlighted many of the problems involved in such cooperation. Most importantly, coordination efforts had to be developed in an ad hoc and improvised way in the heat of the crisis.

This book addresses the important question of how Asia’s regional architecture for economic and financial surveillance, financial safety nets, and crisis management can be strengthened and meshed with those of the IMF and the FSB to establish an effective mechanism for dealing with economic and financial shocks. This includes shocks emanating from both within the region and those transmitted via contagion from other regions.

The global financial crisis and the eurozone sovereign debt and banking crisis highlighted the risks that emerging economies, including those in Asia, face even if their own macroeconomic and financial fundamentals are sound. This book first reviews the latest developments in assessments of their vulnerabilities to various kinds of external shocks, including volatile capital flows, commodity price movements, and exchange rate fluctuations. This includes the development of early-warning systems for potential currency crises. It also examines the challenges facing monetary policy frameworks and arrangements for implementation of macroprudential policy measures and capital flow management.

Third, it assesses the capacity of regional institutions for surveillance and financial safety nets, focusing on the ASEAN+3 Macroeconomic Research Office (AMRO) and the CMIM. It also reviews the potential scope for developing coordinated regional financial regulation in Asia, taking into account the European Union experience with regard to financial supervisory and regulatory architecture and their relevance for Asia. It is important to identify potential weaknesses and areas that can be strengthened further, especially with regard to concrete issues related to activating the CMIM.

Finally, it examines the issue of how the IMF as a provider of global financial safety nets can work with regional financing arrangements, including both the CMIM and bilateral swap arrangements. In light of the experience of the eurozone sovereign debt and banking crisis, we argue that the IMF, AMRO, the CMIM, and other regional institutions need to move proactively to establish a mechanism for cooperation and joint financing activities in the event that a financial crisis hits one or more countries in the region.

The chapters in this book were originally presented at the conference on Global Shocks and the New Global/Regional Financial Architecture, which was jointly sponsored by the Asian Development Bank Institute and the S. Rajaratnam School of International Studies, Nanyang Technological University, in Singapore on 23–24 August 2016. The papers have been updated to reflect recent changes and developments. We hope that they can contribute in a significant way to the debate about how to strengthen Asia's regional economic architecture and to mesh well with global institutions to create an effective framework to deal with regional and global risks to economic and financial stability.

# Abbreviations

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AMRO	ASEAN+3 Macroeconomic Research Office
APEC	Asia–Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
BCBS	Basel Committee on Banking Supervision
BIS	Bank for International Settlements
BRRD	Bank Recovery and Resolution Directive
BU	Banking Union
CDS	credit default swap
CEBS	Committee of European Banking Supervisors
CEIOPS	Committee of European Insurance and Occupational Pensions Supervisors
CESR	Committee of European Securities Regulators
CMIM	Chiang Mai Initiative Multilateralization
CMU	Capital Markets Union
CRD	Capital Requirements Directive
DTI	debt–to–income ratio
EBA	European Banking Authority
ECB	European Central Bank
EDIS	European deposit insurance scheme
EIOPA	European Insurance and Occupational Pensions Authority
ELA	Emergency Liquidity Assistance
EP	European Parliament
ESA	European Supervisory Authority
ESC	European Securities Committee
ESFS	European System of Financial Supervisors
ESMA	European Securities and Markets Authority
ESRB	European Systemic Risk Board
EU	European Union
FDIC	Federal Deposit Insurance Corporation
FSB	Financial Stability Board
FSOC	Financial Stability Oversight Council
GDP	gross domestic product
GFSN	global financial safety net
GWP	gross written (insurance) premiums
IAIS	International Association of Insurance Supervisors
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund

IOSCO	International Organisation of Securities Commissions
JST	joint supervisory team
LTV	loan-to-value ratio
MiFID	Markets in Financial Instruments Directive
NPL	nonperforming loan
NSA	National Supervisory Authority
RFSN	regional financial safety net
SEACEN	Southeast Asian Central Banks
SREP	Supervisory Review and Evaluation Process
SRF	Single Resolution Fund
SRM	Single Resolution Mechanism
SSM	Single Supervisory Mechanism
US	United States
WTO	World Trade Organization



# 1

## Asian Perspectives on the Evolving Global Economic Architecture

*Naoyuki Yoshino, Peter J. Morgan, and Pradumna B. Rana*

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### 1.1 Introduction and Summary

The historic Bretton Woods Conference of 1944 established the International Monetary Fund (IMF), one of the first international economic institutions (IEIs) to promote macroeconomic stability. The Group of Seven/Eight (G7/8) Summit was established in the mid-1970s to oversee the IMF and other IEIs. A third element of this architecture, the Financial Stability Forum (subsequently the Financial Stability Board [FSB]) was established in the 1990s to promote financial stability and develop best practices for financial regulation and supervision.

This relatively simple architecture, which worked well for a few decades, has now come under severe strain. One important source of that strain is the fact that the governance system of the old architecture does not reflect the shift from a unipolar world to a multipolar one. That shift accelerated after the global financial crisis of 2008–2009, most visibly in the increased economic power of Asia, especially the People’s Republic of China (PRC) and India. Another source of strain is the IEI policies (e.g., charters, quotas, and voting rights), which were designed in 1944 in the interests of the like-minded members and are even now strongly protected by the original members. A third contributor to global economic architecture strain is the dramatic change in the context in which the IEIs operate, especially regarding globalization of finance. Finally, many observers have argued that the current architecture actually contributed to the global economic crisis.

Kawai, Morgan, and Rana (2014) analyzed developments across the spectrum of global institutions, including the Group of 20 (G20) in an

overall sense, the IMF in terms of economic and financial stability, the World Trade Organization (WTO) in terms of trade, and the World Bank terms of support for development of emerging economies. This volume, however, has a narrower focus: economic and financial stability, the purview of the IMF and the FSB and their regional counterparts. There are several reasons why we believe this narrowing to be appropriate. First, in the area of trade, there have been few new developments; the WTO Doha Round remains stalled, and even regional initiatives such as the Trans-Pacific Partnership have faced unexpected resistance following the election of United States (US) President Donald Trump. Second, the old cohort of multilateral development banks has seen new arrivals such as the Asian Infrastructure Investment Bank and the New Development Bank (previously the BRICS Development Bank established by the BRICS states [Brazil, the Russian Federation, India, the PRC, and South Africa]). However, it is probably too early for confident assessment of the implications of these developments.

On the other hand, the European sovereign debt and banking crisis, which lasted from approximately 2009 to 2014 and in some aspects remains with us today, provides a wealth of new experience in coordination between the IMF, regional institutions, and individual states in a complex environment of multiple national financial crises. At the same time, international financial markets have continued to evolve and grow more complex, presenting new challenges for the institutions charged with the supervision and regulation of financial stability. Implementation of ultra-low and even negative interest rate monetary policies in a number of developed economies, especially the US, the euro area of the European Union, and Japan, has increased the volatility of capital flows.

The objectives of this chapter are to (i) review key issues related to the reform of the global architecture (including revision of the roles of oversight bodies such as the G20, the IMF, and the FSB) so as to establish economic and financial stability; (ii) identify evolving trends in the global economic architecture, including developments at the regional and national levels; and (iii) develop ideas and principles to ensure that national and regional efforts complement global institutions rather than working to supplant them. The following sections summarize the findings of the studies mentioned here. Section 1.2 analyzes the economic and financial vulnerability of Asia to global shocks. Section 1.3 examines issues related to the management of capital flows. Section 1.4 reviews developments related to regional and global financial safety nets, crisis prevention, and crisis management. Section 1.5 assesses the current situation and examines the need for global and regional financial regulation and supervision. Given the importance for Asia of the recent

European experience, two separate chapters on Europe are included. Section 1.6 surveys progress toward economic stability in Asia and looks to the future.

## 1.2 Economic and Financial Vulnerability of Asia to Global Shocks

In Chapter 2, the Kireyev and Leonidov model estimated international spillovers resulting from a hypothetical drop in PRC imports resulting from the PRC's rebalancing of its growth model. The network-based model used in the analysis allows the capture of higher-round network effects of the shock, which are largely unaccounted for in the existing literature. Such effects include direct spillovers from the PRC to its trading partners, subsequent spillins among trading partners of the PRC, and spillbacks on the PRC itself. The chapter finds that most likely the network effects will be substantial, and may amplify the initial shock and change the direction of its propagation. Asia and the Pacific will experience the strongest impact, followed by the Middle East and Central Asia. The impact on sub-Saharan Africa would be noticeable only for some countries. Spillovers on Europe, including the euro area, will be moderate, and spillovers on North and South America, including the US, would be marginal. Among sectors, metal and nonfuel commodity exporters would experience the largest negative impact.

Commodity prices have become volatile over the past 2 decades, and their recent sharp decline has led to a decrease in consumer price index inflation for most economies. While many Asian economies have benefited from low international oil and food prices, commodity exporters have suffered. The negative impact of declining producer prices on production has attracted considerable attention: policy makers have become increasingly concerned about measuring the magnitude of oil and food price shock diffusion on nations' various inflationary indicators.

In Chapter 3, Yoshino and Asonuma develop a desirable transition policy for East Asian economies to address the PRC's transition to a new exchange rate regime, a basket peg. They attempt to answer two main questions: (i) which would be more beneficial for these economies, a basket peg or a floating regime? and (ii) how should a country orchestrate the shift to its chosen regime? Using a dynamic stochastic general equilibrium model of a small open economy, the authors estimate the impact of the PRC's predetermined exchange rate regime shift on East

Asian economies' choice of optimal transition policy. A calibration exercise, using data for Malaysia and Singapore from the first quarter (Q1) of 2005 to Q4 2014, identifies a gradual adjustment to a basket peg with the long-term desirable weight as first-best policy for both countries. In addition, both a sudden shift to a desirable weight basket peg and a sudden shift to a floating regime are found to be superior to maintaining the dollar peg in Malaysia, but not in Singapore.

In Chapter 4, Inoue and Okimoto investigate the impact of commodity price changes on Asian economies using a global vector autoregressive model. They extend earlier work in this area, primarily analyses of European economies using data from the pre-global financial crisis period, in the following four ways: (i) extension of the sample period to December 2015, thus covering the post-global financial crisis turbulence period (beginning January 2001); (ii) enrichment of the model by consideration of the PRC's role in integrating the Asian region through international trade; (iii) inclusion of a producer price index; and (iv) investigation of the impact of commodity price changes on industrial production.

Using generalized impulse response functions, the authors examine the impact of a onetime hike in oil and food prices on the general price levels and production of nine Asian economies and 13 other countries, including the US and the euro area. They also analyze the difference between pre- and post- global financial crisis shock propagation. The results indicate that increased integration and dependence on exports increased the Asian region's vulnerability to external shocks.

### 1.3 Managing Capital Flows

In Chapter 5, Genberg examines the policy frameworks used in Asian emerging market economies to secure economic and financial stability. Asian emerging market economies have recovered relatively well from the Great Recession of 2008–2009. Emerging Asia has been quite successful in maintaining both macroeconomic and financial stability in the turbulent global environment. Policy frameworks and governance structures have been adapted to reflect lessons learned from the Asian financial crisis. In general, policy makers have not been hesitant to adopt an eclectic approach to achieving monetary and financial stability, using multiple policy instruments to achieve their objectives: Interventions in foreign exchange markets are used in many jurisdictions to limit currency volatility; short-term interest rates to achieve macroeconomic

stability (interpreted mainly, but not exclusively, as price stability); and macroprudential policies to reduce risk related to financial stability.

However, the use of multiple instruments to achieve multiple goals is not without risk. At the very least it requires coordination among the entities responsible for each instrument, which in turn necessitates proper governance both within the central bank and between the central bank and other agencies involved. Expanding central bank objectives beyond price stability raises the question of the ability of central banks to reach these objectives while avoiding the attendant pitfalls.

In Chapter 6, Chantapacdepong examines the international transmission of volatility to the stock markets of emerging Asian economies. The study's period ranges from before the Asian financial crisis until after the global financial crisis. Over the past 2 decades the degree of volatility interdependence of equity markets among Asian economies has been increasing. There has been stronger financial integration during calm periods, which could intensify the contagion effects across markets during turbulent times. The equity markets of the emerging Asian economies exhibited stronger correlations during the global financial crisis, confirming the existence of contagion and the intensification of systemic risk. The introduction of capital flow management measures is associated with a reduction in the degree of volatility interdependence within the region.

In Chapter 7, Llorca reports an empirical assessment of external debt sustainability in a panel of 24 emerging and developing Asian economies divided into four subpanels, Southeast Asia, Southwest Asia, Central Asia, and the Asia and Pacific region, for 1993–2014. He uses present-value methodology to determine whether each country satisfies its intertemporal external constraint, i.e. whether the external debt is sustainable in the long run; and to examine panel stationarity of external debt, current account, imports, and exports. He then evaluates the cointegration between the last two variables, using unit root and cointegration tests in first and second generation tests to account for cross-section dependence. The findings indicate that external debt is sustainable in the long run in the panel of 24 emerging and developing Asian economies.

Finally, Llorca analyzes the vulnerability factors and risks in the region, using different external debt criteria (debt currency composition, share of short-term external debt, amount of reserves, and debt service). He concludes with a presentation of different prospective scenarios for Asian emerging and developing countries for varying degrees of economic slowdown in the PRC (soft and hard landings).

## 1.4 Financial Safety Nets, Crisis Prevention, and Crisis Management

In Chapter 8, Chutikamoltham argues that the Asian financial crisis of 1997–1998 raised awareness that Asia should have its own regional mechanism for mitigation of systemic risk and crisis contagion. The crisis led to the establishment of several regional organizations supportive of the regional macroprudential scheme, including the Association of Southeast Asian Nations (ASEAN)+3 Macroeconomic Research Office (AMRO), which provides macroprudential surveillance and financial crisis resolution assistance. However, AMRO is small and lacks the authority to enforce its policy recommendations, so it is not a substitute for dominant international organizations with ample resources for financial crisis resolution. Rather, AMRO would be more effective for early warning than for crisis resolution, and as such its role should be supported and expanded, with coordination with other international organizations so as to strengthen the macroprudential capacity of the Asian region.

The Southeast Asian Central Banks Research and Training Centre (SEACEN) provides training for central bankers, conducts research on central banking, and fosters networking among its members. Its work contributes indirectly to macroprudential schemes through upgrading of the capabilities of and relationships between members' central banking staff. SEACEN would be more effective if it streamlined its work focus and enhanced its collaboration with other organizations. The Executives' Meeting of East Asia–Pacific Central Banks (EMEAP) organizes meetings for the governors and deputy governors of its members' central banks for dialogue and the exchange of ideas. This fostering of relationships and interactions among top decision makers has an indirect, long-term effect on macroprudential capacity. EMEAP could enhance its effectiveness and recognition by making its planning and work more transparent. Several other high-level meetings, such as the ASEAN+3 Finance Ministers and Central Bank Governors' Meeting, Asia–Pacific Economic Cooperation and Asia–Europe Meeting, provide opportunities for policy dialogue among their members, which indirectly enhances macroprudential efforts. However, given the nature of their objectives and the relatively small size of these regional organizations, those meetings should be viewed as useful supplements to, rather than replacements for, the provisions of existing international organizations.

## 1.5 Global and Regional Financial Regulation and Supervision

In Chapter 9, Rana examines how global economic architecture evolved from its G7/G8 incarnation to that under the G20 and how it is becoming more decentralized. Rana argues that the relatively simple architecture created at Bretton Woods is facing a number of challenges. First, the governance system of the old architecture does not reflect the move from a unipolar world to a multipolar one: it reflects the dominance of the US but does not reflect the economic rise and political power of emerging markets, particularly those in Asia (the PRC and India) and thus lacks legitimacy. Second, as predicted by the theory of clubs, IEI policies (e.g., charters, quotas, and voting rights) were designed in the interests of like-minded members of the 1944 group and are strongly protected by the original members. Third, the context in which the IEIs operate has also changed dramatically. Particularly worthy of note is globalization, especially financial globalization, which has increased the incidence of financial crises and the need for regional and national actions to complement global ones (Kawai and Rana 2009).

Rana argues that in the aftermath of the global financial crisis, the centralized international monetary architecture, i.e., the global financial safety net set up at the Bretton Woods conference, is evolving toward a more decentralized multilayered safety net comprising (i) the G20 at the apex as an overarching institution; (ii) multilateral financial safety nets established under the auspices of the IMF; (iii) bilateral financial safety nets among central banks; (iv) regional financial safety nets (RFSNs) established in various regions of the world; and (v) national financial safety nets or reserve accumulation by individual countries. The factors most significantly contributing to an explanation of this evolution are financial globalization and the increased incidence of capital account crisis. Similar to developments in other regions of the world, Asia has established ASEAN+3 RFSN (comprising the Chiang Mai Initiative Multilateralization (CMIM) and AMRO–CMIM, as an instrument for crisis prevention and management. ASEAN+3 RFSN is intended as a complement to the IMF. However, since AMRO is ad hoc in nature, relatively small, and has cumbersome disbursement procedures, it is unlikely to be utilized when the next financial crisis hits the region. Taking Europe's experience with RFSNs and IMF cooperation as a foundation, Rana makes the case for more structured cooperation between ASEAN+3 RFSN and the IMF. That enhanced cooperation, together with the recent upgrading of AMRO to international organization status, could greatly enhance the effectiveness of ASEAN+3 RFSN.

In Chapter 10, Darvas compares the post-global financial crisis (GFC) financial assistance programs of four euro area countries (Greece, Ireland, Portugal, Cyprus) and three non-euro European Union (EU) countries (Hungary, Latvia, Romania). These programs, which were supported by the IMF and various European financing facilities, have features distinctly different from those of assistance programs in other parts of the world: the size of imbalances; financing; unique cooperation of the IMF and various European facilities; and (in the case of the euro area countries, which faced adjustment through low inflation) membership in a currency union. Darvas evaluates the programs in terms of their success in creating conditions to regain market access, their degree of compliance with loan conditionality, and their actual economic performance relative to program assumptions. He concludes that rate of compliance with loan conditionality is not a good predictor of program success and that the strong correlation between deviations from GDP program assumptions and fiscal performance and unemployment points to the importance of macroeconomic projections in program design. While cooperation among the Troika institutions was reasonably successful, in some cases there were major disputes among the members, primarily related to the assessment of cross-country spillovers. Asian countries can draw several lessons from the European experience, particularly related to the coexistence of the IMF and regional safety nets, cooperation issues, systemic spillovers, and the social implications of program design.

In Chapter 11, Morgan argues that regional-level financial regulation institutions can play a role in mediation between national regulators in Asia and global-level institutions such as the IMF and the FSB. This potential role could include (i) monitoring of financial markets and capital flows to identify regional systemic risks such as capital flows; (ii) coordination of finance sector surveillance and regulation to promote regional financial stability; and (iii) cooperation with global-level institutions in rule formulation, surveillance, and crisis management. Such mediation is particularly important in an environment of increasing financial integration and harmonization in the region.

Morgan considers the experience of the EU in regional financial cooperation and regulation and draws lessons for Asia. The EU's regional financial integration and regulation are the most advanced in the world today, and its experience can provide valuable lessons for Asia. This chapter examines four aspects of financial regulation: microprudential regulation, macroprudential regulation, resolution capacity and deposit insurance, and financial safety nets for liquidity support. The chapter focuses primarily on systemic stability aspects, since that is arguably the area in which regional cooperation can make the largest contribution.

Asia's considerable diversity of financial development and openness requires a more nuanced approach to integration than that taken by



the EU. Despite its shortcomings and slow pace, the ASEAN Economic Community process probably provides the most feasible and relevant model for voluntary regulatory cooperation. Asian economies can also take other steps toward integration: strengthening of existing surveillance processes; enhancement and diversification of the resources, functions, and membership of the CMIM and AMRO for surveillance and the provision of a financial safety net; and creation of an Asian financial stability dialogue to support the monitoring of regional financial markets, to facilitate policy dialogue and cooperation, and to secure regional financial stability.

In Chapter 12, Darvas, Schoenmaker, and Véron argue that European Union countries offer a unique experience of financial regulatory and supervisory integration, complementing that of various other European integration efforts following World War II. Financial regulatory and supervisory integration was a very slow process before 2008, despite significant cross-border integration, especially of wholesale financial markets. However, the existing policy framework proved inadequate in the context of the major financial crisis in the EU starting in 2007, and especially in the euro area after 2010. That crisis triggered major changes in European financial regulation and financial supervisory architecture, most prominently with the creation of three new European supervisory authorities in 2011 and the gradual establishment of the European banking union, starting in 2012. The banking union is a major structural change at the institutional level for the EU, arguably the most significant since the introduction of the euro. Even though it is far from completely developed, and though there is little likelihood of completion in the near future, the banking union has improved financial supervision and resilience in the euro area. Asian financial integration lags well behind that of Europe, and Asia has no comparable political and legal integration. Nevertheless, Asia can draw useful lessons from the European experience in a number of areas including harmonization of the microprudential framework, creation of proper macroprudential structures, and participation in global financial authorities.

## 1.6 Conclusions and the Way Forward

Twenty years after the Asian financial crisis and 10 years since the beginning of the GFC, the development of a well-articulated framework bringing together global, regional, and national institutions to support economic and financial stability in Asia remains very much a work in progress. On the positive side, Asian economies have taken many steps to strengthen their economic fundamentals and reduce their vulnerability to external shocks. These steps include the adoption of more flexible

exchange rates and more transparent and well-managed monetary policy frameworks; the development of local-currency bond markets; and the bolstering of their foreign exchange reserves. However, financial markets and cross-border capital flows continue to develop in ways that may increase financial systemic risks. This requires continued vigilance on the part of the national institutions in charge of macroeconomic policy and financial system stability.

Regional-level institutions have developed too, but progress has been more measured. AMRO has achieved international institution status, but remains too small to be a fully effective monitor of economic and financial stability risks in the region. The CMIM has been strengthened, but not to the extent that it could provide sufficient support if multiple members were hit simultaneously by crises as a result of contagion. Linkage to IMF programs remains a major stumbling block for activation of the CMIM, as seen in the reliance of some Asian countries on bilateral swap agreements during the GFC. The roles of regional policy forums such as the ASEAN+3, EMEAP, and SEACEN have evolved relatively little during this period. Cross-border regulatory coordination is also still in its infancy. Further steps are needed to enhance the capacity of AMRO and the size and flexibility of the CMIM, and to encourage progress in the area of regulatory coordination, building on the structure of the ASEAN Economic Community.

Steps toward the development of closer and more institutionalized relationships between these regional institutions and their global counterparts, the IMF, and the FSB, have been modest so far. The experience of the European sovereign debt and banking crisis showed the importance of coordinated efforts by global and regional bodies, but it also highlighted a number of related problems, notably the ad hoc and improvised coordination efforts developed in the heat of the crisis. Therefore, our strongest recommendation is that Asian regional institutions and their global counterparts take note of this experience and work proactively to develop a framework for closer cooperation before the next crisis erupts.

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# 2

## Imports Slowdown in the People's Republic of China: Spillovers, Spillins, and Spillbacks

*Alexei Kireyev and Andrei Leonidov*

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### 2.1 Introduction

Growth in the People's Republic of China (PRC) is expected to continue to decline in the medium term from the unprecedentedly high rates in the first decade of the 2000s. As a result, the probability of an import shock emanating from the PRC could increase, largely as a result of the PRC's transition to a new consumption-led growth model with less reliance on import-intensive investment. Moreover, excesses in real estate, credit, and investment continue to unwind, with further moderation of investment growth rates, especially those related to residential real estate. This situation has prompted the prediction that in emerging markets, medium-term risks might result from spillovers from a hard landing or much slower potential growth in the PRC (IMF 2015a). This prediction assumes that policy action would be consistent with decreasing vulnerabilities stemming from the recent rapid growth of credit and investment and hence would not aim at fully offsetting the underlying moderation in activity.

This chapter assesses the impact on the rest of the world of a potential slowdown in PRC imports, including impact through network effects. Network effects, defined as higher-round effects generated by the network structure of bilateral balance of payments flows, although largely disregarded in the literature on spillovers, can be substantial and can at times exceed the initial shock. This study applies a network effect quantification method, proposed in Kireyev and Leonidov (2015) with a nominal demand shock as an example. The method, consisting of a sequential transformation of the inflow–outflow matrixes of bilateral

trade flows, captures spillovers from initial shock and subsequent network effects, including spillin and spillback.

Only a few studies have touched on the issue of international spillovers from economic shocks in a network context. Cerdeiro and Wirkierman (2008) proposed a linear general interdependence model of the world economy for assessment of the propagation of an exogenous shock to autonomous expenditures through the channel of international trade. Kali and Reyes (2010) mapped the global trading system as an interdependent complex network to obtain indicators of a country's degree of connectedness to the global trading system. Taking into account interconnectedness, they found that crises are greater for epicenter countries that are better integrated into the trade network. Vidon (2011) assessed the direct impact (including knock-on effect) of a change in United States (US) imports on its trading partners. Fronczak and Fronczak (2012) proposed a spillover model based on a fluctuation response theorem. Finally, Contreras and Fagiolo (2014) analyzed spillovers using Leontief input-output matrixes connecting industry sectors in several European countries.

This chapter contributes to the existing literature in several areas: (i) it develops a computable network model of international spillovers that can be applied to any bilateral balance of payments flow; (ii) it allows identification and estimation of the network effects of international shock spillovers, which can significantly amplify the initial shock and are largely untraceable with existing methodologies; (iii) it proposes the concept of a pass-through coefficient and presents means of estimating it, which would allow the quantification of shock percolation through individual countries by means of a quantitative measure of a country's ability to amplify, absorb, and block shocks; and (iv) it assesses the potential spillovers from the PRC's imports slowdown, which could contribute to uncertainty and risk of economic vulnerability.

The modeling of international spillovers on a network presented here is portrayed as follows. Section 2.2 provides an overview of current policy challenges related to the PRC. Section 2.3 adapts a previously developed network model of economic spillovers to the case of the PRC. Section 2.4 discusses the empirics of spillovers in a network context. Finally, Section 2.5 draws conclusions and makes practical recommendations.

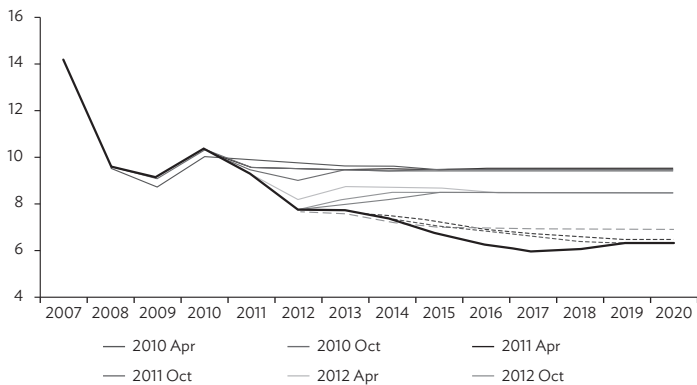
## 2.2 Policy Setting

The PRC's imports are predicted to moderate as a result of a new growth model after the unprecedentedly high rates observed since the early

2000s. The PRC's growth stayed in the range of 10% a year through 2010, driven mainly by domestic investment and exports (Figure 2.1). Since then, growth gradually declined to an average of 8% in 2011–2014. The PRC leadership has recently announced a new growth model aimed at rebalancing the economy in favor of domestic consumption (including services) and less reliance on import-intensive investment. As a result, the PRC's leaders targeted an even lower growth rate of 6%–7% for 2015–2016. For 2015, International Monetary Fund (IMF) staff continued to see gross domestic product (GDP) growth of 6.5%–7% as striking the desired balance between addressing vulnerabilities and minimizing the risk of either too sharp a slowdown or disorderly adjustment (IMF 2015b).

The transition to a new growth model is considered favorable for the PRC and the world as the new model seems more sustainable in the long run. In the last 2 decades, the PRC moved from labor-intensive export products toward more sophisticated ones, which increased domestic value added and reduced the import content of its exports. This move up the value chain has contributed to a sharp reduction of PRC imports from its main supplier countries, increasing those countries' trade deficits with the PRC. Lower import demand by the PRC, driven by the PRC's orderly slowdown, has for the most part been factored into

**Figure 2.1: Revisions of PRC Growth Projections, 2016–2020**  
(Real GDP growth in %)



GDP = gross domestic product, PRC = People's Republic of China.  
IMF World Economic Outlook databases, 2012–2015.

exports and growth forecasts for the rest of the world. Therefore, the near-term slowdown in economic activity in the PRC is broadly viewed as a price worth paying for safer and more sustainable long-term growth.

While the PRC's growth has been moderating broadly in line with projections, international spillovers from the PRC's import slowdown already show signs of becoming larger than previously imagined. In September 2015, the World Trade Organization (WTO) revised its earlier trade forecast for 2015. The downward revision of the forecast for Asia on the import side was substantial, from 5.1% to 2.6%, due in part to a 2.2% year-on-year decrease in PRC imports for Q2 2015 (non-seasonally adjusted data). The product composition of the PRC's merchandise imports suggests that some of the slowdown may be related to the country's ongoing transition from investment-led to consumption-led growth. Large year-on-year drops in the import volume of machinery (−9%) and metals (iron and steel−10%, copper−6%) were recorded in customs statistics (WTO 2015). Driven mainly by reduced projections of import-intensive investment, lower import demand by the PRC has already spilled over to the rest of the world and affected both international prices and the volume of exports from other countries to the PRC.

The risks of a substantial drop in PRC imports are open to debate and span a broad spectrum, including real and financial channels (Table 2.1). The October 2015 edition of the World Economic Outlook (WEO) (IMF 2015a) presented simulations of two possible risk scenarios related to structural slowdowns in a number of emerging market economies. In both simulations, investors expect lower growth in the future, because of slower catch-up, lower productivity growth, lower capital inflows, and tighter financial conditions. As a result, investors reduce investment expenditure relative to the WEO baseline projections, resulting in weaker domestic demand in emerging market economies. In particular, the sizable decline in investment and growth in the PRC—together with a general slowdown across emerging market economies—indicates a sizable weakening of commodity prices, particularly metal prices, resulting in weaker terms of trade for commodity exporters. Similarly, the 2015 IMF staff report for Article IV consultations with the PRC (IMF 2015b) suggests slower medium-term growth and a sharp slowdown relative to the baseline scenario (Figure 2.2).

Different scenarios have been used to quantify the above risks. One scenario assumes that without reforms, growth would gradually fall to around 5% in 2020, with sharply increasing debt (IMF 2015b). In another scenario, the PRC would experience 4 consecutive years of lower growth for a permanent cumulative real GDP loss of 12% compared with the baseline scenario (Anderson et al. 2015). All scenarios are purely

**Table 2.1: PRC Domestic Risks**

Main Source of Risk	Overall Level of Concern	
	Likelihood Over the Next 1 to 5 Years	Impact and Policy Response
Sharp slowdown in 2015–2016	<p><b>Low</b></p> <p>Growth falls significantly below target, possibly due to a severe housing downturn or a shock in the shadow banking sector, and absent offsetting stimulus.</p>	<p><b>High</b></p> <p>Such a shock could trigger a negative feedback loop between real activity, bank asset quality, lending, and local government finances.</p> <p><b>Policy response:</b> If near-term growth were to slow too sharply, then fiscal stimulus should be used in a manner that supports rebalancing and helps protect vulnerable groups.</p>
Medium-term slowdown	<p><b>Medium</b></p> <p>Insufficient progress with reforms leads to a continued buildup of vulnerabilities, which over the medium-term results in a significant growth slowdown.</p>	<p><b>High</b></p> <p>Main impact would be through continued resource misallocation, leading to significant total factor productivity slowdown and overall potential growth in the medium term.</p> <p><b>Policy response:</b> Advance structural reforms to accelerate the transition toward a more balanced and sustainable growth path.</p>

PRC = People's Republic of China.

Source: IMF (2015b).

illustrative. Rather, these exercises are attempts to identify channels through which slow growth impacts on the rest of the world.

The modeling of the potential spillovers is mainly in the frame of reference of global general equilibrium models. For example, staff simulations based on the flexible system of global models suggest that the impact of such a slowdown on other major economies would be relatively minor, while slow progress in reforms or the containment of vulnerabilities—resulting in much lower income in the PRC over time—would have significant negative spillovers in the medium to long term (IMF 2015b). Simulations based on the global integrated monetary and fiscal model suggest that the impact on commodity prices would depend on perceptions of the slowdown: it would be largest if

completely unanticipated, which could be interpreted as a substantial revision of expectations regarding growth prospects or, equivalently, as an erroneous perception of growth prospects before the slowdown, leading to excessive investment in future supply. The findings from application of the abovementioned models also suggest that the impact would depend on the exposure of individual countries to the PRC, the size of their external sectors, and the commodity composition of their trade. For example, lower growth in the PRC was found to have likely non-negligible effects on global real GDP, which would permanently decline by more than 1.6% relative to the baseline (Box 2.1).

This chapter examines the risk resulting from a drop in PRC imports exceeding baseline projections. Two parallel forces could trigger such a drop in imports. On the one hand, domestic rebalancing in the PRC would imply a transition to a more sustained growth path over the medium to long term, and a shift from import-intensive investment to less import-intensive consumption could reduce the demand for imports by PRC companies and the PRC government. On the other hand, lower demand for exports of final goods assembled in the PRC (resulting from sluggish growth in most key PRC export markets) would inevitably reduce PRC demand for intermediate imports.

## 2.3 Trade Network Economics

### 2.3.1. Network Presentation of Spillovers

To represent international trade in a network form, each country is considered a node and its bilateral trade as links. Such a trade network is a directed, weighted, incomplete, and asymmetric graph. That graph is directed because the links that explicitly represent revenue from exports and payments for imports denote a flow and the direction of that flow from one country to another. The graph is weighted because all links reflect some value of payment—different for each country and each flow. The graph is incomplete since not all countries in the world are connected through trade. Finally, the graph is asymmetric because for most countries the number of links to export partners (out-links) is different from the number of links to import partners (in-links).

Several elementary types of connections are possible within a trade network. From the position of epicenter country *A* affected by the domestic demand shock, there are the following four possible scenarios (Figure 2.2):



### **Box 2.1: Spillovers from a Decrease in PRC Imports (Selected Previous Findings)**

The possible scenario of global repercussions of a generalized slowdown in emerging market and developing economies includes the materialization of a number of risks—a slowdown in investment and growth across emerging market economies, more severe in faster-growing economies such as the People's Republic of China (PRC) and India; lower commodity prices, arising from that slowdown; and higher risk premiums and exchange rate depreciation across emerging market economies. The implications for growth in emerging market economies and developing countries would be considerable, with growth rates decreasing by 1.5 to 2 percentage points lower over 5 years. Spillovers onto advanced economies would also be material, with growth about 0.2 to 0.3 percentage points after 5 years (depending on whether risk aversion toward emerging market assets increased) and a substantial deterioration in current account balances, despite the partial offset resulting from lower commodity prices.<sup>a</sup>

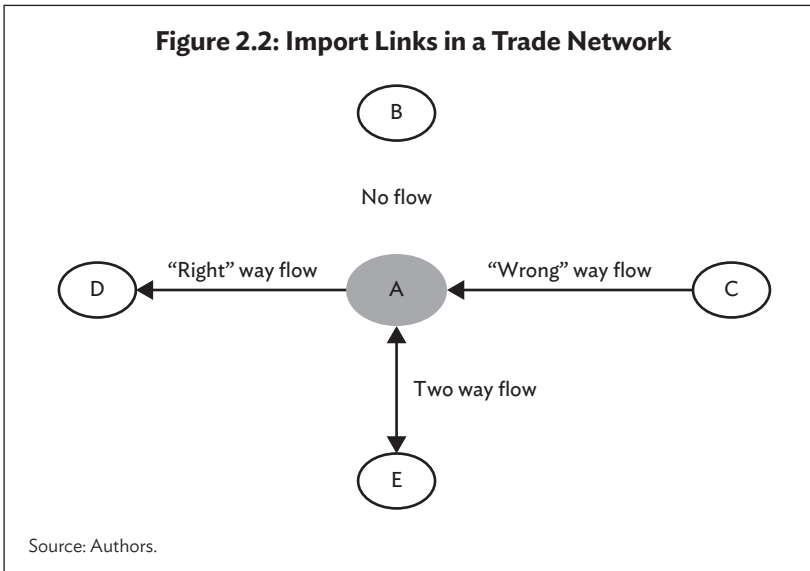
In the event of lower potential output in the PRC global, real gross domestic product (GDP) would be 1.6% lower relative to the baseline. Real commodity prices would also be lower, oil prices by almost 8%. However, the net effect on the economic activity of sub-Saharan Africa commodity importers would be near zero because of the positive effect of lower global commodity price. The overall impact on commodity exporters would be about -0.5% of GDP. The PRC rebalancing scenario would have global effects that would in turn impact on sub-Saharan Africa. The results of the simulations in this paper suggest that these reforms would likely lead to an increase of more than 25% in real GDP in the medium to long term, accompanied by adverse effects on PRC economic activity in the short to medium term, i.e., a decline of about 1% relative to the baseline. During the transition, there would be a marginal negative impact on global economic activity and commodity prices would likely fall below the baseline. However, in the long term, oil prices would increase by roughly 15%. Consequently, the PRC reforms would benefit commodity exporters in sub-Saharan Africa by about 1% of real GDP, but would provide little benefit to commodity importers.<sup>c</sup>

<sup>a</sup> IMF October 2015 World Economic Outlook (IMF 2015a).

<sup>b</sup> People's Republic of China: Staff Report for the 2015 Article IV Consultation (IMF 2015b).

<sup>c</sup> Anderson et al. (2015).

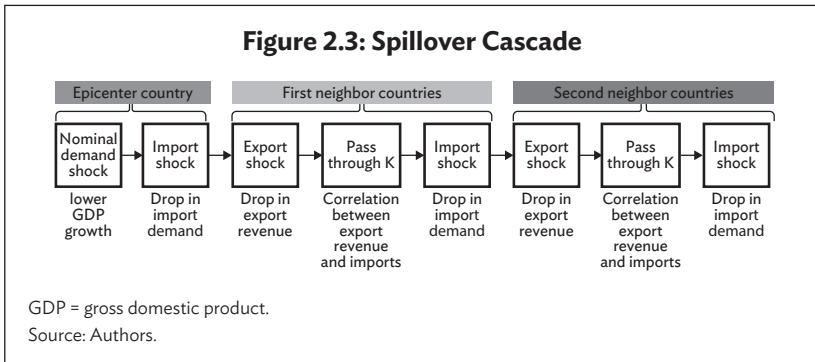
- (i) If there are no links in any direction, there can be no direct impact on *B* from a shock in *A* (although this does not exclude an indirect impact through spillin effect).
- (ii) There could be a one-way link but in the “wrong” direction for shock spillovers. (Epicenter country *A* exports to *C* and gets payments for exported goods as indicated by the arrow, but *A*



does not import from *C* and therefore does not pay for these imports. Therefore, an import demand shock in *A* would not directly affect *C*. Again, spillins would be possible.)

- (iii) There could be a one-way link in the “right” direction for shock spillovers. Country *A* does not export to *D* but *A* does import from *D* and sends payments for imports as indicated by the arrow. Therefore, there will be a direct impact on *D* from an import demand shock in *A*, as *D* would simply get less revenue from its exports. In this case, there would be no direct spillback from *D* to *A*, but indirect spillbacks would be possible.
- (iv) There could be two-way links. *A* exports to *A* and gets payments for exported goods, as indicated by the top arrow. In parallel, *A* imports from *E* and sends payments for imports as indicated by the bottom arrow. In this case, an import demand shock in *A* would affect *E*, its first neighbor; and there would be also immediate spillback from *E* to *A*, because the loss in export revenue for *E* would translate into lower imports from all its trading partners including *A*.

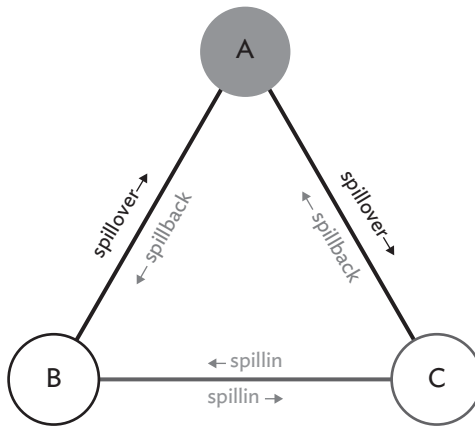
In Figure 2.3, two types of shocks emerge in the spillover cascade. An *import shock* in the epicenter country can be defined as a drop in that country’s import demand, driven by any factor. An *export revenue shock*



can be defined as a drop in the export revenue of its trading partners as a result of the import demand shock in the epicenter country (Figure 2.3). The two shocks are fundamentally different. An import shock sends an *exit* shock, that is, it sends a signal from the epicenter country to its immediate neighbors, which is passed from its first neighbors to its secondary, tertiary, up to  $n$ th level neighbors. An export shock is an *entrance* shock, which affects first and onward, and an import shock at the epicenter. Once an export shock hits first neighbors, it could pass through to affect their imports or it could die if the country does not pass on the shocks due to its economic structure. The export shock for each country will always be nonzero, whereas the import shock will be zero except for countries where import revenue depends on export revenue.

Representation of world trade as a network allows modeling of the network effects from shocks to individual countries. The immediate impact is generally well understood: the immediate trading partners of each country are known and the distribution of the impact from, and import demand shock to, the epicenter country can be immediately assessed based on its share of the exports of its trading partners. Higher-round impacts are less well known and are generally poorly understood because of the complexity of the assessment of network effects in traditional global general equilibrium models.

The network effect of an import demand shock can be broken down into spillover, spillin, and spillback effects. In a simplified form, the distinction between the three types of network effects can be presented as in Figure 2.4. Suppose that the world consisted of three countries. Country A, the epicenter of the shock, is directly connected to countries B and C. Therefore: *spillovers* would be first round impacts on B and C from the shock in A; *spillins* would all be higher round effects between B and C in both directions, generated by spillovers; and *spillbacks* would be all higher round impacts from B and C back on A.

**Figure 2.4: Spillovers, Spillins, and Spillbacks**

Source: Authors.

### 2.3.2 Network Model of Spillovers

International trade flow data are represented here by export–import matrixes. An export matrix is a matrix where rows contain exports of a country to all other countries, and columns contain imports of each country from all other countries. These matrixes are  $W = \{w_{ij}\}$ , such that  $w_{ij}$  is a matrix element of matrix  $W$ , which stands for exports from country  $i$  to country  $j$ . Thus, for a fixed  $i = i_0$ ,  $w_{i_0j}$  vector is the vector of exports of a country  $i_0$ , and for a fixed  $j = j_0$ ,  $w_{ij_0}$  is the vector of imports to country  $j_0$ .

A cascade round is the process by which the initial import shock in the epicenter country is transformed into a secondary shock to its trading partners. Schematically, each round of a cascade consists of two steps:

- (i) The initial import demand shocks  $(\Delta M_1, \dots, \Delta M_N)$  are proportionally distributed among exporters to the epicenter country and by definition create a vector of export shocks to their export revenue

$$(\Delta M_1, \dots, \Delta M_N) \rightarrow (\Delta X_1, \dots, \Delta X_N).$$

- (ii) These export shocks create secondary import shocks  $(\widetilde{\Delta M}_1, \dots, \widetilde{\Delta M}_N)$  which create a vector

$$(\Delta X_1, \dots, \Delta X_N) \rightarrow (\Delta \widetilde{M}_1, \dots, \Delta \widetilde{M}_N).$$

If additional import shocks need to be included on top of the dynamically generated secondary imports shocks, they can be added to the secondary shocks  $(\Delta \widetilde{M}_1, \dots, \Delta \widetilde{M}_N)$ .

Export shocks are generated by the following process. Assume that total imports  $\overline{M} = (M_1, \dots, M_N)$  of the epicenter country have decreased by  $\overline{M} - \Delta \overline{M}$ . For each of its components  $M_j$ , the negative import demand shock  $\Delta \overline{M}$  by definition translates in losses in export revenue  $\{\Delta w_{ij}\}$  for all countries  $\{i\}$  that export to the epicenter country  $j$ .

$$\Delta M_j = \sum_{i=1}^N \Delta w_{ij}$$

Assuming that export reduction is proportional to the corresponding shares of export from  $i$  to  $j$

$$\Delta w_{ij} = \frac{w_{ij}}{\sum_{k=1}^N w_{kj}} \Delta M_j \equiv \frac{w_{ij}}{M_j} \Delta M_j$$

This equation corresponds to the transformation  $W \rightarrow \widetilde{W}$  of the import-export matrix by which

$$W = \begin{pmatrix} w_{11} & \cdots & w_{1j} & \cdots & w_{1N} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ w_{N1} & \cdots & w_{Nj} & \cdots & w_{NN} \end{pmatrix}$$

turns into

$$\widetilde{W} = W - \Delta W$$

where

$$\Delta W = \begin{pmatrix} \Delta w_{11} & \cdots & \Delta w_{1j} & \cdots & \Delta w_{1N} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \Delta w_{N1} & \cdots & \Delta w_{Nj} & \cdots & \Delta w_{NN} \end{pmatrix}$$

The component of the corresponding drop in the export revenue vector  $\Delta \overline{X}$  is thus equal to

$$\Delta X_i = \sum_{j=1}^N \Delta w_{ij} \equiv \sum_{j=1}^N \frac{w_{ij}}{M_j} \Delta M_j$$

This equation can be presented in two equivalent forms: as a matrix multiplication

$$\Delta \bar{X} = W \frac{\Delta \bar{M}}{\bar{M}}$$

whereby the exports shock  $\Delta \bar{X}$  transforms the initial export–import matrix  $W$  by changing the relative imports weights  $\frac{\Delta \bar{M}}{\bar{M}}$  for all countries

or in matrix form

$$\Delta \bar{X} = \Omega \Delta \bar{M}$$

where  $\Omega$  is a matrix  $W$  in which each column is normalized by its sum, so that  $\Omega_{ij} = w_{ij}/M_j$ .

The pass-through coefficient is estimated as part of an import demand function. Estimations in real and nominal terms have been considered. In real terms, the pass-through coefficient  $\beta_i$  for each country  $i$  can be estimated based on the import demand function

$$\ln \left( \frac{m_{i,t+1}}{m_{i,t}} \right) = \alpha_i + \beta_i \ln \left( \frac{x_{i,t+1}}{x_{i,t}} \right) + \gamma_i \ln \left( \frac{r_{i,t+1}}{r_{i,t}} \right) + \delta_i \ln \left( \frac{P_{i,t+1}^M}{e P_{i,t}} \right) + \varepsilon_i$$

This model allows differentiation of marginal propensities to import across expenditure categories. For each country  $i$ , changes in demand for real imports ( $m_i$ ) depend on: changes in export revenue in real terms ( $x_i$ ); and changes in real domestic income ( $r_i$ ), defined as the economy's total real income from all sources minus its real income from exports ( $y - x$ ); relative prices defined as the ratio of the index of import prices  $P_i^M$  to domestic prices ( $P_i$ ) for each country, converted into dollars using exchange rate ( $e$ ) and a country-specific error term ( $\varepsilon_i$ ). This model requires taking the small country assumption as international prices are treated as given for all countries other than the PRC itself, and the shock propagation affects only the volumes of imports and exports.

Alternatively, the pass-through coefficients can be estimated in nominal terms to take into account both price and volume effects. The equation is

$$\ln \left( \frac{M_{i,t+1}}{M_{i,t}} \right) = \alpha_i + \beta_i \ln \left( \frac{X_{i,t+1}}{x_{i,t}} \right) + \gamma_i \ln \left( \frac{R_{i,t+1}}{R_{i,t}} \right) + \varepsilon_i$$

where changes in nominal imports  $M_i$  are driven by changes in export revenue  $X_i$  and domestic income  $R_i$ . The assumption regarding the spillover dynamics is that for some but not all countries, decline in export revenue can lead to a drop in imports, contemporaneously or with some lag. Therefore, the export shock is transmitted only to imports and does not affect domestic income directly. Parameter  $\beta_i$  can be viewed then as a *pass-through coefficient* for shock spillovers through each country.

Secondary import shocks are generated as follows. In the simplest case, a linear relation between export revenue and the ensuing imports can be assumed, so that the secondary import shock  $\Delta\widetilde{M}_i$ , generated by the export revenue shock  $\Delta X_i$  is on average determined by

$$\ln\left(\frac{M_i - \Delta\widetilde{M}_i}{M_i}\right) = \beta_i \ln\left(\frac{X_i - \Delta X_i}{X_i}\right)$$

or

$$\Delta\widetilde{M}_i = M_i \left( 1 - \left( 1 - \frac{\Delta X_i}{X_i} \right)^{\beta_i} \right)$$

The newly generated import demand shock  $\{\Delta\widetilde{M}_1\}$  becomes the new export revenue shock for the next round of shock spillover.

The cascade of spillovers can be generated dynamically as quarterly shocks. Assuming that the vector of imports drops by some fixed amount  $\overline{\Delta M}_0^i$  each quarter, the cascade proceeds as follows. Let us denote by  $\overline{\Delta M}_{In}^{(i)}$  the vector of direct import shocks in a given quarter  $i$  and by  $\overline{\Delta M}_{Out}^{(i)}$  the network-generated import shock at the end of each quarter. The resulting cascade is:

$$\begin{aligned} \overline{\Delta M}_{In}^{(1)} &\rightarrow \overline{\Delta X}_{\square}^{(1)} \rightarrow \overline{\Delta M}_{Out}^{(1)} \\ \overline{\Delta M}_{Out}^{(1)} + \overline{\Delta M}^{(2)} &\rightarrow \overline{\Delta X}_{\square}^{(2)} \rightarrow \overline{\Delta M}_{Out}^{(2)} \\ &\dots \rightarrow \dots \\ \overline{\Delta M}_{Out}^{(7)} &\rightarrow \overline{\Delta X}_{\square}^{(8)} \rightarrow \overline{\Delta M}_{Out}^{(8)} \\ &\dots \rightarrow \dots \end{aligned}$$

The estimated pass-through coefficients might lead to three cases of shock diffusion. Individual countries can be (i) *spillover amplifying*: if  $\beta > 1$ , a change in the export revenue of first neighbors would lead to a proportionally larger change in their imports. (As a result, the

initial shock impulse would expand, passing through those countries, and its impact on other countries might be stronger than the original shock.); (ii) *spillover absorbing*: if  $0 < \beta \leq 1$ , a change in export revenue would lead to a proportionally smaller change in imports and the shock impulse spilled over from first to second neighbors would be smaller than the original shock; finally, (iii) *spillover blocking*: if  $\beta \leq 0$  or  $\beta$  is not statistically significant irrespective of its value, export revenue cannot be seen as a constraint on imports and the shock to the export revenue of the country would not have any impact on its imports, which are probably financed from other sources. Countries with this type of pass-through coefficient would serve as natural barriers to shock spillovers.

Although the model is presented nominally, it can also be estimated in real terms. This alternative approach would allow differentiation between the impact of price and volume effects, and could account for volumes-induced shifts in prices. This is particularly important in the case of a real import shock originating in the PRC, a large country in the economics sense, capable of affecting world prices of key commodities (Box 2.2).

In sum, the economics of spillovers from a nominal import demand shock can be presented as follows:

*Initialization*: The initial shock to the epicenter country  $i$  is the decline in its nominal demand  $\Delta Y_i$ ; assuming its marginal propensity to import is unity, this shock translates into a decline in its imports of  $\Delta M_i$ ; this translates to a loss of export revenue for  $N_i$  adjacent countries by the same amount. The underlying assumption is that the initial shock redistributes between exporters to the epicenter country in proportion to their shares in the epicenter country's imports. A more detailed balance of payments analysis would certainly necessitate modifications to this assumption.

*First round*: the loss of export revenue for  $N_i$  adjacent countries leads to a decline in their GDP,  $Y_i \downarrow = C + I + X_i \downarrow - M$ ; the impact on a trading partner's GDP depends on the share of exports in the partner's GDP; the larger the share, the larger the impact.

*Pass-through*: countries with  $\beta > 1$  amplify the original shock and spill it over to their trading partners; countries with  $0 < \beta \leq 1$  absorb part of the shock but still spill it over; countries with  $\beta < 0$  or statistically insignificant, block the shock (Box 2.3).

*Second and subsequent rounds*: the variably lower GDP growth rate of the immediate trading partners of the epicenter country translates into a demand shock for their trading partners, which at this stage is not uniform, but rather, proportional to the decrease in the export revenue of each of the immediate partners at the first round. Assuming again the marginal propensity to import at unity, imports of the epicenter



### Box 2.2: Price and Volume Effects of Spillovers

Shocks can be decomposed into price and volume effects. Imports in nominal terms  $M_i$  are a product of the volume of all imported goods  $Q_i^M$  and their prices  $P_i^M$ , i.e.,  $M_i = Q_i^M * P_i^M$ . The shock is represented by the decrease in the volume of imports by a large country. Such a decrease may be driven by: a domestic economic or financial crisis, as domestic agents reduce demand for real imports; the process of economic rebalancing, when the government decides to promote import substitution in favor of domestically produced goods; an outright import ban; or a technological breakthrough that reduces the need for a particular resource. The assumption of a large country suggests that the fall in import volume should affect international prices.

The first stage of spillover would consist of a decrease in import volume only. Assume that the volume of imports of a large country drops by  $\Delta Q_i^M$ . This decrease would translate immediately into a symmetrical drop in the volume of exports by all the country's trading partners  $\Delta Q_i^X$ . Total import volume

$$\bar{Q} = (M_1, \dots, M_N)$$

of the epicenter country would decrease by  $\bar{Q} - \Delta \bar{Q}$ . For each of the components  $Q_j$  of total import volume, the negative import demand shock  $\Delta \bar{Q}$  by definition translates to losses in export volumes  $\{\Delta w_{ij}\}$  for all countries  $\{i\}$  that export to the epicenter country  $j$ , written as

$$\Delta Q_j = \sum_{i=1}^N \Delta w_{ij}$$

assuming that export reduction is proportional to the corresponding shares of export from  $i$  to  $j$

$$\Delta w_{ij} = \frac{w_{ij}}{\sum_{k=1}^N w_{kj}} \Delta Q_j^M \equiv \frac{w_{ij}}{M_j} \Delta Q_j^M$$

At this point, there would be no impact on world prices, as the shock would be short term and would affect only trade volumes.

In the second step, the shock begins to affect both volumes and prices. The shock would spill over the trade network and reduce the volume of imports from all neighboring countries (nodes) and simultaneously depress international prices. The price shock is added to the volume shock. The impact on volumes can be described as a transformation of the initial real import shock in the epicenter country into a secondary real shock to its trading partners. Schematically, each round of the cascade consists of two steps. The initial real import demand shock  $(\Delta Q_1, \dots, \Delta Q_N)$  is proportionally distributed among exporters to the epicenter country and by definition creates a vector of real export shocks to their export volumes

*continued on next page*

**Box 2.2** *continued*

$$(\Delta Q_1^M, \dots, \Delta Q_N^M) \rightarrow (\Delta Q_1^X, \dots, \Delta Q_N^X).$$

These real export shocks would create secondary real import shocks  
 $(\widetilde{\Delta Q}_1^M, \dots, \widetilde{\Delta Q}_N^M)$

$$(\Delta Q_1^X, \dots, \Delta Q_N^X) \rightarrow (\widetilde{\Delta Q}_1^M, \dots, \widetilde{\Delta Q}_N^M)$$

If there were a need to add further import shocks to the dynamically generated secondary imports shocks, they could be added to the secondary shocks.

In parallel, in the second stage the decrease in import volumes generated at the secondary import shock would affect international prices. The impact on prices can be represented as an inverse demand function. This function, also called the price function, shows the dependence of international prices on import volumes, i.e.,

$$P^M = f(Q^M).$$

Accordingly, the change in import prices would depend on the change in import volumes.

Source: Authors.

country's first neighbors from their immediate neighbors should decline in proportion to the change in their export revenue.

It is assumed that the spillover process would continue for several rounds before it died out. This version of the proposed algorithm uses contemporaneous import and export data from the same matrix, and the pass-through coefficients remain unchanged in each round. The network estimation is dynamic, as the shock is applied sequentially by quarter for 2016–2017 and spillover for 2018–2020, also sequentially by quarter. In more general versions, the corresponding matrixes can lag; the pass-through coefficients can be updated in each round and recalculated on a bilateral basis; and more generic functional dependencies between import and export can be considered.

The proposed network-based spillover model for the PRC is based on a number of assumptions. First, the model assumes only partial equilibrium effects from import slowdowns and does not consider any general equilibrium effects on variables other than trade and GDP; it also assumes that the trade matrix, the pass-through coefficients, and

### Box 2.3: Shock Amplifiers, Absorbers, and Blockers

Countries can be classified as shock amplifiers, shock absorbers, and shock blockers. Of the 185 countries with available bilateral trade data, 148 are capable of shock pass-through. Only 51 (28%) of them can potentially act as shock amplifiers; among them are such important and well-connected international trade players as the United States, India, Brazil, Italy, and Switzerland, which pass shocks through with insignificant amplifications of 5%–10%. However, this group includes a small subgroup of strong shock amplifiers, such as Argentina; Thailand; the Republic of Korea; Hong Kong, China; Denmark; Indonesia; and India, some of which are capable of expanding the original shock by 30% or more. Shock-offsetting policies in these countries are particularly important for constraining negative shock proliferation.

A total of 97 countries (52%) are shock absorbers. However, even without public policies aimed at reducing the shock, the magnitude of the aftershock for second neighbors will be smaller than the original shock. A number of important countries (Italy, Japan, Germany) have pass-through coefficients very close to unity, suggesting that the pass-through might be almost one-to-one in the absence of shock-absorbing policies. Other large countries, such as the PRC, Canada, and the United Kingdom, should in principle reduce the strength of shock to second neighbors.

Finally, 37 countries (20%) do not pass shocks through at all. These are shock blockers. Their pass-through coefficients are statistically insignificant. When a shock reaches one of these countries, it dies out naturally, even without any policy intervention on the country's behalf. These are mainly small developing countries with little impact on international trade (e.g., Bhutan, Chad, Central African Republic, Djibouti), where import is financed mainly by public and private capital flows and depends little on export revenue. The shock-blocker group also includes some oil-producing countries (Azerbaijan, Qatar, Iran, Iraq, Oman, Venezuela), some with substantial accumulated wealth, which would allow them to maintain imports irrespective of their export revenue. Finally, a number of financial centers do not pass trade shocks through either, as their commodity imports are financed substantially by financial services exports. The distinction between shock amplifiers, absorbers, and blockers depends only on the individual country's economic structure and is unrelated to the structure of the network or to the country's location in the network.

Taken as a whole, the network is shock absorbing since spillovers die down after several rounds.

Source: Authors.

the commodity structure of trade remain unchanged throughout each spillover round. Second, the model does not differentiate between consumption and investment goods in the PRC's imports. The

transformation of the PRC growth model examined here would involve a reduction of growth in exports as investment slows, providing mitigating effects for global demand. Also, PRC households would receive a higher share of income and save less, opening up the possibility of increased import of luxury goods and foreign services such as tourism. Third, the initial import shock from the PRC is assumed to be distributed proportionately between trade partners. Therefore, all countries with varying bundles of exports to the PRC are assumed to be uniformly affected, conditional only on their total exports to the PRC. This may not be the case if the decrease in imports is not distributed proportionally between consumer and investment goods. Fourth, the analysis abstracts from initial and subsequent output gaps, which underlie potential growth rates, and from self-equilibrating tendencies. In that sense, the study leaves out some relevant dynamics, even though the simulations are for 5 years into the future. Fifth, the model is presented in nominal terms and does not allow direct calculation of the price and volume effects of spillovers. For example, the PRC's imports of oil and iron ore were growing in volume in 2015, but import revenues decreased due to declining global commodity prices. Finally, the model does not take into account the role of the PRC in value-added chains. Given the fact that processing trade accounted for a relatively large portion of PRC trade, raw material imports by the PRC were bound to decline due to weakening external demand for PRC exports.

## 2.4 Empirical Findings

### 2.4.1 The PRC in the World Trade Network

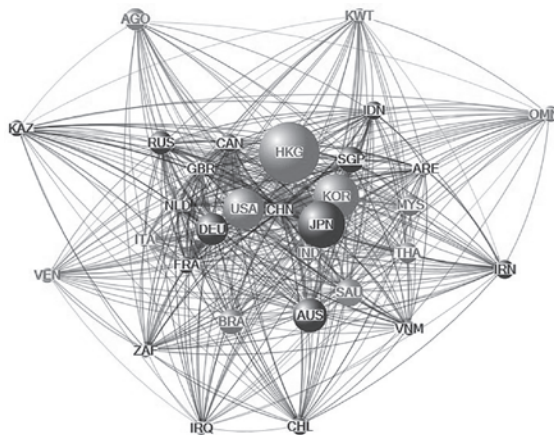
The PRC now holds a central place in the world trade network, trading with virtually every country in the world. The PRC's in/out degree is 168/166 with a maximum of 170, and the value of trade in most directions is very high relative to that of other countries. Visualization based on the Fruchterman–Reingold (1991) force-directed layout algorithm shows that the largest trade flows in the world pass through the PRC. The algorithm places the PRC squarely in the middle of the world trade network, which suggests that any shock with its epicenter in the PRC would have a major impact on the rest of the world economy.

The network structure of the PRC's main import partners suggests that among them are shock amplifiers, shock absorbers, and shock blockers. An import demand shock originating in the PRC would lead to an immediate drop in the export revenue of its partners, in proportion

to the PRC's share in their exports (Figure 2.5). Although virtually all countries around the world would be affected, the main impact would be felt by the 30 countries which account for almost 90% of the PRC's imports. However, amplifiers, absorbers, and blockers do not play equal roles in the network. Most likely the shock would amplify with each iteration, since all of the PRC's main partners (United States; Hong Kong, China; the Republic of Korea; Italy; and India) are large spillover amplifiers. Most other partners (including Japan, Germany, the United Kingdom, the Netherlands) are spillover absorbers, but even as a whole they have a small share of PRC imports. Shock blockers (Argentina, Kuwait, Oman, Saudi Arabia, Viet Nam) occupy a marginal place in the PRC's trade network and most likely would not be able to restrain the passing through of the shock to the rest of the trade network.

The network structure of the PRC's main export partners differs substantially from their import structure. Of the PRC's top 20 trading partners, some 30% are not balanced in terms of exports and imports. The PRC exports to virtually every country in the world, but the top 30 countries receive about 85% of PRC exports (Figure 2.6). The PRC is surrounded by large shock amplifiers (United States; Hong Kong, China; the Republic of Korea; India). Some other countries (Japan,

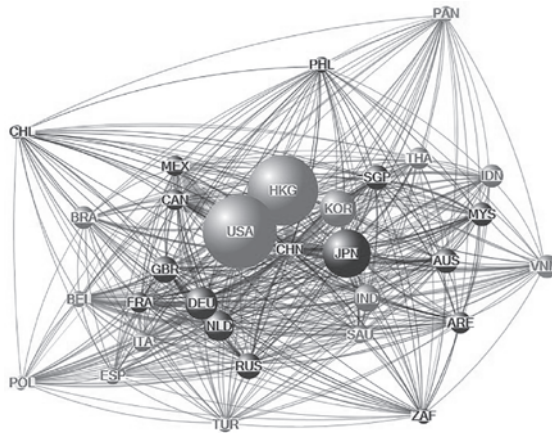
**Figure 2.5: The PRC's Import Network, 2014**



PRC = People's Republic of China.

Note: Node area is proportional to share of PRC imports; link weight is proportional to value of trade in each direction.

Source: Authors.

**Figure 2.6: The PRC's Export Network, 2014**

PRC = People's Republic of China.

Note: Node area is proportional to share of PRC imports; link weight is proportional to value of trade in each direction.

Source: Authors.

Germany, the Netherlands, the United Kingdom) absorb shock, but their importance in terms of PRC exports is markedly less. Finally, shock blockers (Belarus, Panama, Saudi Arabia, Viet Nam) are clearly marginal in the PRC's export network.

Asymmetries in the structures of the PRC's export and import partner networks have important consequences for shock spillovers. The value of PRC trade in most directions is unbalanced; there are large trade surpluses with many important countries. Geographically, at least half of the PRC's main exports are not main import partners, and vice versa. While the United States; Hong Kong, China; Japan; and the Republic of Korea are clearly dominant as both PRC export destinations and PRC import sources, Singapore, Australia, Malaysia, and Brazil are important destinations for PRC exports, but are not key sources of PRC imports. Similarly, Saudi Arabia, the Russian Federation, Angola, Iran, Oman, Kuwait, and other countries are important sources of PRC imports but are not key PRC export destinations.

Once the shock to export revenue hits the PRC's first neighbors, it will easily spill over to their imports. The reason is that although almost the whole world can be included in the group of PRC first neighbors (and thus many of them should in principle block any further spillovers),

there are only five spillover blockers (Saudi Arabia, Kuwait, Angola, Oman, Venezuela), all oil-producing countries, among the PRC's most important import partners. These are all oil-producing countries whose imports can be financed by accumulated savings, regardless of a drop in current export revenue.

## 2.4.2 Data and Shock Calibration

The data set used here is derived from bilateral flows for 1993–2014 and from October 2015 World Economic Outlook (WEO) projections for 2015–2020. The sample includes 170 countries for which bilateral trade flow data are available. Among the 28,730 possible bidirectional trade flows, 9,029 (about 31%) are absent, i.e., either there is no trade in either direction or there is trade in only one direction. The model is estimated using world trade data for 1993–2014. Given the radical changes in the structure of the PRC's trade in the past few years, the paper study uses 2013–2014 weights for the 2015–2020 projections of bilateral trade flows. The import demand shock is applied on top of the projected slowdown of PRC imports for 2015–2020 already included in the baseline.

This study uses the United Nations Commodity Trade Statistics database (UN Comtrade) rather than on the joint OECD–WTO Trade in Value-Added (TiVA) used in numerous recent studies. The UN Comtrade database (UN 2015) contains annual bilateral import and export statistics for about 200 countries and areas from 1962 onward.<sup>1</sup> The 2015 edition of the TiVA database (WTO/OECD 2015) includes data for only 61 economies (OECD, EU28, and G20 economies; most East and Southeast Asian economies; and some South American countries) for 1995, 2000, 2005, and 2008 to 2011. Therefore, while the TiVA database provides important insights on the value added by each country within global production chains, its country coverage and periodicity are not sufficient for a network-based model of spillovers. In addition, the large delays in the release of TiVA data do not allow for the capture of

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<sup>1</sup> Comtrade has important limitations. Some countries may not report some of their detailed trade or trade statistics for every year in the most recent commodity classification; imports reported by one country may not coincide with exports reported by its trading partner. Differences are due to various factors including valuation (imports cost, insurance, and freight; exports free on board), differences in the inclusion and exclusion of particular commodities; and timing. Almost all countries report as partner country for imports the country of origin; hence, in the case of imports the term “partner country” does not necessarily imply any direct trading relationship. Bilateral gross trade data are also problematic as these double count many of the trade flows as part of the global value chain.

the recent deep structural changes in the PRC's trade and production structure.

To model the spillovers from a shock to PRC imports, annual trade flows were divided into four equal quarterly flows. The shock was assumed to affect the PRC by the same amount—a drop by 10% relative to the baseline projections—for each quarter in 2016–2017. This approach allows the capture of the high intra-year correlations between export revenue and import flows observed empirically for most countries. With the current data available to trade operators in real time and to customs authorities on a monthly basis, the adjustment of import values to reflect intra-year changes in export proceeds also takes place within the year, probably on a quarterly basis. Therefore, a four-round shock spillover process would seem to reflect correctly the intra-year correlation between exports proceeds and import flows for most countries.<sup>2</sup>

The assumption of the size of the import demand shock in the PRC is consistent with the October 2015 WEO scenario of a structural slowdown in emerging economies (IMF 2015a). In this scenario, investment growth in emerging markets is assumed to decrease annually by an average of about 4 percentage points relative to the baseline. Within this general approach, this chapter makes the additional assumption for the case of the PRC only: that in 2016 and 2017 the PRC's imports would be 10% lower relative to the baseline WEO projections. In this scenario, growth in the PRC would be 1 percentage point lower than the baseline and would lead to a drop in nominal PRC imports of about 2.5% of projected GDP for 2016 and 2017. This assumption was not discussed at the October 2015 WEO; it is purely illustrative and does not represent an IMF assessment of the potential amplitude of the GDP and import reduction of the PRC resulting from the structural slowdown scenario.

### 2.4.3 Export Shock to the PRC's Trading Partners

The drop in PRC imports would immediately spill over to trading partners and translate into an export revenue shock for all of them. As virtually all countries export to the PRC, all would be directly affected in the first round, in proportion to the exposure of their exports to the PRC (Figure 2.7). Assuming that below baseline import performance in the PRC continued in 2016–2017, the initial impact would be on average a loss by all countries of about 1.2% of GDP in export revenue in 2016, which with network effects would increase to 2.0% of GDP in 2017 before decreasing gradually to about 0.2% of GDP in 2020.

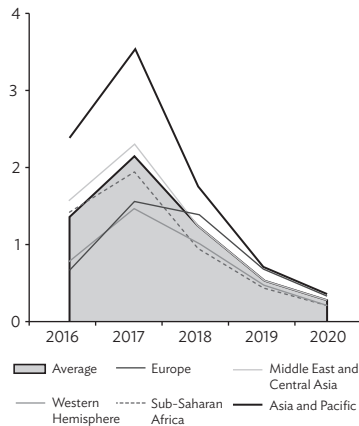
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<sup>2</sup> An exporter of steel would know its orders from the PRC at least 3 months ahead. If these orders decline relative to the same period last year, the exporter would reduce its imports of iron ore from third countries scheduled for that quarter.

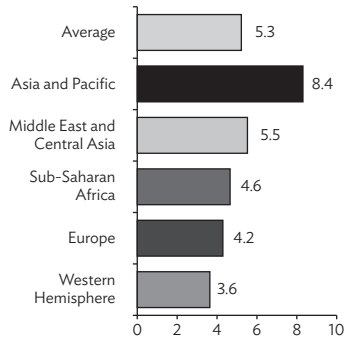


**Figure 2.7: PRC Export Shock Spillovers, 2016–2020**  
(% of GDP)

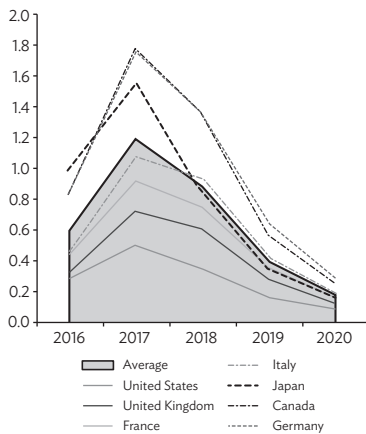
**a. World regions: shock profile**



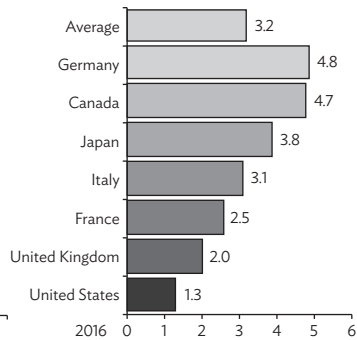
**Accumulated shock**



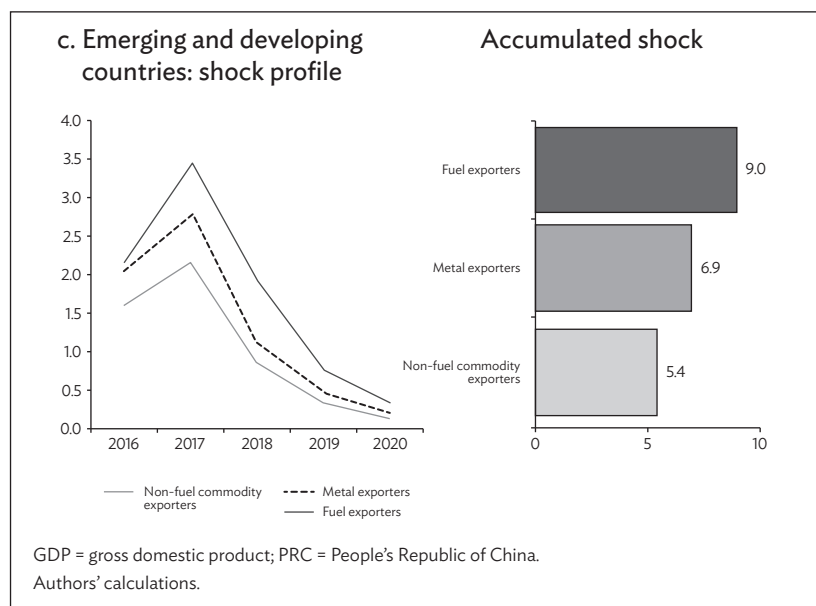
**b. Major advanced economies: shock profile**



**Accumulated shock**



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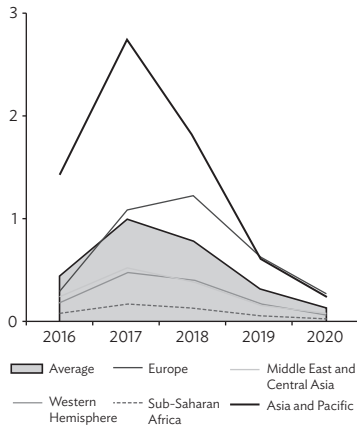
**Figure 2.7** *continued*

The spillovers would affect regions of the world unequally. Countries in Asia and the Pacific might lose substantially more in export revenue than the average country, about 2.3% of GDP in 2016 and 3.5% of GDP in 2017, because of their large export exposure to the PRC (Figure 2.8a). Hong Kong, China; Singapore; Solomon Islands; Malaysia; Mongolia; and Viet Nam would be among the most affected Asian economies. The accumulated average shock to Asian economies during 2016–2020 might exceed 8% of their GDP. The Middle East and Central Asia would also be affected at a rate above the average. Oman, Mauritania, Qatar, and Saudi Arabia would feel the largest reduction of export revenue, given their substantial exposure to exports of oil and other primary commodities to the PRC. The cumulative shock might exceed 5% of their GDP. The impact on other regions would most likely be less than the average.

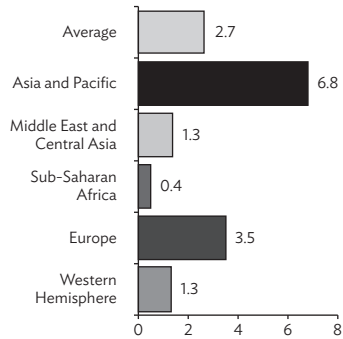
For major developed economies, the shock from the PRC's drop of imports would most likely not be significant. In 2016, the shock to their export revenue would not exceed 0.6% of GDP, which might double in 2017. The average shock experienced during the next 5 years would be about 3% of their GDP, well below the world average (Figure 2.8b). Germany, Canada, and Japan are more exposed to exports to the PRC than other developed countries, and therefore would likely be affected most.

**Figure 2.8: PRC Import Shock Spillovers, 2016–2020**  
(% of GDP)

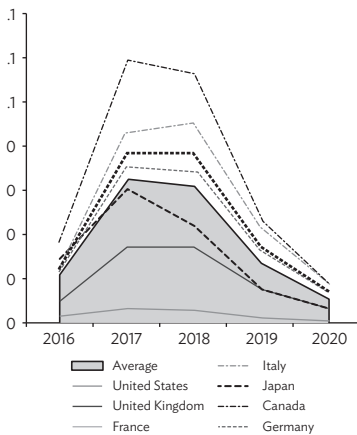
**a. World regions: shock profile**



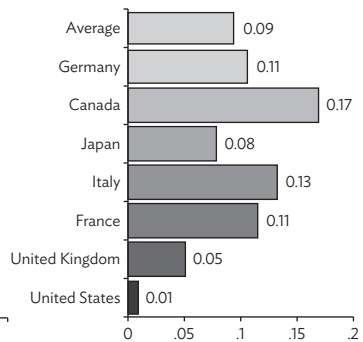
**Accumulated shock**



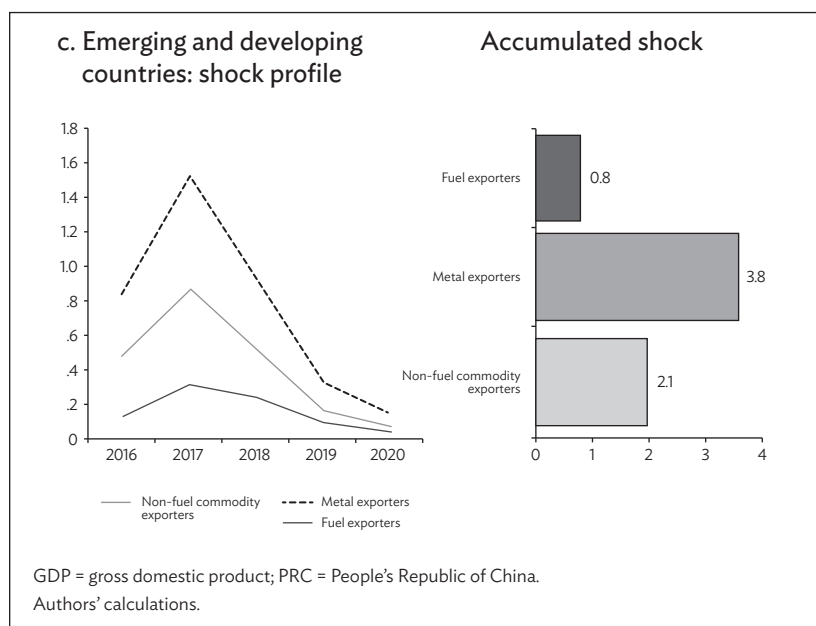
**b. Major advanced economies: shock profile**



**Accumulated shock**



continued on next page

**Figure 2.8** *continued*

Among emerging and developing economies, oil-exporting countries would feel the effect of the drop in PRC imports most strongly. Fuel exporters might lose 2.3% of their GDP in export revenue in 2016 and an additional 3.6% of GDP in 2017 (Figure 2.8c). The cumulative impact during the next 5 years might reach 9% of their GDP. If oil exporters responded by trying to maintain global sales while reducing prices, the spillin effects could be much larger. Poorly diversified oil-exporting countries, such as Equatorial Guinea, Oman, Brunei Darussalam, and Angola would feel the most impact from a slowdown in PRC imports. As the PRC is the world's largest metal importer, the impact on metal exporters would also be significant, 2.1% of their GDP in 2016 and 2.9% of GDP in 2017. The cumulative five-year loss of metal export revenue might reach 7% of their GDP. Mauritania, Mongolia, Zambia, and Chile would top the list of countries with significant export revenue losses. Finally, the impact on non-fuel commodity exporters would also be substantial. Their loss of export revenue in 2016–2020 might exceed 5% of their GDP. Mauritania, Solomon Islands, Sierra Leone, and Mongolia will lose the most.

#### 2.4.4. Later Round Effects of the PRC Import Shock

With the abovementioned asymmetries in the network structure of PRC trade, the profile of the import shock would differ substantially from that of the export shock. As many countries either block shocks or substantially reduce their magnitude, the average size of the second-round import shocks would be substantially less than that of the spillover from initial shock to export revenue that provoked it (Figure 2.9). On average, the 2016 loss of export revenue by all countries would translate to only about 0.4% of GDP reduction in the imports financed with that revenue. With network effects, the drop in imports would increase to 1% of GDP in 2017 but would decline thereafter to virtually zero by 2020, when the shock would dissipate altogether. The average import shock during 2016–2020 would amount to at most half of the export shock.

As in the case of the export shock, the secondary import shock provoked by it would spread unequally across different regions. Second-round effects would be the strongest in Asia and the Pacific, where countries would pass through to the rest of the world the shock of about 1.4% of their GDP in 2016 and 2.8% of GDP in 2017. The total secondary shock emanating from this region might reach almost 7% of GDP in the next 5 years (Figure 2.8a). Hong Kong, China; Singapore; Malaysia; and Mongolia would pass the shock through to the rest of the trade network, and some of them, given their internal economic structure, would even amplify it. Europe might be the second-largest region to experience a decrease in imports following the drop in export revenue and could pass through a substantial proportion of the initial drop augmented by network effect to the rest of the world. With Europe strongly involved in international trade, the secondary shock might be very persistent, increasing until 2018, reflecting strong network effects, and remaining visible to the end of the period. Small European countries (such as Malta, Estonia, Slovak Republic, Ukraine, Ireland, the Czech Republic) seem to be capable of passing through the largest portion of the initial shock and some of them could even augment it. The cumulative average secondary import shock from Europe might reach about 3.5% of its GDP in 2016–2020. The secondary import shock from other regions would most likely be less than the average.

In most developed economies, the drop in export revenue would not lead to significant cuts in imports. Most of them pass through the shock, amounting to less than 0.05% of their GDP (Figure 2.8b). However, given the relatively large size of their GDP, the secondary import shock emanating from them could be significant for other countries. The

largest reduction in imports than could spillover further to the rest of the world would be expected in Canada, Italy, and Germany. Spillovers from the United States and the United Kingdom most likely would be negligible. The overall accumulated secondary import shock passed through by each advanced economy should not exceed 0.1% of GDP.

Finally, among emerging and developing economies, metal exporters would pass through the largest share of the export revenue shock to their imports. Metal exporters, obviously likely to be the worst hit by the drop in export revenue, would have to reduce their imports from the rest of the world (Figure 2.8c). This reduction would amount to 0.8% of their GDP in 2016 and 1.5% in 2017 to reach the cumulative average drop in their import demand of almost 4% by 2020. Mongolia would clearly be the largest source of the secondary import shock among all metal exporters. Non-fuel commodity exporters would also have to trim their imports as a result of the decline in export revenue, for a total of about 2% of GDP. This drop would be driven by the same countries, plus Solomon Islands. Finally, oil producers would pass the shock through to their export revenue at the margin, as most of them have alternative sources for import financing (sovereign funds, capital inflows) and they could maintain their imports at roughly unchanged levels, regardless of a drop in export revenue resulting from lower PRC demand for their oil.

### 2.4.5 Network Effects

The direct spillovers from a nominal shock in the PRC would be augmented by network effects. The initial shock represented by the assumed drop in the PRC's imports during 2016–2017 would be redistributed among all exporters to the PRC in proportion to their observed weights in PRC imports. The network effects would include all secondary shocks radiating from the rest of the trade network, i.e., excluding the PRC. The network-based calculations suggest that relative to the GDP of each world region, the initial shock would be uniform, 0.4% of each region's GDP (Figure 2.10). However, the network effects would differ substantially across regions. The overall network effect might be around 1% of GDP by 2017, be generated by multiple higher-round effects as the initial shock radiates from the rest of the trade network.

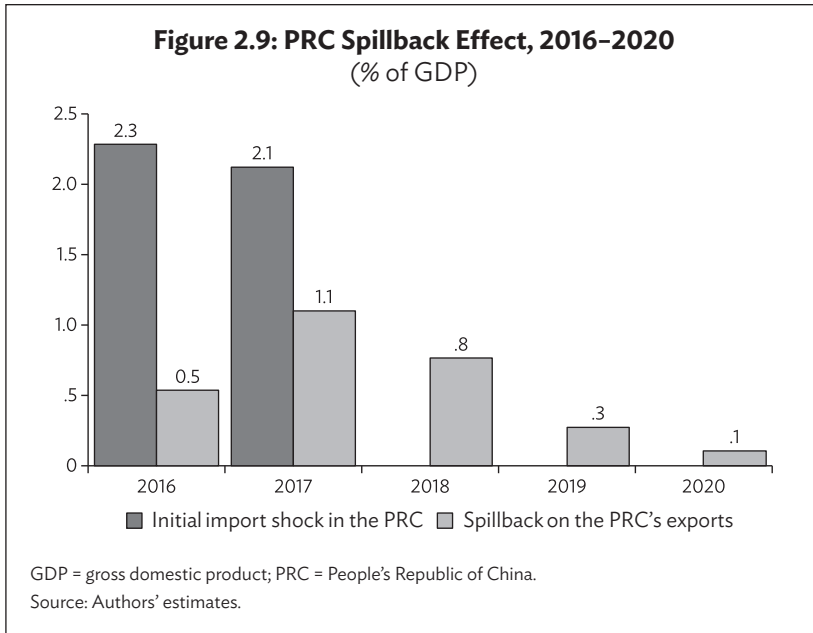
In terms of their respective GDPs, the regions of the world might experience highly heterogeneous impacts from the network effects driven by the slowdown in the PRC. The largest negative network effects might be felt in the Middle East and Central Asia, where the network effect might exceed 2.3% of GDP by the end of 2017, compounding the initial shock of 0.4% of GDP. Sub-Saharan Africa could be the next most

affected region, with a network effect of about 1.8% of its GDP, since most countries in the region are strongly connected to countries that would be affected by the first round shock. In Asia and the Pacific, the network effect would be lower, amounting to 1.6% of its GDP. In the above three regions, the network effect would exceed the initial shock in both 2016 and 2017, with increased amplitude in both years. The strong network effect in these three regions might reflect the high vulnerability of developing countries to shock spillovers from large economies like the PRC, as their individual GDPs are small relative to the size of the potential loss of export revenue resulting from the shock.

The network effect in the developed countries might have a very different profile; the network effect from the immediate shock would be very small in the first year and would add almost nothing to the overall shock in the developed countries and just 0.2% of GDP in Europe in 2016. However, the network effect would expand substantially during the second year of the initial shock, to 0.4% and 1% of GDP, respectively. The insignificance of the network effect in the first year can be explained by the substantial resilience of the advanced European economies, the United States, and Canada in the face of a reduction of export revenue driven by a drop in PRC import demand. However, the network effect would strengthen substantially during the second year of the shock, probably reflecting substantial integration of those countries into international trade flows as demand for their exports decreased, not only in the PRC but worldwide.

The drop in PRC imports from the rest of the world might affect PRC exports via the spillback effect. As the PRC's trading partners lost a portion of their export revenue, those of partners capable of passing the shock through would have to reduce their imports from all other countries, including the PRC. This fall in imports from the PRC, summed across all its trading partners, represents the spillback effect (Figure 2.9). If because of the transition to the new growth model PRC imports dropped by more than 2% of GDP in 2016 and 2017, the spillback on the PRC's own exports could reach 0.5% of GDP in 2016 and could well exceed 1% of GDP in 2017. As exports are part of GDP, this spillback effect would further reduce PRC GDP growth. Even in the absence of further import demand shocks in 2018–2020, the PRC would still feel negative spillback effects before they faded out toward the end of the period.

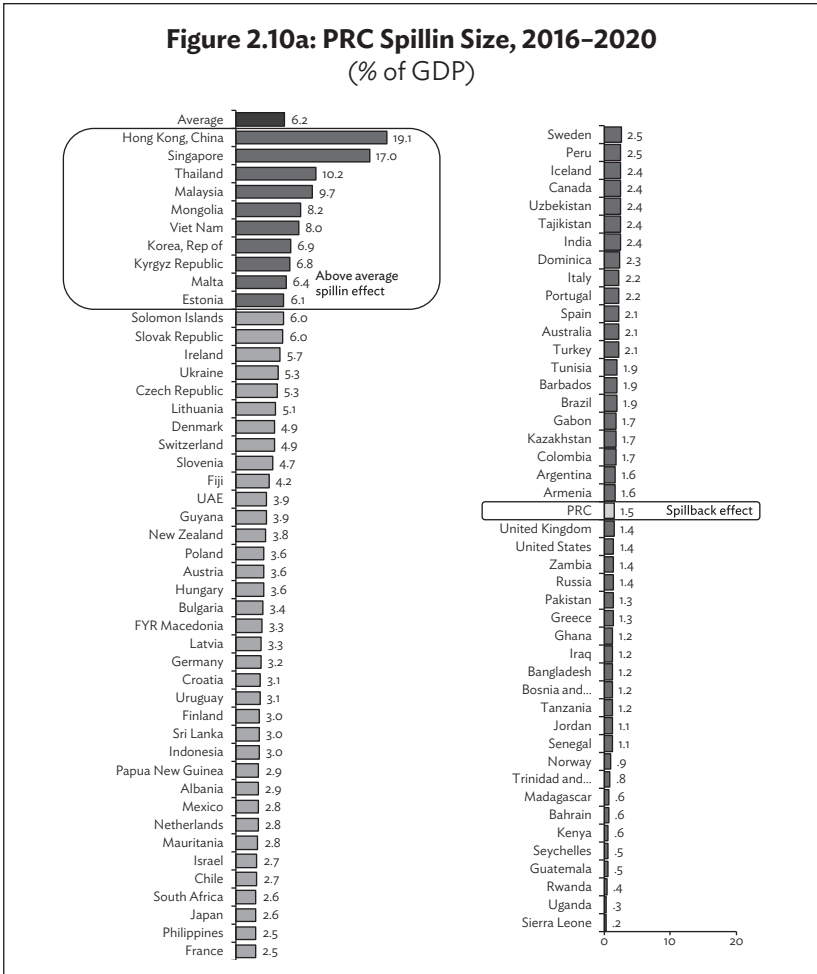
The spillin effect can be calculated as the difference between total spillover, the initial shock, and the spillback to the PRC. Regarding the shock to the PRC, the spillover period extends for 20 quarters, i.e., throughout 2016–2020, while the initial shock is assumed to persist for 8 quarters, i.e., 2016–2017. The spillin effect generated by the import



shock can be measured for each country in terms of its *relative size*, i.e., the difference between overall and initial shock as a percentage of GDP. It can also be measured in terms of its *relative strength*, i.e., the ratio of total spillin to the initial shock.

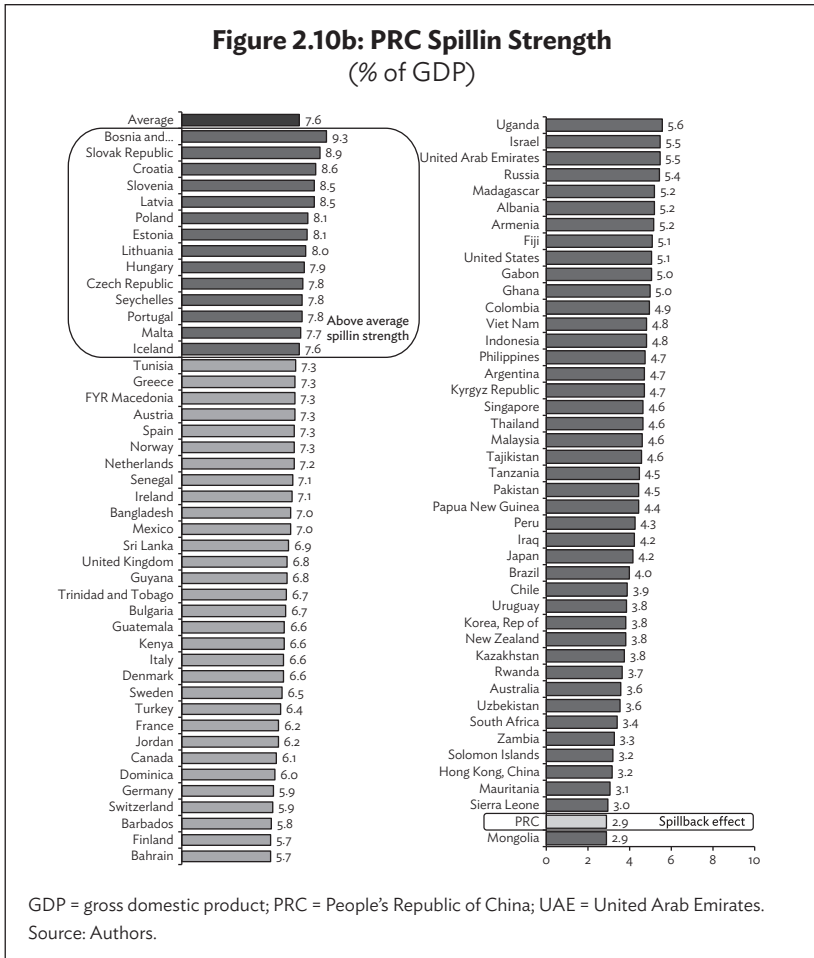
For a shock radiating from the PRC, the list of affected countries in terms of the size of spillins would be substantially different from the list in terms of strength. On average, the relative size of spillin effect would exceed 6% of individual countries' GDP, with a skewed distribution (Figure 2.10a). Only nine countries (mainly the PRC's immediate Asian trading partners, including Hong Kong, China; Singapore; Thailand; Malaysia; Mongolia; Viet Nam; and the Republic of Korea) would generate spillins substantially exceeding the world average, with the more than 80 remaining countries generating relatively small spillins. At the same time, the spillover effect would be relatively strong because the average ratio of total spillover to initial shock is 7.6 (Figure 2.10b). Again, only 14 countries (virtually all of them small open economies in Europe, e.g., Bosnia and Herzegovina, Slovak Republic, Croatia, Slovenia, and Latvia) would radiate strong spillins substantially exceeding the average. Finally, spillback effect from the rest of the network onto the PRC itself could also be seen, but it would amount to only 1.5% of GDP. As would be expected, the spillback effect would be very weak.





### 2.4.6 Sensitivity Analysis and Robustness Checks

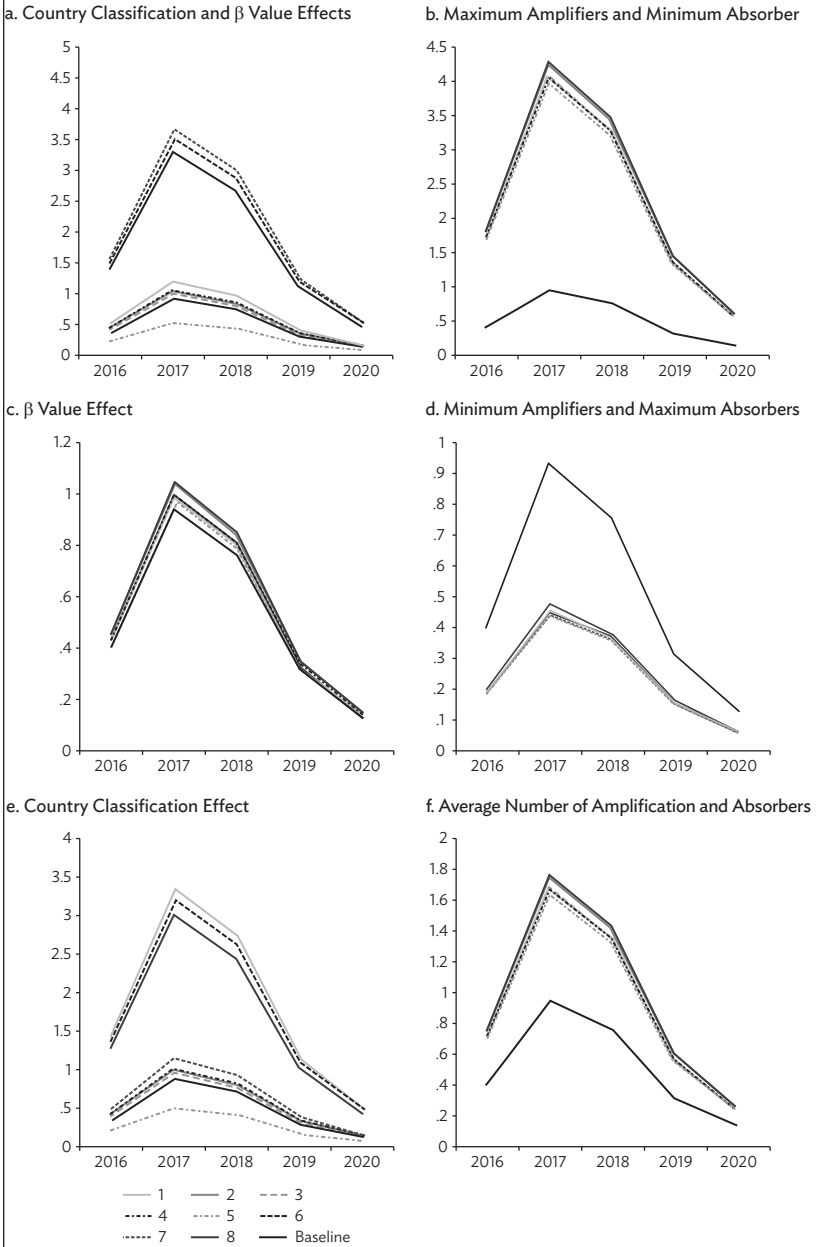
Sensitivity analyses to different specifications suggest that the magnitude of spillovers would depend on the policies of those countries capable of shock pass-through. For nine model specifications in real (1–5) and nominal (6–9) terms, the models in nominal terms were found especially sensitive to the classification of countries as shock amplifiers, absorbers, and blockers (Figure 2.11a). The values of  $\beta$  coefficients across all model specifications do not seem to have any significant impact on the magnitude of shock spillovers or on their profiles, as most models



depict a shock very close to the baseline (Figure 2.11b). At the same time, the different assumptions regarding the number of countries that appear capable of amplifying, absorbing, and blocking shocks can change the magnitude of spillovers and country time profiles (Figure 2.11c).

Counterfactual experiments have been performed by the authors on the classification of countries capable of shock pass-through. The results suggest that the largest higher round effects under all model specifications can be expected under the extreme assumption that a total of 103 countries are capable of augmenting shock, as in models 7 and 8, and that only 48 countries would absorb at least part of the shock, as in model 1, with all remaining countries assumed to be shock blockers.

**Figure 2.11: Import Shock Spillover Sensitivity, 2016–2020**  
(% of GDP)



GDP = gross domestic product.  
 Source: Authors' estimates.

Given this extreme assumption, and also assuming that the countries take no policy action to prevent shock pass-through, spillovers could quadruple in 2017 relative to the baseline (Figure 2.11d). In the opposite scenario, if the models with the minimum number of shock amplifiers (23, in model 5) and the maximum number of shock absorbers (97, in model 9) are assumed to be valid, the network spillover effect would be roughly half of the 2017 baseline level (Figure 2.11e). Finally, if the number of shock amplifiers and absorbers is set at the average level across all nine models, i.e., at 56 and 63, respectively, the 2017 spillover would still be about 40% higher than that for 2016 relative to the baseline (Figure 2.11f).

Therefore, the current baseline shock presented in this chapter should be treated as conservative, since its higher round spillovers critically depend on the policy actions taken by the PRC's trading partners in response to the slowdown in PRC imports. These policies could either further amplify the initial shock or absorb part of its impact before spilling it over to other countries. Compensatory policy measures taken by the PRC's trading partners could shift them from the group of shock amplifiers to the group of shock absorbers, and even to shock blockers. Such measures would help to arrest the proliferation of negative spillovers through the trade network. If the PRC's trading partners took no policy measures, their capacity to pass shocks through would remain unchanged relative to previous years.

## 2.5 Conclusions

A network model of spillovers, applied to the PRC, allows the capture of higher round network effects of spillovers. The network effects would originate from the feedback process, starting in the second round of shock propagation. The strength of those effects would depend on the network structure, including the relative magnitude of the initial shock at the epicenter; the epicenter country's centrality and other network properties; the position of its main trading partners in the network, their domestic economic structure, the relative compounding strength of spillover signals spreading in the same direction; and the offsetting strength of signals spreading in opposite directions. When compounded through different stages of the shock spillover, the magnitude of the network effect could become comparable to or even exceed that of the initial shock at the epicenter country.

Compared with other spillover models, the network model affords some important insights. The main benefit of network analysis that cannot be accomplished with other existing tools (e.g., GVARs, FSGM,

General Equilibrium DSGE models) is direct quantification of higher-round effects. These inferences rely on the analysis of observable directional flows, rather than on correlations between flows, as is the case with most other models. Moreover, the direction of causality is also directly captured from the data, whereas in other models it is established probabilistically by means of econometric techniques. Overall, the network modules can be seen as complements to GE models.

The projected drop in the PRC's imports might lead to spillovers worldwide through trade channels. The PRC growth at a bound 1 percentage point below the baseline in 2016–2017, leading to a drop in demand for imports of about 10% each, would lead to an export revenue loss of about 1.2% of GDP for all countries in 2016, and network effects could increase to 2.0% of GDP in 2017 before gradually abating to about 0.2% of GDP in 2020. The network effects substantially amplify the initial shock. Such effects consist of direct spillovers of the nominal shock in the PRC; spillin effects, when all affected trading partners propagate the shock to each other; and the spillback effect from all countries onto the PRC itself. While the assumed nominal shock could amount to about 0.4% of world GDP in 2016 and 1.1% in 2017, the induced spillover and spillin effects could more than double the magnitude of the initial shock. The spillback effect on the PRC would amount to 0.5% and 1.1% of its GDP in each of these years.

The impact on regions would be heterogeneous. Asia and the Pacific would be affected the most, followed by the Middle East and Central Asia, because of their relatively high exposure to trade with the PRC. The impact on sub-Saharan Africa would be smaller because of the regions' still relatively low volume of trade with the PRC. The spillover on Europe would be moderate because of Europe's substantial economic size, and the impact on the developed countries would be marginal. Metal exporters could be hit hardest by spillovers from the PRC (the largest metal importer in the world), followed by non-fuel primary commodity exporters. The impact on fuel exporters most likely would be marginal. Among individual countries, the strongest negative spillovers in terms of impact on GDP would likely be Hong Kong, China; Singapore; Mauritania; Republic of Congo; Mongolia; and Solomon Islands.

The model used here has several limitations and conclusions from the data should be drawn with caution. First, the analysis is partial equilibrium and abstracts from the possible endogenous responses of exchange rates and policy variables in the face of a slowdown in the PRC. It does not incorporate the usual mitigation or amplification channels through such means as financial markets, exchange rates, commodity prices, which should be modeled separately.

Second, the model is not based on trade in value added, which would allow the capture of both direct and indirect trade linkages in complicated global supply chain networks, but rather, at that stage, spillover characterization is based on the more comprehensive Comtrade database of bilateral trade flows. Upstream and downstream production are closely linked across sectors and within the PRC, but also across country sectors and within other countries, so final products should be treated very differently from raw material inputs.

Third, the model is applied to the data in nominal terms and therefore does not allow explicit distinction between price and volume effects in spillovers. The findings and implications may not necessarily remain unchanged if reduced nominal exports to the PRC stem from a fall in volumes or prices. Finally, the network model does not allow the capture of the potentially different impacts of processing imports and non-processing imports.

The PRC and its trading partners are facing the challenge of offsetting possible spillovers from a PRC import slowdown. Our main policy recommendations to the PRC include: avoidance of a sharp growth slowdown; reduction of vulnerabilities from excess leverage after a credit and investment boom; and strengthening of the role of market forces in the economy (IMF 2015a). Modest policy support may be needed for the PRC's partners, in particular those most exposed to trade with the PRC. Further progress in the implementation of PRC structural reforms would be critical for private consumption to pick up some of the slack from slowing investment growth (IMF 2015b). The core reforms would be the assignment of a broader role in the economy market mechanisms; the elimination of distortions; and the strengthening of institutions.

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# 3

## Optimal Dynamic Path along the Transition of an Exchange Rate Regime: An Analysis of the People's Republic of China, Malaysia, and Singapore<sup>1</sup>

*Naoyuki Yoshino and Tamon Asonuma*

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### 3.1 Introduction

Since the Asian financial crisis of 1997–1998, there has been considerable policy debate and academic research regarding the optimal exchange rate regime for East Asia. There have been major developments in both academic research and policy implementation on this front. With respect to policy implementation, the monetary authorities in East Asian countries experienced two patterns of shifts in exchange rate regimes: on the one hand, Indonesia, the Republic of Korea, and Thailand abandoned their de facto dollar pegs and shifted to floating or managed

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<sup>1</sup> The views expressed herein are those of the authors and should not be attributed to ADB, ADBI, IMF, their Executive Board, or their management. For the IMF's view on exchange rate regimes in the PRC, Malaysia and Singapore, see IMF (2017a; 2017b; 2017c). This chapter is written based on two previously published academic journal articles (Yoshino, Kaji, and Asonuma 2014; 2016). For details of theoretical models (including underlying assumptions and derivations of equations), defined transitional policies, and calibration exercises (with specified parameters, data of shocks, and computation methods), see Yoshino, Kaji, and Asonuma (2014) for analysis on the PRC and Yoshino, Kaji, and Asonuma (2016) for analysis on Malaysia and Singapore, respectively. The authors thank Calixte Ahokpossi, Chikako Baba, Wai-Mun Chia (discussant), Zsolt Darvas (discussant), Peter Morgan (editor), Ainslie Smith (coordinator), Hui Tong, and participants at for comments and suggestions.



floating regimes at the onset of the Asian financial crisis. On the other hand, the People's Republic of China (PRC) and Malaysia maintained their de facto dollar pegs until roughly mid-2005. In July 2005, the PRC made a dramatic break from its dollar peg and Malaysia followed suit by increasing flexibility in exchange rate fluctuations.

On the academic research front, there have been two approaches of analyses in the exchange rate regime in East Asia since the crisis. The first is a static analysis—initiated by Ito, Ogawa, and Sasaki (1998)—which garnered attention from academic researchers, and was followed by subsequent studies (Ogawa and Ito 2002; Yoshino, Kaji, and Suzuki 2004; Yoshino, Kaji, and Asonuma 2004). Their analysis relies on the loss over the short term, i.e. one quarter, and compares the optimality between a dollar peg, a basket peg, and a floating regime under free capital mobility. The second approach of analysis is a conventional dynamic one which has been extended to cover the longer term, 10 years or over the infinite horizon as in Yoshino, Kaji, and Suzuki (2003) and Shioji (2006a; 2006b).<sup>2</sup> Over the specified horizon, the monetary authorities are assumed to maintain the same exchange rate regimes. The main rationale behind the conventional dynamic approach is to consider whether the exchange rate regime that is desirable in the short term, remains optimal over the longer term. Studies on conventional dynamic analysis show that either a basket peg or a floating regime desirable in the long run (at the “steady state”) for East Asian countries (Yoshino, Kaji and Suzuki 2003; Yoshino, Kaji and Asonuma 2012).

In addition to these two traditional approaches, a new type of analysis has also attracted attention, which is the dynamic transition analysis proposed by Yoshino, Kaji, and Asonuma (2014; 2016a). They consider shifts in exchange rate regimes, i.e. shifts from a dollar peg to a basket peg or to a floating regime over the same time intervals set in the conventional dynamic analysis together with maintaining a dollar peg. There are three main advantages to the dynamic transition analysis. First, this analysis compares shifts from the current regime to alternative regimes with the benchmark of maintaining the current regime, a dollar peg. Second, it explores how capital controls are relaxed in order to reach the desired regimes under free capital mobility. This coincides with where the PRC and Malaysia stood in the aftermath of the Asian financial crisis. Third, it considers two adjustment options for exchange rate regimes and capital account restrictions.

By applying the dynamic transition analysis, we attempt to answer two main questions: (i) how can the PRC successfully transition to a desirable exchange rate regime, either a basket peg or a floating regime,

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<sup>2</sup> See also Yoshino, Kaji, and Asonuma (2012).

from the de facto peg to the dollar regime which it adopted before Q3 2005? (ii) are neighboring countries (Malaysia and Singapore) that have close economic linkages with the PRC better off loosening their ties to the US dollar when the PRC does so?

To answer these two questions, we apply a dynamic small open economy general equilibrium model to two cases of East Asian countries: the PRC on the first question and Malaysia and Singapore on the second one. For each question, we define transition policies and compare the welfare gains of these policies relative to the existing regime, i.e. maintaining a dollar peg regime or a basket peg regime—where the PRC, Malaysia, and Singapore stood before Q3 2005.

On the first question, the quantitative analysis using PRC data from Q1 1999 to Q4 2010 provides two policy implications.<sup>3</sup> One is that following a gradual adjustment from a dollar peg—where it stood prior to the announcement of the shift in regime in Q3 2005—to a basket peg regime is the most desirable path for the PRC to take, with minimal welfare losses associated with the shift in the exchange rate regime.<sup>4</sup> The other is that a sudden shift to the basket peg is the second-best solution, and is superior to a sudden shift to a floating regime.

On the second question, the quantitative analysis incorporating exogenous shocks as actually occurred in Malaysia and Singapore from Q1 2005 to Q4 2014 shows that a gradual adjustment to a basket peg with long-term optimal weights is the first-best policy for both countries, where optimal weights are derived to minimize the loss function: Malaysia would shift gradually from a dollar peg—where it stood prior to the announcement of the shift in regime in Q3 2005—to a basket peg regime and Singapore would adjust its basket weights under the current basket peg regime.<sup>5,6</sup> Further, both a sudden shift to a basket peg with optimal weights and a sudden shift to a floating rate regime are superior

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<sup>3</sup> Coverage of the quantitative analysis to 2010Q4 is the result of setting equal sample periods around 20 quarters for (i) pre-announcement period (1999Q1–2005Q2) and (ii) post-announcement period (2005Q3–2010Q4).

<sup>4</sup> The IMF stressed the importance of continued progress toward greater exchange rate flexibility, and welcomed the PRC authorities' commitment to deepen reforms and rely more on market forces to determine the exchange rate (IMF 2017a).

<sup>5</sup> The IMF recommended that exchange rate flexibility should continue to play the central role in helping the economy to adjust to external shocks and in this regard, welcomed the Malaysian authorities' commitment to keeping the exchange rate as the key shock absorber (IMF 2017b).

<sup>6</sup> The IMF supported Singapore's basket, band, crawl (BBC) exchange rate-based monetary policy framework and stressed that Normal shocks can be accommodated by exchange rate movements within the NEER band (IMF 2017c).

to maintaining the dollar peg in Malaysia, but not to maintaining the existing basket peg with the original weight in Singapore.<sup>7</sup>

Our first implication has been supported by recent developments in the PRC's exchange rate policy. Beyond the coverage of the numerical analysis (until Q4 2014), the PRC authorities took several steps to make the country better prepared to increase exchange rate flexibility; the PRC (i) established reference to a basket,<sup>8</sup> (ii) reduced interventions, (iii) kept the real exchange rate broadly in line, and (iv) stabilized expectations by explicitly countering, both in words and actions, market views (IMF 2017a).

Following a literature review Section 3.2 presents empirical analysis of exchange rate movements and regimes in the PRC, Malaysia, and Singapore. Section 3.3 discusses the desirable transition policy of exchange rate regime in the PRC. Next, we explore the desirable transition policy of exchange rate regime in Malaysia and Singapore in response to the PRC's shift in exchange rate regime in Section 3.4. Finally, we present our conclusions in Section 3.5.

**Literature Review:** The present paper is related to literature on exchange rate policy in the PRC. McKinnon and Schnabl (2014) recommend that the PRC should focus on stabilizing the yuan (renminbi)–US dollar exchange rate in order to encourage naturally high wage increases to improve the country's international competitiveness. On the contrary, Goldstein and Lardy (2006) point out shortcomings of the current exchange rate regime in the PRC and propose the immediate removal of capital restrictions and gradual widening of the band of the exchange rate. Frankel (2005) also stresses the benefits of exchange rate flexibility over the long term and suggests shifting to an intermediate regime, for example, through establishing a target zone. Eichengreen (2006) follows by arguing that greater flexibility of the exchange rate would help the PRC's monetary authority tailor monetary conditions to domestic needs.

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<sup>7</sup> Yoshino, Kaji, and Asonuma (2015) explore whether actual policies that were implemented by East Asian countries after the Asian financial crisis follow or deviate from theoretically "desirable" policies over the medium and long term.

<sup>8</sup> Since December 2015, the People's Bank of China has published its China Foreign Exchange Trade System (CFETS) (2015) exchange rate index. This index encompassed 13 currencies selected on the basis of international trade weights adjusted for re-export in December 2015 and expanded its coverage to 24 currencies in January 2017 (CFETS 2016). The CFETS index is intended to bring about a shift in public perception of yuan (renminbi) exchange rate movements. The launch of the index does not necessarily imply adoption of a basket peg at the current stage, but it may perhaps signify the monetary authority's intention to move in that direction in the future.

The literature explores exchange rate arrangements in the East Asian region after the PRC's shift in exchange rate regime.<sup>9</sup> Shioji (2006b) considers theoretically how the PRC's choice of exchange rate regime interacts with the rest of East Asia's policy choices under two invoicing practices (a producer currency pricing and a vehicle currency pricing). On policy coordination, Gochoco-Bautista and Fabella (2006) stress that a regional monetary arrangement to address intra-regional fluctuations in response to a change in the PRC's monetary and exchange rate arrangement may not be warranted given the differing directions and size of exchange rate adjustments in individual countries due to asymmetric complementarities with the PRC. In contrast, Volz (2014) argues that there is loose and informal exchange rate cooperation in East Asia based on currency baskets, with the PRC moving toward a managed exchange rate system guided by a currency basket. Henning (2012) finds that Malaysia, the Philippines, Singapore, and Thailand have formed a loose but effective "yuan (renminbi) bloc" with the PRC since the country's shift in exchange rate policy, with the Republic of Korea participating tentatively in this bloc since the global financial crisis.

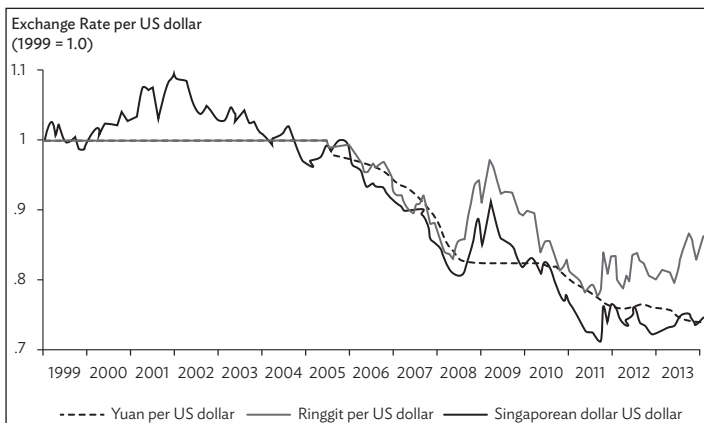
### 3.2. Exchange Rate Movements and Regimes in the PRC, Malaysia, and Singapore

We start with an empirical analysis of exchange rate dynamics in the PRC, Malaysia, and Singapore. Figure 3.1 shows an exploration of the nominal exchange rate for these countries against the US dollar for the period 1999–2014. Prior to January 1999, the PRC government set an initial rate of 8.70 yuan (renminbi) to the US dollar in 1994, and eventually allowed the rate to rise to 8.28 in 1997. Since January 1999, it kept the rate relatively constant up to July 2005. The PRC government modified its currency policy on 21 July 2005 by announcing that the yuan (renminbi)–dollar rate would become “adjustable, based on market supply and demand with reference to exchange rate movements of currencies in a basket.” From July 2005 to June 2008, the yuan (renminbi)–dollar rate showed an appreciating trend and the situation at that time might be best described as a “managed float”: market forces determined the general direction of the yuan (renminbi)–dollar rate movement, but the government slowed

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<sup>9</sup> Ito (2008) analyzes how the PRC's exchange rate policy changed before and after the announcement of a new approach in July 2005 and finds that the post-announcement exchange rate regime is close to a crawling-peg against the US dollar and deviates substantially from a basket peg regime. See Kawai (2004) and McKibbin and Lee (2004) for the desirability of a basket peg regime in East Asia.

**Figure 3.1: Nominal US Dollar Exchange Rates, Monthly 1999–2014**



Note: The data are for the month of January each year.

Sources: IMF International Financial Statistics.

down its rate of appreciation through market intervention (period 2). After an interval from July 2008 to May 2010 in which the yuan (renminbi)–dollar rate was held relatively constant at 6.83 (period 3), it reverted to the appreciation trend (period 4).

Following the July 2005 break in the PRC's exchange rate policy, the Bank Negara Malaysia announced an immediate switch from a dollar peg to a managed float (Bank Negara Malaysia 2005).<sup>10</sup> In line with the appreciation of the yuan (renminbi), the Malaysian ringgit also began to follow an appreciating trend. Similarly, the Singapore dollar, which prior to the PRC's shift had fluctuated without trend with respect to the US dollar, also appreciated, gaining 25% versus the US dollar over the period 2005–2010.

This evolution of the exchange rates in the three countries is also consistent with the transition of the IMF de facto exchange rate regimes over 1999–2010, as reported in Table 1. According to IMF (2014), de facto exchange rate arrangements are those that the IMF staff classifies according to the categories—the IMF staff revised the classification methodology in February 2009—and are different

<sup>10</sup> Bank Negara Malaysia declared its intention to monitor the exchange rate against a currency basket to ensure that the rate remained close to fair value.

**Table 3.1: Transitions of IMF De Facto Exchange Rate Regimes in the PRC, Malaysia, and Singapore**

Country	1999 <sup>a</sup>	2005 <sup>a</sup>	2008 <sup>b</sup>	2010 <sup>b</sup>
PRC	Soft peg ( <i>Conventional pegged arrangement</i> )	Soft peg ( <i>Conventional pegged arrangement</i> )	Stabilized arrangement	Crawl-like arrangement
Malaysia	Soft peg ( <i>Conventional pegged arrangement</i> )	Floating regime ( <i>Managed floating with no pre-determined path for the exchange rate</i> )	Floating <sup>c</sup>	Other managed arrangement <sup>d</sup>
Singapore	Floating ( <i>Managed floating with no pre-determined path for the exchange rate</i> )	Floating ( <i>Managed floating with no pre-determined path for the exchange rate</i> )	Floating <sup>e</sup>	Other managed arrangement <sup>d</sup>

PRC = People's Republic of China.

Notes:

<sup>a</sup> The categories of de facto exchange rate arrangements over 1999–2007 are: (1) hard pegs, (2) soft pegs, and (3) floating regimes. See IMF (2005, 2008).

<sup>b</sup> The categories of exchange rate arrangements over 2008–2010 are: (1) hard pegs comprising (a) exchange arrangements with no separate legal tender and (b) currency board arrangements; (2) soft pegs consisting of (a) conventional pegged arrangements, (b) pegged exchange rates within horizontal bands, (c) crawling pegs, (d) stabilized arrangements, and (e) crawl-like arrangements; (3) floating regimes, under which the exchange rate is market determined and characterized as (a) floating or (b) free floating; and a residual category, other managed arrangements. See IMF (2014).

<sup>c</sup> The ringgit is managed with reference to a currency basket. The composition of the basket is not disclosed. Effective 2 February 2009, the classification of the de facto exchange rate arrangement was changed from managed floating with no predetermined path for the exchange rate to floating, retroactively to 30 April 2008, due to the revision of the classification methodology.

<sup>d</sup> Bank Negara Malaysia operates a de jure managed float for the ringgit with reference to a currency basket. The composition of the basket is not disclosed. As a result of the ringgit tracking a composite, although not closely enough to be classified as a stabilized arrangement against a composite, the de facto exchange rate arrangement is classified as other managed arrangement. For Singapore, the de jure exchange rate arrangement is floating. The Singapore dollar is allowed to fluctuate within a targeted policy band and is managed against a basket of currencies of the country's major trading partners and competitors.

<sup>e</sup> The Singapore dollar is allowed to fluctuate within a targeted policy band and is managed against a basket of currencies of the country's major trading partners and competitors. The various currencies are assigned weights in accordance with the importance of the countries to Singapore's trade relations with the world. The exchange rate policy is announced every 6 months in the Monetary Policy Statement, typically in terms of changes to the slope of the policy band. The US dollar is the intervention currency.

Source: IMF Annual Report on Exchange Rate Arrangements and Exchange Restrictions (1999, 2005, 2008, 2010).

from those the authorities officially announce.<sup>11</sup> Both the PRC and Malaysia have experienced a deviation from a soft peg—“conventional pegged arrangement” in the pre-2009 classification—to a crawl-like arrangement or another managed arrangement, respectively. Singapore have allowed to increase flexibility in exchange rate and continued to remain in the broader category of a floating regime.

<sup>11</sup> Ilzetzki et al. (2010) provide an alternative de facto classification based on arrangements on market-determined exchange rates.

Table 3.2 shows the estimated weights on the US dollar rate in a currency basket for the PRC and Singapore.<sup>12</sup> Due to both limited variations in the nominal ringgit–US dollar exchange rate and an overlapping shift in the exchange rate regime with the PRC, it is not feasible to differentiate between the “pure” weight on the US dollar in the currency basket in Malaysia from the weight on the yuan (renminbi). For the PRC, we successfully differentiate into four sub-sample periods where weights on the US dollar rate in the currency basket differ on the basis of announcements of shifts in exchange rate regimes and observed fluctuations of nominal exchange rates against the US dollar (Figure 3.1): (i) Period i: May 2003–July 2007; (ii) Period ii: August 2005–June 2008; (iii) Period iii: July 2008–May 2010; and (iv) Period iv: June 2010–June 2012. Periods i and iii coincide with samples under a dollar peg and a temporal recurrence to a dollar peg due to the global financial crisis. In contrast, periods ii and iv correspond to a basket peg regime, i.e. a departure from a dollar peg. In these sample periods (ii and iv), weights on the US dollar in the currency basket are substantially lower by 0.16 and 0.18, respectively than that in period i when the yuan (renminbi)–US dollar rate was fixed (1.00). Even in period iii in which the yuan (renminbi)–US dollar was held relatively constant, the weight on the US dollar in the currency basket is lower than that under the dollar-peg period. These results clearly indicate that the yuan (renminbi) is

**Table 3.2: Estimates of Basket Weight on the US Dollar Rate**

(1) PRC				
	Period i	Period ii	Period iii	Period iv
Sample period	2003/5–2005/7	2005/8–2008/6	2008/7–2010/5	2010/6–2012/6
Estimated Weight on the US dollar rate	0.999	0.842	0.918	0.819

(2) Singapore		
	Period A	Period B
Sample period	2003/5–2009/3	2009/4–2016/4
Estimated Weight on the US dollar rate	0.570	0.475

Source: Authors' calculations.

<sup>12</sup> See Yoshino, Kaji, and Asonuma (2016b) for a detailed explanation on empirical approaches for both cases.

not completely pegged to the US dollar and is increasingly influenced by other currencies, i.e. increasing weights on other currencies in the basket.

Next, for Singapore, we have 2 sample periods with different estimated weights. These two periods are differentiated by an identified structural change in the Singapore dollar–US dollar rate supported by a Stepwise Chow Test. In period A, corresponding to the timeframe before and during the global financial crisis, the estimated weight on the US dollar in the currency basket is 0.57. In contrast, in period B (the post-global financial crisis period) during which the Singapore dollar had appreciated, the estimated weight on the US dollar fell to 0.475. While the US dollar depreciated, Singapore obviously increased weights on other currencies in the currency basket.

### 3.3. Optimal Transition Policy of the Exchange Rate Regime for the PRC

In this section we focus on the PRC's optimal transition path for the exchange rate regime. In particular, we attempt to answer the following policy-relevant question: How can the PRC successfully make the shift from the de facto dollar-peg regime to a more desirable one, whether a basket peg or a floating regime? To answer this, we construct a dynamic stochastic general equilibrium model of a small open economy. We define four transition policies based on a basket peg or a floating regime and compare the welfare gains of these policies relative to maintaining the dollarpegregime. Weobtain twomainresultsfromthequantitativeanalysis using PRC data from Q1 1999 to Q4 2010. First, we find that following a gradual adjustment to a basket peg regime is the most desirable path for the PRC to take, with minimal welfare losses associated with the shift in the exchange rate regime. Second, a sudden shift to the basket peg is the second-best solution, and is superior to a sudden shift to a floating regime.

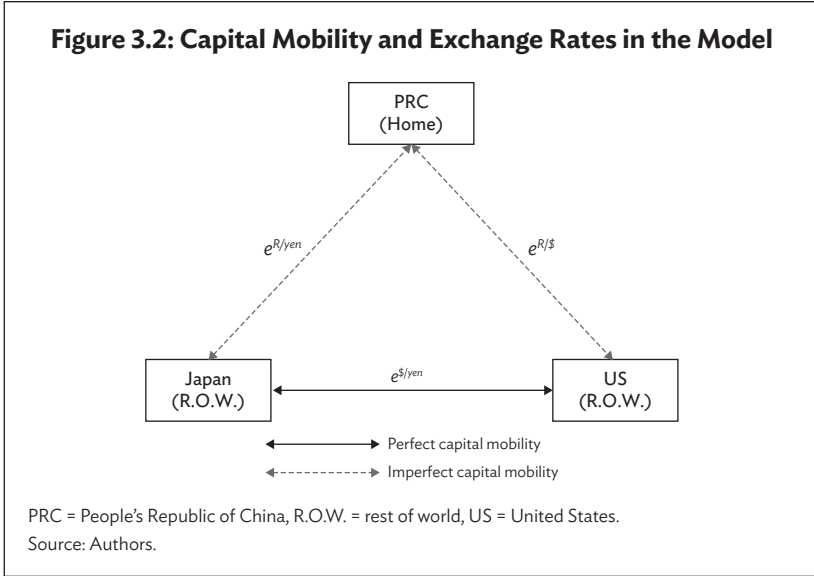
#### 3.3.1. Dynamic Small Open Economy Model

Our dynamic model closely follows Yoshino, Kaji, and Suzuki (2003) and Dornbusch (1976).<sup>13</sup> There are three countries in this model: the PRC

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<sup>13</sup> Although we do not derive equilibrium conditions directly from optimal behaviors of households and firms, our equilibrium conditions are the same as those in Yoshino, Kaji, and Asonuma (2012, 2016b), which are based on micro foundations.





(Home), the United States (US), and Japan (both of them are the rest of the world). We assume that domestic and foreign assets are imperfect substitutes, while US and Japanese assets are perfect substitutes for domestic investors, equivalently, interest parity condition for US and Japanese assets holds.

The interest parity condition for domestic (PRC) and foreign assets is shown as:

$$i_{t+1} - i_t = -\lambda \left[ i_t - \left\{ i_t^{US} + e_{t+1}^{R/\$,e} - e_t^{R/\$} - \sigma(e_t^{R/\$}) \right\} \right] \quad (1)$$

where  $\lambda$  denotes the adjustment speed of the domestic interest rate, which also captures the degree of capital control. Moreover,  $\sigma(e_t^{R/\$})$  denotes a risk premium that depends on the yuan (renminbi)-dollar exchange rate. If  $\lambda = 1$ , equation (1) can be rewritten as:

$$i_{t+1} = i_t^{US} + e_{t+1}^{R/\$,e} - e_t^{R/\$} - \sigma(e_t^{R/\$}) \quad (1')$$

The equilibrium condition for the money market is:

$$m_t - p_t = -\varepsilon i_{t+1} + \phi(y_t - \bar{y}) \quad (2)$$

where the left-hand side of equation (2) is the real supply of money, and the demand for money on the right-hand side of equation (2) depends on the interest rate and GDP gap.

Since one of three exchange rates is not independent, the yuan (renminbi)–yuan rate can be expressed as:

$$e_t^{R/yen} = e_t^{R/\$} + e_t^{\$/yen} \quad (3)$$

Equation (4) defines aggregate demand, which consists of consumption, investment, exports and imports. Therefore, it depends on real exchange rates, exchange rate expectations, real interest rate, and exchange rate risks:

$$y_t - \bar{y} = \delta \left( e_t^{\frac{R}{\$}} + p^{US} - p_t \right) + \delta' e_{t+1}^{\frac{R}{\$},e} + \theta \left( e_t^{\frac{R}{yen}} + p^{JP} - p_t \right) + \theta' e_{t+1}^{\frac{R}{yen},e} - \rho \left\{ i_{t+1} - (p_{t+1}^e - p_t^e) \right\} - \tau \Delta e^{R/\$} - \zeta \Delta e^{R/yen} \quad (4)$$

Lastly, equation (5) defines the aggregate supply. The inflation rate depends on total productivity, the GDP gap, real exchange rates, exchange rate expectations, and exchange rate risks since we assume that the PRC imports materials from Japan and the US and exports final goods to Japan and the US.

$$p_{t+1} - p_t = -\alpha_t + \psi (y_t - \bar{y}) + \eta \left( e_t^{\frac{R}{\$}} + p^{US} - p_t \right) + \eta' e_{t+1}^{\frac{R}{\$},e} + \mu \left( e_t^{\frac{R}{yen}} + p^{JP} - p_t \right) + \mu' e_{t+1}^{\frac{R}{yen},e} + (p_{t+1}^e - p_t^e) + \chi \Delta e^{R/\$} + \xi \Delta e^{R/yen} \quad (5)$$

Table 3.3 summarizes the variables used in the model.

**Table 3.3: Description of Macroeconomic Variables**

$m$	Stock of money supply
$p$	Domestic price level
$p^e$	Expected domestic price level
$p^{US}$	The price level in the US
$p^{JP}$	The price level in Japan
$i$	Home interest rate
$i^{US}$	US interest rate
$y$	Domestic GDP
$\bar{y}$	Potential GDP
$e^{R/\$}$	Yuan (renminbi)–US dollar exchange rate
$e^{R/yen}$	Yuan (renminbi)–Japanese yen exchange rate
$e^{\$/yen}$	US dollar–yen exchange rate
$\upsilon$	Basket weight on the US dollar rate
$\alpha$	Total productivity

Source: Authors.

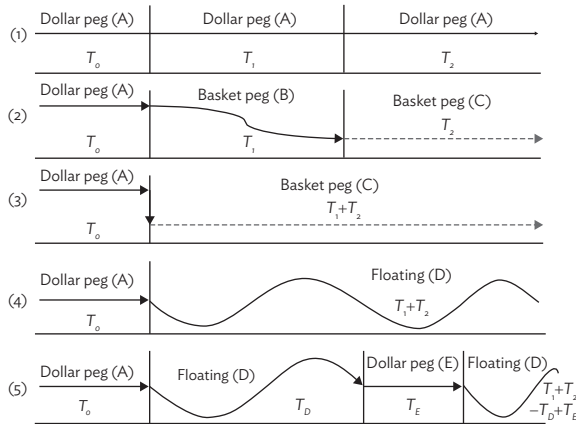
### 3.3.2. A Comparison of the Transition Policies

In this subsection, we consider the following four transition paths to the target regimes in addition to the scenario maintaining the current regime, the dollar peg regime with capital controls as shown in Figure 3.3.<sup>14</sup>

1. Maintaining the dollar peg (with strict capital controls)
2. Gradual shift from the dollar peg to a basket peg without capital controls
3. Sudden shift from the dollar peg to a basket peg without capital controls
4. Sudden shift from the dollar peg to a floating regime
5. Sudden shift from the dollar peg to a managed floating regime

<sup>14</sup> One would consider the transition path 5 (a sudden shift from the dollar peg to a managed floating regime) as one type of gradual adjustments to the floating regime as the monetary authorities intervene in the foreign exchange market to stabilize the exchange rate if the exchange rate fluctuation is remarkably large. Ongoing project (Yoshino and Asonuma 2017) explores several adjustment paths to the floating regime taking into account the order of the exchange rate adjustments (basket weight adjustments) and capital account liberalization.

**Figure 3.3: A Comparison of the Transition Policies in the PRC**



Source: Authors.

### 3.3.2.A Maintaining the Dollar Peg Regime (With Strict Capital Controls)

Under the first policy (policy 1), the PRC maintains a fixed exchange rate against US dollar (exogenous) and enforces strict capital controls. Money supply becomes endogenous and the domestic interest rate is a policy instrument (exogenous). From equations (1)–(5), deviations of GDP and the price level from the long-term equilibrium are expressed as follows:

$$(y_t - \bar{y}'_A) = A_1(t) \hat{e}_t^{S/yen} + A_2(t) \Delta \hat{e}^{R/yen} + A_3(t) i_{t+1} \quad (6)$$

$$(p_t - \bar{p}'_A) = A_1^p(t) \hat{e}_t^{S/yen} + A_2^p(t) \Delta \hat{e}^{R/yen} + A_3^p(t) i_{t+1} \quad (6a)$$

where both deviations are expressed in terms of the US dollar–yen exchange rate, the yuan (renminbi)–US dollar exchange rate risk, and the domestic interest rate (policy instrument).

### 3.3.2.B Gradual Shift From the Dollar Peg to a Basket Peg Without Capital Controls

The second policy (policy 2) includes a transition period, which reflects the adjustment period of capital controls and basket weights. During the transition and after the transition, the authorities intervene in the foreign exchange market to maintain the value of the basket. The currency basket is a weighted average of the yuan (renminbi)–US dollar rate and the yuan (renminbi)–yen rate shown as:

$$\nu e_t^{R/\$} + (1-\nu)e_t^{R/yen} = \Gamma \quad (7)$$

where  $\Gamma$  is the value of the basket. The authorities put weight  $\nu$  to the yuan (renminbi)–US dollar exchange rate and  $1-\nu$  to the yuan (renminbi)–yen exchange rate.<sup>15</sup> The authorities have the basket weight  $\nu$  as a policy instrument. The following reduced forms for three endogenous variables are obtained:

$$(\gamma_t - \bar{\gamma}') = B_1(t)\nu\hat{e}_t^{\$/yen} + B_2(t)\hat{e}_t^{\$/yen} + B_3(t)\hat{z}_t \quad (8)$$

$$(p_t - \bar{p}') = B_1^p(t)\nu\hat{e}_t^{\$/yen} + B_2^p(t)\hat{e}_t^{\$/yen} + B_3^p(t)\hat{z}_t \quad (8a)$$

$$(\dot{i}_t - \bar{i}_B) = -(1-\nu)[(1+\sigma)(1-b_4)](1-\lambda)^t \hat{e}_t^{\$/yen} \quad (8b)$$

where both deviations are expressed in terms of the the US dollar–yen exchange rate, the US dollar–yen exchange rate risk, and both the yuan (renminbi)–US dollar and the yuan (renminbi)–yen exchange rate risks  $\hat{z}_t$ , and the basket weight, which is the policy instrument.

### 3.3.2.C Sudden Shift From the Dollar Peg to a Basket Peg Without Capital Controls

In contrast, the third policy (policy 3) does not include a transition period, implying that the economy will jump to the target basket peg regime. The following reduced forms for two endogenous variables are obtained:

<sup>15</sup> It has often been discussed that the weight on the exchange rate is equal to the trade weight. However, Yoshino, Kaji, and Suzuki (2004) show that the trade weight is not optimal, and it should depend on the policy objective (such as GDP stability, exchange rate stability etc.) and the structure of the economy in the static model.

$$(y_t - \bar{y}'_C) = C_1(t)v\hat{e}_t^{S/yen} + C_2(t)\hat{e}_t^{S/yen} + C_3(t)\hat{z}_t \quad (9)$$

$$(p_t - \bar{p}'_C) = C_1^p(t)v\hat{e}_t^{S/yen} + C_2^p(t)\hat{e}_t^{S/yen} + C_3^p(t)\hat{z}_t \quad (9a)$$

where both deviations are expressed in terms of the US dollar–yen exchange rate, the US dollar–yen exchange rate risk, and both the yuan (renminbi)–US dollar and the yuan (renminbi)–yen exchange rate risks  $\hat{z}_t$ , and the basket weight, which is the policy instrument.

### 3.3.2.D. Sudden Shift From the Dollar Peg to a Floating Regime or a Managed Floating Regime

The fourth policy (policy 4) involves shifting from the dollar peg to a floating regime without a transition period, implying that the economy will suddenly jump to a floating regime. In both cases, after the shift, the money supply ( $m_t$ ) becomes a policy instrument for the authorities. The following reduced forms for two endogenous variables are obtained:

$$(y_t - \bar{y}'_D) = D_1(t)\hat{e}_t^{S/yen} + D_2(t)\hat{z}_t + D_3(t)m_t \quad (10)$$

$$(p_t - \bar{p}'_D) = D_1^p(t)\hat{e}_t^{S/yen} + D_2^p(t)\hat{z}_t + D_3^p(t)m_t \quad (10a)$$

where both deviations are expressed in terms of the US dollar–yen exchange rate, the yuan (renminbi)–US dollar and the yuan (renminbi)–yen exchange rate risks  $\hat{z}_t$ , and the money supply, which is the policy instrument.

Finally, the last policy (policy 5) involves shifting from the dollar peg regime to a managed floating regime without a transition period. Under the managed floating regime, if the exchange rate fluctuation is remarkably large, the monetary authorities intervene in the foreign exchange market to maintain the exchange rate at a fixed rate. Otherwise, it allows the exchange rate to fluctuate as the exchange rate does not deviate from the desired level. Therefore, reduced forms for endogenous variables can be expressed either equation (6) and (6a) or equation (10) and (10a).

### 3.3.2.E. Benefits and Costs of the Transition Policies

There are benefits and costs associated with the four transition policies, (2), (3), (4), and (5), together with maintaining the current regime (1), as shown in Table 3.4. By focusing on the costs associated with

**Table 3.4: Benefits and Costs of the Transition Policies**

Policy	Benefits	Costs
(1) Maintaining the dollar-peg	a. No volatility of $e^{R/\$}$	a. Limited capital inflows
(2) Gradual shift to basket-peg	a. Small volatility of $i$	a. Time to reach stable regime
	b. Small volatility of $e^{R/\$}$ , $e^{R/yen}$	b. Adjustment costs
	c. Small deviations of $e^{R/\$,e}$ , $e^{R/yen,e}$	
(3) Sudden shift to basket-peg	a. Reaching stable regime at once (Higher benefits under stable regime)	a. High volatility of $i$
	b. No adjustment costs	b. High volatility of $e^{R/\$}$ , $e^{R/yen}$
(4) Sudden shift to floating	a. Reaching stable regime at once (Higher benefits under stable regime)	a. High volatility of $i$
	b. No adjustment costs	b. High volatility of $e^{R/\$}$ , $e^{R/yen}$
		c. Large deviations of $e^{R/\$,e}$ , $e^{R/yen,e}$
(5) Sudden shift to managed floating	a. Reaching stable regime at once (Higher benefits under stable regime)	a. High volatility of $i$
	b. No adjustment costs	b. No monetary policy autonomy during interventions
	c. Limited exchange rate fluctuations	

Source: Authors.

the transition policies, we provide an estimate of component in each transition policy in Table 3.5. Moreover, these benefits and costs are taken into consideration by quantifying cumulative losses discussed in Section 3.3.3.

With respect to maintaining the dollar peg (policy 1), one advantage is that the private sector (exporting and importing firms and financial sector firms investing in foreign assets) does not have to worry about exchange rate fluctuations and associated risks. In contrast, one disadvantage arises due to limited capital inflows.

In a gradual shift to a basket peg (policy 2), the monetary authorities enjoy the benefit of a limited impact on the economy associated with smaller volatility of both interest rate and real exchange rates compared with the sudden shift to a basket-peg regime (policy 3). However, the monetary authorities have to bear the costs of a long adjustment period: it takes time to reach the stable regime and the transition results in sizable adjustment costs.

**Table 3.5: Estimates of the Costs of the Transition Policies**

Policy	Costs	Estimates
(1) Maintaining the dollar-peg	a. Limited capital inflows	0.033 <sup>a</sup>
(2) Gradual shift to basket-peg	a. Time to reach stable regime	0.003 <sup>b</sup>
	b. Adjustment costs	0.0066 <sup>c</sup>
(3) Sudden shift to basket-peg	a. High volatility of $i$	0.0028 <sup>d</sup>
	b. High volatility of $e^{R/\$}$ , $e^{R/yen}$	0.0030 <sup>e</sup>
(4) Sudden shift to floating	a. High volatility of $i$	0.0034 <sup>d</sup>
	b. High volatility of $e^{R/\$}$ , $e^{R/yen}$	0.034 <sup>e</sup>
	c. Large deviations of $e^{R/\$,e}$ , $e^{R/yen,e}$	0.0013 <sup>f</sup>
(5) Sudden shift to managed floating	a. High volatility of $i$	0.0034 <sup>d</sup>
	b. No monetary policy autonomy during interventions	0.023 <sup>g</sup>

## Notes:

<sup>a</sup> A proxy is the cumulative loss over 9 quarters (one initial period and two years).

<sup>b</sup> An estimate is a difference between the cumulative losses under transition period of 14 quarters and 18 quarters.

<sup>c</sup> An estimate is a difference between the cumulative losses based on the baseline  $\lambda$  and on a 20% deviation from the baseline  $\lambda$ .

<sup>d</sup> An estimate is a change in the cumulative loss due to an increase in interest rate originally driven by a 0.001-unit deviation of  $e^{S/yen}$  shock.

<sup>e</sup> An estimate is a change in the cumulative loss due to a 0.001-unit  $e^{S/yen}$  shock.

<sup>f</sup> An estimate is a change in the cumulative loss due to a 0.001-unit  $e^{S/yen,e}$  shock.

<sup>g</sup> An estimate is a fraction of the cumulative loss during intervention periods.

Source: Authors' calculations.

In a sudden shift to a basket peg (policy 3), the monetary authorities benefit from reaching the stable regime immediately. However, the sudden shift generates large fluctuations in the interest rate and real exchange rates, which negatively impact the economy.

The benefits and costs under the sudden shift to a floating regime (policy 4) or a managed floating regime (policy 5) are similar to those seen in the sudden shift to a basket peg. On the one hand, the sudden shift to the stable regime provides an advantage of limited adjustment costs. On the other hand, the monetary authorities suffer the negative influence due to the large volatility of the interest rate and real exchange rates associated with the shift. Under the shift to a managed floating (policy 5), exchange rate fluctuation is limited within the specified range due to interventions in the foreign exchange market. As the economy suffers large exchange rate shocks, the frequency and size of interventions increase, which result in costs for the monetary authorities.



We consider mainly stabilizing output fluctuation in the analysis, which is consistent with the PRC authorities' policy goal of achieving sustainable growth. We assume that the time interval for the initial dollar-peg regime is  $T_0$ . Furthermore, we consider the transition period as  $T_1$  and the time interval after the authorities reach the target regime as  $T_2$ . A discount factor is assumed to be  $\beta$ . For the policy goal of stabilizing the output fluctuations, the cumulative loss function is defined as follows:<sup>16</sup>

$$L(T_1, T_2) = \sum_{t=1}^{T_0+T_1+T_2} \beta^{t-1} (y_t - \bar{y}')^2 \quad (11)$$

### 3.3.3. Quantitative Analysis in the Case of Output Stability

The structure of the economy is presented by five equations explained in Section 3.3.1. Under each policy, the optimal value of the policy instrument is obtained by minimizing the value of cumulative loss function (11) and is reported in the third row of Table 3.6. Under policy 1, the interest rate is the policy instrument. Under policies 2 and 3, the basket weight is the policy instrument. Under policies 4 and 5, the level of monetary supply is the policy instrument.

We apply our model and incorporate exogenous shocks as actually occurred from Q1 2005 to Q4 2014. We then compare the strategies based on values of the cumulative loss function for output stabilization (equation 11). Table 3.6 also provides a comparison of the estimates of the cumulative loss under the five policies (fourth and fifth rows). Among the five policies, maintaining the dollar peg (policy 1) results in the highest cumulative loss. Focusing on shifting to a basket peg regime, policy 2, which calls for a gradual adjustment yields a smaller cumulative loss than policy 3, which entails a sudden shift. Having transition periods in which the degree of capital controls and basket weights are gradually adjusted provides benefits to the country by minimizing the volatility of the interest rate and exchange rates.<sup>17</sup> A comparison between shifts to a basket peg and a floating regime suggests that the shift to a basket peg leads to a smaller cumulative loss. Finally, the shift to a managed floating regime yields a better outcome for the monetary authorities than the shift to a floating regime. Reducing exchange rate volatility, which directly affects output fluctuations through occasional interventions, is beneficial to the monetary authorities.

<sup>16</sup> The appendix discusses the case of the price level stability.

<sup>17</sup> The optimal weights of policies 2 and 3 differ, as explained in Yoshino, Kaji, and Asonuma (2014).

**Table 3.6: Values of the Cumulative Losses and Policy Instruments**

	Policy 1	Policy 2	Policy 3	Policy 4	Policy 5 <sup>b</sup>
Stable regime	Dollar peg	Basket peg	Basket peg	Floating	Managed float
Adjustment	–	Gradual	Sudden	Sudden	Sudden
Instrument value	$i^* = 4.34$	$v^* = 0.58$	$v^{**} = 0.68$	$m^* = 0.016$	$m^{**} = 0.017$
Cumulative loss (value)	17.04	1.80	1.91	2.67	2.31
Cumulative loss (percent of ) <sup>a</sup>	23.4	2.4	2.6	3.7	3.2

<sup>a</sup> We calculate the value of  $\bar{y}^2$  shown in Section 3.3.1 and obtain  $\bar{y}^2 = 72.8$ .

<sup>b</sup> For  $T_\varepsilon = 7$ , the cumulative loss is 3.54 ( $m^{**} = 0.017$ ).

Source: Authors' calculations.

### 3.4. Optimal Transition Policy of Exchange Rate Regime for Malaysia and Singapore in Response to a Shift in the PRC's Exchange Rate Regime

The previous section shows that the PRC would be better off shifting gradually to a basket peg regime. Based on this result, this section considers how Malaysia and Singapore might best respond to such a move. We apply a dynamic stochastic general equilibrium model of a small open economy. We specify five alternative exchange rate regime strategies that encompass fixed, basket, and floating regimes, and gradual versus sudden transitions. Based on the quantitative analysis incorporating exogenous shocks as actually occurred from Q1 2005 to Q4 2014, a gradual adjustment to a basket peg with long-term optimal weights is the first-best policy for both countries, where optimal weights are derived to minimize the loss function. Further, both a sudden shift to a basket peg with optimal weights and a sudden shift to a floating regime are superior to maintaining the dollar peg in Malaysia, but not to maintaining the existing basket peg in Singapore.

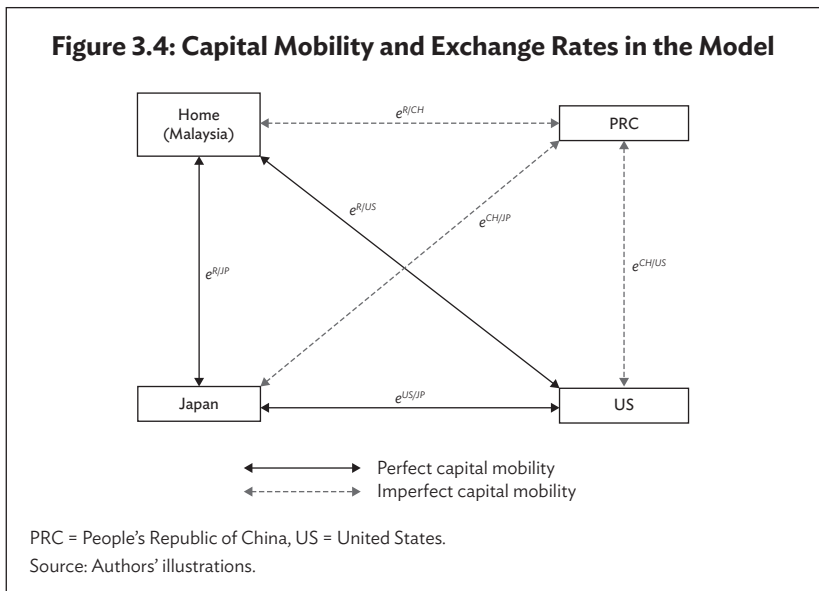
#### 3.4.1. Dynamic Small Open Economy Model

We use the dynamic stochastic general equilibrium model of a small open economy, given as either Malaysia or Singapore, with the rest of the world comprising three economically exogenous countries: the PRC, Japan, and the US. Our model is an extended version of the one presented in Clarida, Gali, and Gertler (2002), and has been adapted

to capture transitions of three types (i) a shift in the exchange rate regime; (ii) adjustment in the weights on currencies under a basket peg regime; and (iii) with respect to the PRC, adjustment in the degree of capital mobility.

Figure 3.4 presents a schematic diagram of the influence of capital mobility on exchange rate determination. Home country currency is denoted as R in the case of the Malaysian ringgit and SD in the case of the Singapore dollar, with the figure capturing the case of Malaysia as the Home country. Currencies for the PRC, Japan, and the US are represented by the symbols CH, JP, and US, respectively. Thus the exchange rate between the ringgit and the yuan (renminbi) is given as  $e^{R/CH}$ .

The economies of all countries consist of three sectors: households, firms, and the central bank. We assume that the countries share the same preferences and technologies and produce traded goods that are imperfect substitutes in utility. When prices are sticky, output and real exchange rates can differ from their flexible-price equilibrium values. We denote variables in deviation from these equilibrium values with  $\hat{a}_t \equiv a_t - a_t^o$ , and next-period expected value as  $E_t a_{t+1}$ . For other variables, output gap  $x_t$  is defined as follows:  $x_t \equiv y_t - y_t^o$  and inflation rate is  $\pi_t^C = \pi_t^C - \pi_t^{C,o}$  where the inflation rate at steady-state  $\pi_t^{C,o} = 0$ .



From the optimization problems of households and firms, we derive equilibrium conditions for the Home country, taken to be Malaysia for notational purposes.<sup>18</sup> Seven endogenous variables such as output gap  $x_t$ , consumer price index (CPI), inflation rate  $\pi_t^c$ , domestic interest rate ( $i_t - i_t^o$ ), nominal wage  $\hat{w}_t$ , real yuan (renminbi) exchange rate  $\hat{e}_t^{R/CH}$ , real Japanese yen exchange rate  $\hat{e}_t^{R/JP}$ , real US dollar exchange rate  $\hat{e}_t^{R/US}$  are solved with seven equations mentioned above (note that we have three equations in total for the interest parity condition—16 and 17). Equations (12) and (13) are the open-economy aggregate supply equation (AS) and investment-savings equation (IS), respectively. Equations (14) and (15) are money market and labor market equilibrium conditions, respectively. Equations (16) and (17) are real interest parity conditions.

$$\pi_t^c = \frac{\beta}{1+\kappa} E_t \pi_{t+1}^c + \frac{\lambda_H \kappa}{1+\kappa} \left\{ \alpha \hat{w}_t + (1-\alpha') \hat{q}_t \right\} - \sum_{i \in \{CH, JP, US\}} \frac{\lambda_i}{1+\kappa} \left\{ \beta \left( E_t \hat{e}_{t+1}^{\frac{R}{i}} - \hat{e}_t^{\frac{R}{i}} \right) + (1+\kappa) \left( \hat{e}_t^{\frac{R}{i}} - \hat{e}_{t-1}^{\frac{R}{i}} \right) \right\} \quad (12)$$

$$x_t = E_t x_{t+1} - \frac{\omega_H}{\sigma} (i_t - E_t \pi_{t+1}^c - r_t^o) + \theta \left( \frac{\omega_H}{\lambda_H} - 1 \right) E_t \pi_{t+1}^c - \theta (1 - \omega_H) \left\{ \alpha' (\hat{w}_t - E_t \hat{w}_{t+1}) + (1 - \alpha') (\hat{q}_t - E_t \hat{q}_{t+1}) \right\} + \sum_{i \in \{CH, JP, US\}} \left\{ \left( \theta \omega_i + \frac{\lambda_i}{\lambda_H} \right) (\hat{e}_t^{R/i} - E_t \hat{e}_{t+1}^{R/i}) - \frac{\omega_i}{\sigma} \hat{r}_t^i \right\} \quad (13)$$

$$m_t - m_t^o = \frac{\sigma}{b \omega_H} x_t + \frac{\sigma (1 - \omega_H)}{b \omega_H} \left\{ \alpha' \hat{w}_t + (1 - \alpha') \hat{q}_t \right\} - \frac{\sigma}{b} \left[ \frac{1 - 2\omega_H}{\omega_H} + \theta \left( \frac{\lambda_H - 1}{\lambda_H} \right) \right] \pi_t^c - \sum_{i \in \{CH, JP, US\}}$$

$$\left\{ \left( \lambda_i + \frac{\omega_i}{\omega_H} \right) \theta \hat{e}_t^{R/i} \right\} - \left( \frac{1}{b} \right) (i_t - i_t^o) \quad (14)$$

<sup>18</sup> See Yoshino, Kaji, and Asonuma (2016b).

$$\begin{aligned}
x_t = & E_t x_{t+1} - \left\{ 1 - (1 - \omega_H) \alpha' + \frac{1}{\eta} \right\} (E_t \hat{w}_{t+1} - \hat{w}_t) \\
& + \left\{ 1 - \omega_H - \frac{\omega_H}{\lambda_H} + \frac{1}{\eta} \right\} E_t \pi_{t+1}^C + \frac{1}{\eta} (i_t - E_t \pi_{t+1}^C - r_t^o) \\
& + (1 - \omega_H)(1 - \alpha')(E_t \hat{q}_{t+1} - \hat{q}_t) + \sum_{i \in \{CH, JP, US\}} \\
& \left\{ \left( \omega_i + \frac{\omega_H \lambda_i}{\lambda_H} \right) (E_t \hat{e}_{t+1}^{R/i} - \hat{e}_t^{R/i}) \right\} \tag{15}
\end{aligned}$$

$$i_t - E_t \pi_{t+1}^C - r_t^o = \hat{r}_t^j + E_t \hat{e}_{t+1}^{R/j} - \hat{e}_t^{R/j} \quad \text{for } j = JP, US \tag{16}$$

$$i_t - E_t \pi_{t+1}^C - r_t^o = \hat{r}_t^{CH} + E_t \hat{e}_{t+1}^{R/CH} - \hat{e}_t^{R/CH} + E_t \hat{w}_{t+1} \tag{17}$$

### 3.4.2. A Comparison of the Transition Policies

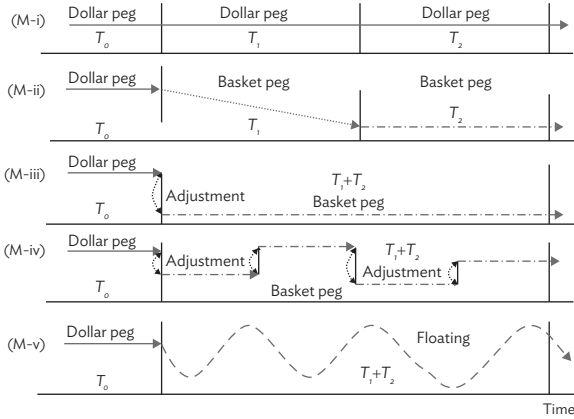
Next, we define some possible transition policies together with maintaining the status quo regime. As discussed in Section 3.3, we assume that the PRC starts from a dollar-peg regime with capital controls, and undergoes a transition to adjust its basket weight and capital controls, and finally adopts a basket-peg regime with the long-term desired weight. We consider the following five transition policies for Malaysia and Singapore, respectively, as explained in Figure 3.5. Reflecting both pre-2005 exchange rate regimes and degree of capital mobility, Malaysia starts from a dollar peg, while Singapore starts from a basket peg under perfect capital mobility.

#### Malaysia

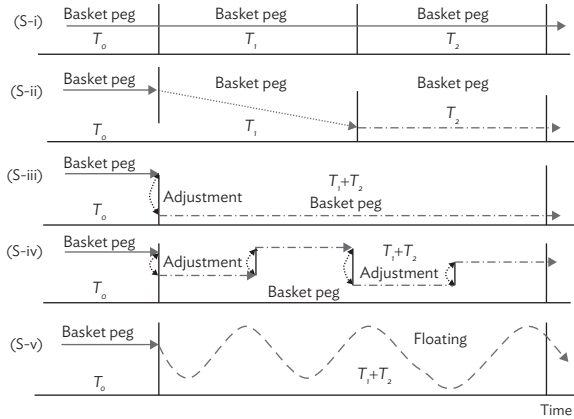
- (M-i) Maintaining the dollar peg under perfect capital mobility (basket weight to the US dollar is always equal to 1);
- (M-ii) Gradual shift from the dollar peg to a basket peg with the long-term desirable weight (gradual adjustments of basket weight);
- (M-iii) Sudden shift from the dollar peg to a basket peg with the long-term desirable weight (sudden adjustments of basket weight);
- (M-iv) Sudden shift from the dollar peg to a basket peg with discretion (sudden and frequent adjustments of basket weight);
- (M-v) Sudden shift from the dollar peg to a floating regime.

**Figure 3.5: Transition Policies for Malaysia and Singapore**

**(A) Malaysia**



**(B) Singapore**



Source: Authors' illustrations.

**Singapore**

- (S-i) Maintaining the basket peg under perfect capital mobility (keeping basket weight on the US dollar rate at the initial level);
- (S-ii) Gradual shift from the basket peg with current weight to a basket peg with the long-term desired weight (gradual adjustments of basket weight);

(S-iii) Sudden shift from the basket peg with current weight to a basket peg with the long-term desired weight (sudden adjustments of basket weight);

(S-iv) Sudden shift from the basket peg with current weight to a basket peg with estimated weights (actual weights during 2005–2014) (sudden adjustments of basket weight);

(S-v) Sudden shift from the basket peg to a floating regime.

We assume that an initial time period for a dollar peg is  $T_0$ . Furthermore, the transition period in which the PRC adjusts its basket weight and capital controls is set as  $T_1$  and the time interval after the PRC implements a basket peg with its long-term desired weight is set as  $T_2$ . The discount rate is assumed to be  $\beta$ . Based on our analysis, the cumulative loss for Malaysia and Singapore for the whole sample period is:

$$L_1 = E_t \sum_{i=0}^{T_0+T_1+T_2} \beta^i \left[ \varpi_1 (\pi_{t+i}^C)^2 + \varpi_2 (x_{t+i})^2 + (1 - \varpi_1 - \varpi_2) (\hat{e}_{t+i}^{REER})^2 \right] \quad (18)$$

where  $\varpi_1$  and  $\varpi_2$  show weights on policy targets, which capture the relative importance of policy targets for the monetary authorities. This indicates that the monetary authorities attempt to minimize the CPI inflation rate, output gap, and deviations in the real effective exchange rate (REER). There are benefits and costs associated with the five transition policies as explained in Section 3.3.2. They are clearly included in the cumulative loss defined above.

### 3.4.3. Quantitative Analysis

We analyze quantitatively the relative superiority of the transition policies in terms of calibrated cumulative losses. We calculate cumulative losses incurred under the five transition policies for Malaysia and Singapore using actual shocks over 40 quarters (Q1 2005–Q4 2014). These cumulative losses are measured based on equation (18), which consists of the inflation rate, output gap, and real effective exchange rate.

The following three implications emerge from Table 3.7. First, a gradual shift to a basket peg with the long-term desirable weight is the first-best choice for both Malaysia and Singapore. Second, a sudden shift to a basket peg with the desirable weight is superior to maintaining the dollar peg in Malaysia, but not to maintaining the initial weight under a basket peg in Singapore. Third, a sudden shift to a basket peg with discretion results in a higher cumulative loss than both a gradual shift or a sudden shift to a basket peg with the desirable weight in both Malaysia

**Table 3.7: A Comparison of the Transition Policies**

(1) Malaysia					
	Policy M-i	Policy M-ii	Policy M-iii	Policy M-iv	Policy M-v
Stable regime	Dollar peg	Basket peg	Basket peg	Basket peg	Floating
Adjustment	No	Gradual	Sudden	Sudden/Discreet	Sudden
Desired Basket Weight	1.00	0.62	0.56	–	–
Cumulative Losses	1.550E-2	1.157E-2	1.226E-2	1.435E-2	1.229E-2
Cumulative Losses (relative to policy M-i)	1.00	0.75	0.79	0.93	0.79

(2) Singapore					
	Policy S-i	Policy S-ii	Policy S-iii	Policy S-iv	Policy S-v
Stable regime	Basket peg	Basket peg	Basket peg	Basket peg	Floating
Adjustment	No	Gradual	Sudden	Sudden/Discreet	Sudden
Desired Basket Weight	0.80	0.61	0.44	–	–
Cumulative Losses	4.668E-2	4.648E-2	4.938E-2	4.955E-2	4.874E-1
Cumulative Losses (relative to policy M-i)	1.00	0.996	1.058	1.062	10.44

<sup>a</sup> The initial weight on the US dollar rate under a basket peg regime for Singapore is assumed to be 0.8.

Source: Authors' calculations.

and Singapore. Lastly, a sudden shift to a floating regime is found to be inferior to maintaining the initial weight under a basket peg regime in Singapore. On the contrary, the sudden shift to a floating regime is more desirable than maintaining the dollar peg regime in Malaysia.

### 3.5. Conclusion

This chapter considers the optimal transition policy of exchange rate regime for three East Asian countries: the PRC, Malaysia, and Singapore. Contrary to two traditional approaches of analysis on exchange rate regime in East Asia, the paper follows the new and emerging approach of analysis: a dynamic transition analysis. In particular, we consider shifts in exchange rate regimes, i.e. shifts from a dollar peg to a basket peg or a floating regime over fixed time intervals together with maintaining a dollar peg. We construct a dynamic stochastic general equilibrium model



of a small open economy and apply to the PRC, Malaysia, and Singapore. For each analysis, we define transition policies and compare the welfare gains of these policies relative to the current regime, i.e. maintaining a dollar peg regime or a basket peg regime. The quantitative analysis using data from the PRC, Malaysia, and Singapore shows that the PRC would be better off shifting gradually from a dollar peg—where it adopted prior to the announcement of the shift in regime in 2005Q3—to a basket peg. In response to such a shift, Malaysia would opt to shift gradually from a dollar peg—it adopted prior to the announcement of the shift in regime in 2005Q3—to a basket peg regime and Singapore would be better off adjusting its basket weights under the current basket peg regime.

## Appendix: Quantitative Analysis in the Case of the Price Level Stability

We also consider the case which the monetary authorities aim to minimize fluctuations in the price level, i.e. inflation rates over the horizon, shown as:

$$L(T_1, T_2) = \sum_{t=1}^{T_0+T_1+T_2} \beta^{t-1} (p_t - \bar{p}')^2 \quad (11a)$$

The policy instrument under each policy is identical to that in the case of output stability. Table A1 provides a comparison of estimates of the loss function under the five policies (fourth and fifth rows). Similar to Table 3.6, maintaining the dollar peg (policy 1) results in the highest cumulative loss among the five policies. The sudden shift to a floating regime (policy 4) results in a smaller cumulative loss than those under other transition policies. The second-best policy is the sudden shift to the basket peg with gradual adjustments.

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**Table A1: Values of the Cumulative Losses and Policy Instruments**

	Policy 1	Policy 2	Policy 3	Policy 4	Policy 5 ( $T_E = 5$ ) <sup>b</sup>
Stable regime	Dollar peg	Basket peg	Basket peg	Floating	Managed floating
Adjustment	–	Gradual	Sudden	Sudden	Sudden
Instrument value	$i^* = 1.14$	$v^* = 0.65$	$v^{**} = 0.78$	$m^* = 0.11$	$m^{**} = 0.01$
Cumulative loss (value)	0.30	0.020	0.021	0.013	0.033
Cumulative loss (% of $\bar{p}$ ) <sup>a</sup>	33.0	2.2	2.3	1.4	3.3

<sup>a</sup> We calculate the value of  $\bar{p}^2$  shown in Section 3.3.1 and obtain  $\bar{p}^2 = 0.91$ .

<sup>b</sup> For  $T_E = 7$ , the cumulative loss is 0.050 ( $m^{**} = 0.015$ ).

Source: Authors' calculations.

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# 4

## Measuring the Effects of Commodity Price Shocks on Asian Economies

*Tomoo Inoue and Tatsuyoshi Okimoto*

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### 4.1 Introduction

In April 2016, the International Monetary Fund (IMF) released the latest World Economic Outlook (WEO). In this survey, the IMF listed major macroeconomic realignments that are likely to generate substantial uncertainty in the world economy: “the slowdown and rebalancing in the People’s Republic of China (PRC); a further decline in commodity prices [...]; a related slowdown in investment and trade; and declining capital flows to emerging market and developing economies” (IMF 2016: 1).

Commodity prices have become volatile over the past 2 decades, and their recent sharp decline has led to a drop in the consumer price index (CPI) inflation rates of most economies. While many Asian economies have benefited from low international food and fuel prices, commodity exporters have suffered. Therefore, analyzing the negative impact on production due to the decline in producer prices has attracted considerable attention. Given this situation, policy makers have become increasingly concerned about measuring the magnitude of oil and food price shock diffusion on a nation’s inflationary indicators.

Our study aims to examine and quantify the impact of oil and food price shock propagation on the sample countries’ inflationary indicators and industrial production, which the IMF has listed in the recent WEO as a second key problem that influenced the global economic outlook in 2016.

We examine the problem by using a global vector autoregressive (GVAR) model. We extend the work done by Galesi and Lombardi (2009), which primarily analyzed European economies using data for the pre-global financial

crisis period, in the following four ways: (i) the sample period is extended to December 2015, thus covering the post-global financial crisis turbulence period (beginning January 2001); (ii) the model is enriched by considering the PRC's role in integrating the Asian region through international trade; (iii) the pass-through effects for the headline and core consumer CPIs, as well as the producer price index (PPI) are examined; and (iv) the impact on industrial production is investigated.

The remainder of the chapter is organized as follows. Section 4.2 analyzes the historical transition of trade linkages between the sample countries using the network analysis. Section 4.3 explains the GVAR modeling. Section 4.4 discusses the data and presents the estimation results. Section 4.5 presents the generalized impulse response functions (GIRFs) and investigates the effects of external commodity price shocks on the sample countries by comparing the shapes of the GIRFs in various settings. Section 4.6 provides the conclusion.

## 4.2 The Transition of Trade Links Surrounding the People's Republic of China

When we investigate the transmission of the international commodity price shock to domestic prices as well as its impact on economic activity, the underlying trade linkages between countries must play an important role. Following this intuition, we investigate the evolution of trade links among the sample countries.

Our data set includes 22 economies (Table 4.1). Of these, 9 are Asian—the PRC, India, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, and Thailand. As often emphasized, the PRC's economic connections became much stronger after it became a member of the World Trade Organization (WTO) in 2001. We calculated the trade weights (or trade shares) for each sample country. For country  $i$ , its trade weight  $w_{ij}(t)$  with respect to country  $j$  at time  $t$  is quantified as:

$$w_{ij}(t) = \frac{\text{bilateral trade flows at time } t \text{ between countries } i \text{ and } j}{\sum_{k=1}^N \text{bilateral trade flows at time } t \text{ between countries } i \text{ and } k} \quad (1)$$

where the “bilateral trade flow” is the sum of exports and imports between a pair of countries, obtained from the IMF's Direction of Trade Statistics. In order to make smooth the short-run variation of trade data, we take a 5-year moving average of trade flows.

**Table 4.1: A List of Sample Countries and their Abbreviations**

Name	Abbreviation	Name	Abbreviation
Brazil	Bra	Norway	Nor
Canada	Can	Peru	Peru
PRC	PRC	Philippines	Phlp
Chile	Chl	South Africa	Safrc
Eurozone	Euro	Saudi Arabia	Sarbia
India	India	Singapore	Sing
Indonesia	Indns	Sweden	Swe
Japan	Japan	Thailand	Thai
Korea	Korea	Turkey	Turk
Malaysia	Mal	United Kingdom	UK
Mexico	Mex	US	USA

PRC = People's Republic of China, UK = United Kingdom, US = United States.

Note: "eurozone" includes Belgium, Finland, France, Germany, Italy, Netherlands, and Spain.

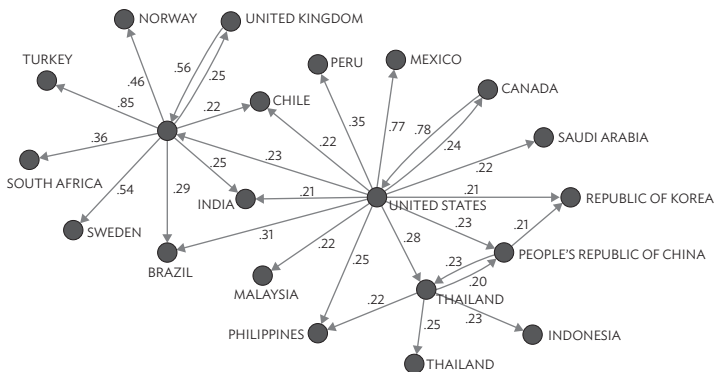
Sources: Authors.

Given the  $w_{ij}(t)$  for all the sample countries for different periods, the evolution of trade linkages is presented using network graphs (Figures 4.1 and 4.2).

The network graph in Figure 4.1 is constructed by using the trade weights at the beginning of the sample period, i.e., the average weights from 2001 to 2005. From this graph, we can identify three important nodes: the United States (US), the eurozone, and Japan. These three economies have more connecting arrows with other countries in general. For example, the US is connected with Malaysia, and the arrow has a numeric label of 0.22. This implies that Malaysia's average trade share with the US is 22% for the 2001–2005 period. Similarly, the trade share of the Philippines and Japan with the US are 25% and 28%, respectively.

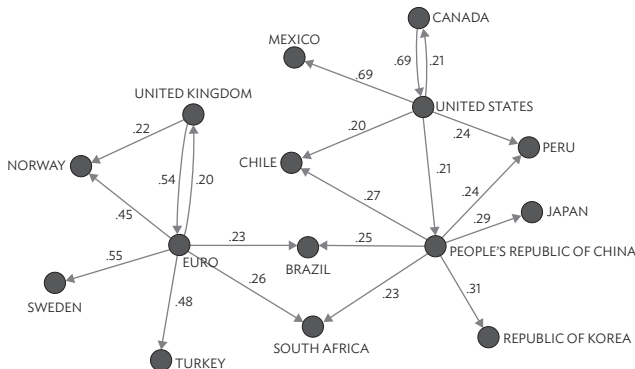
Similar phenomena are observed for the eurozone, which is also an important trading hub for Norway (46%), the United Kingdom (UK) (25%), Turkey (58%), South Africa (36%), Sweden (54%), India (25%), Chile (21%), and Brazil (29%). With respect to the Asian countries, Japan played a similar role: it was an important trading counterpart for the PRC (20%), the Philippines (22%), Indonesia (23%), and Thailand (25%) at the beginning of the sample period. During this period, the PRC's influence was limited, and Japan (23%) and the Republic of Korea (21%) were the two noticeable counterparts.

**Figure 4.1: Trade Linkages Among the Sample Countries Between 2001–2005**



Source: IMF Direction of Trade Statistics; Authors’ calculations. This graph is drawn by Pajek (Mrvar and Batagelj 2016). Technically, each country has 21 connecting arrows. In order to simplify the presentation, the arrows are drawn only if the trade weights are more than 20%. The country without any arrow, i.e., Singapore in this sample, is not included.

**Figure 4.2: Trade Linkages Among the Sample Countries Between 2011–2015**



Source: IMF Direction of Trade Statistics; Authors’ calculations. This graph is drawn by Pajek (Mrvar and Batagelj 2016). Technically, each country has 21 connecting arrows. In order to simplify the presentation, the arrows are drawn only if the trade weights are more than 20%. Countries without any arrows, i.e., India, Indonesia, Malaysia, the Philippines, Saudi Arabia, Singapore, and Thailand, are not included.



Trade linkages underwent drastic changes in terms of the trade weights at the end of the sample period, i.e., from 2011 to 2015. The PRC became an important hub. Currently, the PRC's share for the Republic of Korea is 31%, Japan (29%), Brazil (24%), Chile (27%), Peru (24%), and South Africa (23%). Thus, the PRC not only took over Japan's position in the Asian network, but also extended its linkages to many Latin American countries.

As we have noted above, global trade flows began to change drastically shortly after the PRC joined the WTO in December 2001. Thus, we expect that the mechanism of how the international commodity price shock propagated in the early 2000s and in recent years would be quite different. This implies that an appropriate econometric model should be able to specify (i) the dynamics of domestic macroeconomic variables and the global variables of each sample country, and (ii) the evolution of economic linkages between the sample countries.

For this purpose, we introduce the GVAR methodology in the next section.

## 4.3 The Global Vector Autoregressive Model

### 4.3.1 A Brief Literature Review of the GVAR

In order to quantify the magnitude of oil and food price shock diffusion to a nation's various inflationary indicators, we use a novel time-series technique: the GVAR model, which was introduced by Pesaran, Schuermann, and Weiner (2004); Dees, di Mauro, Pesaran, and Smith (2007); and Dees, Holly, Pesaran, and Smith (2007).

In general, the GVAR model is configured by a system of country-specific VAR models, each of which is connected through the so-called "foreign" variables in each sub-VARs. A key idea is that the "foreign" variables are defined as a deterministic function of the other country's domestic variables. At the time of estimating the parameters, the country-specific VAR models are estimated one-by-one by assuming that the "foreign" variables are indeed "exogenous." For the dynamic analysis, such as the impulse response analysis, the entire system is solved along with the identity equations that associate the "foreign" variables with the other country's "domestic" variables.

Due to its modeling flexibility, the GVAR model has been applied to various fields such as macroeconomics (Dees, di Mauro, Pesaran, and Smith 2007), industrial sectors (Hiebert and Vansteenkiste 2010), bond markets (Favero 2013), real estate markets (Vansteenkiste 2007),

fiscal imbalance on borrowing costs (Caporale and Girardi 2013), and US credit supply shocks (Eickmeier and Ng 2015). The model was also applied to examine the impact of the PRC's recent slowdown (Gauvin and Rebillard 2015; Inoue, Kaya, and Oshige 2015).

By using the GVAR methodology, Galesi and Lombardi (2009) examined short-term propagations of oil and food price shocks for a set of 33 countries for the period 1999–2007. Their data set includes the US and the UK, 12 euro area countries, 3 Baltic countries, 13 other European countries, 2 developing Asian countries, and Saudi Arabia. Thus, the focus region is mainly Europe. Although the measure of “closeness” between countries  $w_{ij}(t)$  defined by Equation (1) is genuinely time-varying, Galesi and Lombardi substituted the sample average trade flow data. Thus, the closeness matrix in their application is effectively time-invariant.

Our study is different from Galesi and Lombardi (2009) at least in four respects. First, we extend the sample period to December 2015, thus covering the post-global financial crisis turbulence period (beginning January 2001). Second, we enrich the model by considering the PRC's evolving role in integrating the Asia and Pacific region through international trade. This is done by replacing a time-constant  $w_{ij}$  with a time-varying  $w_{ij}(t)$ , calculated from a 5-year moving average of trade flows. Third, we include the producer price index, and thus examine the pass-through effects for the headline and core CPIs, as well as PPI. Last, we investigate the recent stagnation of industrial production owing to the decline in commodity prices.

### 4.3.2 The Model

The  $i$ -th country-specific (VAR with eXogenous variables) VARX\*( $p, q$ ) model (for  $i = 1, \dots, N$ ), a building-block of the GVAR model, is specified as

$$\Phi_i(L, p_i)x_{i,t} = a_{i0} + a_{i1}t + \Lambda_i(L, q_i)x_{i,t}^* + \Psi_i(L, q_i)\omega_t + \mathbf{u}_{i,t} \quad (2)$$

where  $\mathbf{x}_{i,t}$  represents the domestic variable vector of country  $i$ ;  $\mathbf{x}_{i,t}^*$  denotes the foreign variable vector;  $\omega_t$  represents a vector of global variables;  $a_{i0}$  and  $a_{i1}$  denote the coefficients of a constant and a time trend;  $p_i$  represents country  $i$ 's lag length of domestic variables;  $q_i$  represents country  $i$ 's lag length of foreign and global variables;  $L$  denotes the lag operator;  $\Phi_i(L, p_i)$ ;  $\Lambda_i(L, q_i)$ , and  $\Psi_i(L, q_i)$  represent the polynomials of coefficient matrixes with order  $p_i$ ,  $q_i$ , and  $q_i$ ; and  $\mathbf{u}_{i,t}$  represents the idiosyncratic errors. A vector of country-specific shocks,  $\mathbf{u}_{i,t}$ , is assumed to be distributed as serially uncorrelated with zero mean and a nonsingular covariance matrix,  $\mathbf{u}_{i,t} \sim i.i.d.(0, \Sigma_{i,t})$ .

The element of foreign (“star”) variable vector,  $\mathbf{x}_{it}^*$ , is constructed from the other country’s domestic variables in the following manner. For time  $t$ , let us denote the first element of country  $i$ ’s foreign variable as  $x_{it}^{*(1)}$  and the corresponding variable of country  $j$  as  $x_{jt}^{(1)}$ . They are linked by the weights,  $w_{ij}(t)$ , which represent the time-varying “closeness” between country  $i$  and country  $j$ .<sup>1</sup>

$$x_{it}^{*(1)} = \sum_{j=1}^N w_{ij}(t) x_{jt}^{(1)} \quad (3)$$

By definition,  $w_{ii}(t) = 0$ , and  $\sum_{j=1}^N w_{ij}(t) = 1$  for  $i = 1, \dots, N$ . If the variable  $x_{jt}$  is missing for country  $j$ , then  $\{w_{ij}(t)\}_{i=1}^N$  is rescaled accordingly.<sup>2</sup>

The dynamics of the global variables,  $\omega_t$ , is specified as a following VARX( $p, q$ ) model:

$$\Phi(L, p) \omega_t = \mu_0 + \Lambda(L, q) \tilde{\mathbf{x}}_{t-1} + \eta_t \quad (4)$$

where  $p$  is the lag length of global variables and  $q$  is the lag length of the feedback variables,  $\tilde{\mathbf{x}}_t$ , constructed by the country-specific domestic variables in the GVAR model. The first element of  $\tilde{\mathbf{x}}_t$  is defined as

$$\tilde{x}_t^{(1)} = \sum_{i=1}^N \tilde{w}_i x_{it}^{(1)} \quad (5)$$

where  $\tilde{w}_i$  represents a weight in order to construct these feedback variables.<sup>3</sup>

<sup>1</sup> In this study, we use  $w_{ij}(t)$  defined by Equation (1). It is also possible to construct the weight matrix by using either import or export data only, and in this way, one can clarify the direction of causality from oil and food price shock to inflation and production. We appreciate a comment from Alexei Kireyev on this issue. See Kireyev and Leonidov (2016) for identifying different network effects.

<sup>2</sup> Technically, we can use a different kind of  $w_{ij}(t)$  for constructing the different variables. One possibility is to use capital flow data to construct financial weights for financial variables. See Galesi and Sgherri (2009), Eickmeier and Ng (2015) for empirical examples, and Smith and Galesi (2014) for econometric specifications. In this study, however, we use the same weights, which are calculated from the 5-year moving averages of the annual bilateral trade flows (exports + imports) between countries  $i$  and  $j$ , obtained from the IMF’s Direction of Trade Statistics.

<sup>3</sup> Unlike the weights  $w_{ij}(t)$  in Equation (3), the weight  $\tilde{w}_i$  is not time-varying. In this study,  $\tilde{w}_i$  is calculated from the 2009–2011 average of the gross domestic product (in current international PPP) obtained from the World Development Indicators prepared by the World Bank.

When we estimate the country-specific VARX\* models and the global variable's VARX model,  $\mathbf{x}_{it}^*$ ,  $\hat{\mathbf{x}}_t^*$  and  $\tilde{\mathbf{x}}_t$  are constructed directly from the data. However, at the time of dynamic analysis, such as calculating the impulse response functions, the values of  $\mathbf{x}_{it}^*$  and  $\tilde{\mathbf{x}}_t$  are calculated internally from the forecasted values of  $\{x_{jt}\}$  for  $j=1, \dots, N$ , which are obtained by solving the system of Equations (2), (3), (4), and (5). Thus, the GVAR model can describe the interactions of variables not only within a country, but also between countries.

As we report below, the variables included in the country-specific models and the global variable model are mostly integrated of order one. This implies that, if there exist long-run equilibrium relationships among these variables, the VARX\* models have their corresponding Vector Error Correction Model with exogenous variables (VECMX\*) forms. If such long-run equilibrium relationships are detected, they are imposed at the time of simulating the GIRFs.

## 4.4 Estimation and Testing

### 4.4.1 Data and a Related Specification Issue

In this study, we estimate 22 country-specific VARX\* models and one commodity price VARX\* model, at monthly frequency.<sup>4</sup> Nine of them are Asian (the PRC, India, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, and Thailand). Data are collected from the Stat database of the Organisation for Economic Co-operation and Development (OECD), the IMF's International Financial Statistics, and CEIC Data's Global Database, which cover the periods from January 2001 to December 2015.

The vector of domestic variables,  $\mathbf{x}_{it}$ , in the country-specific VARX\* model includes at most six variables: industrial production  $y_{it}$  (mnemonic is ip); the production price index  $p_{it}^p$  (ppi); the headline consumer price index  $p_{it}^H$  (cpiH); the core consumer price index  $p_{it}^C$  (cpiC); the short-term interest rate  $r_{it}$  (r); and the nominal effective exchange rate  $e_{it}$  (neer).<sup>5</sup> Since  $p_{it}^p$ ,  $p_{it}^H$ , and  $r_{it}$  are missing for some countries, they are included when available (Table 4.2). For instance, the model of Saudi Arabia does not include all the three variables. Two more countries—

<sup>4</sup> Since one of the economies is the eurozone, which consists of seven countries—Belgium, Finland, France, Germany, Italy, Netherlands, and Spain—the total number of countries in our data set is 28.

<sup>5</sup> For  $y_{it}$ ,  $p_{it}^p$ ,  $p_{it}^H$ ,  $p_{it}^C$ , and  $e_{it}$ , we have tested if the series contains seasonal variation. After adjusting the seasonality, we have detected the outliers. See Appendix for details.

**Table 4.2: List of Domestic Variables**

	ip	ppi	cpiH	cpiC	r	neer
Brazil	○	○	○		○	○
Canada	○	○	○	○	○	○
Chile	○		○	○	○	○
PRC	○		○		○	○
Eurozone	○	○	○	○	○	○
India	○	○	○		○	○
Indonesia	○	○	○		○	○
Japan	○	○	○	○	○	○
Rep. of Korea	○	○	○	○	○	○
Malaysia	○	○	○		○	○
Mexico	○	○	○	○	○	○
Norway	○	○	○	○	○	○
Peru	○	○	○		○	○
Philippines	○	○	○		○	○
Saudi Arabia	○		○			○
Singapore	○	○	○		○	○
South Africa	○	○	○		○	○
Sweden	○	○	○	○	○	○
Thailand	○	○	○		○	○
Turkey	○	○	○	○	○	○
United Kingdom	○	○	○	○	○	○
US	○	○	○	○	○	○

PRC = People's Republic of China, US = United States.

Note: A circle indicates that the data are available. If blank, then it indicates that the corresponding variable is not available, and is thus excluded from the dataset.

Source: Authors.

Chile and the PRC—do not include  $p_{it}^P$ . For  $p_{it}^C$ , data are available only for half of the sample countries.<sup>6</sup>

The domestic variable vector (for  $i=1, \dots, N$ ) is  $\mathbf{x}_{it} = (y_{it}, p_{it}^P, p_{it}^C, p_{it}^H, r_{it}, e_{it})'$  where

<sup>6</sup> The list of countries that do not include the core CPI is as follows: Brazil, the PRC, India, Indonesia, Malaysia, Peru, the Philippines, Saudi Arabia, Singapore, South Africa, and Thailand.

$$\begin{aligned}
 y_{it} &= 100 \times \log(\text{industrial production}) \\
 p_{it}^P &= 100 \times \log(\text{PPI}) \\
 p_{it}^C &= 100 \times \log(\text{core CPI}) \\
 p_{it}^H &= 100 \times \log(\text{headline CPI}) \\
 r_{it} &= \text{short-term interest rate (\%)} \\
 e_{it} &= 100 \times \log(\text{nominal effective exchange rate})
 \end{aligned}$$

Before taking the logarithmic transformation, the industrial production, PPI, core CPI, headline CPI, and nominal effective exchange rate are all normalized so that the average value of the period January 2009 to December 2011 takes 100. For some countries, the monthly short-term interest rate data are occasionally missing. If this happens, the most recent figures are repeatedly used for extrapolation.

Since one of our research interests is to investigate the pass-through of the international commodity price shocks to domestic core inflation, we have included two CPIs in our country VAR models (Galesi and Lombardi 2009). However, it is possible that a high correlation exists between the two CPIs. Thus, we report the correlation coefficients between  $\Delta p^C$  and  $\Delta p^H$  in Table 4.3.

The country with the highest correlation is Turkey, and the coefficient is 0.912. However, for other countries, the coefficients are relatively low, and the sample average of the correlations is 0.515. Thus, we decide to include two CPIs in the model.

The set of foreign variables,  $x_{it}^*$ , is constructed as defined by Equation (3). As discussed by Pesaran, Schuermann, and Weiner (2004) and Galesi and Lombardi (2009), due to a strong correlation between domestic and

**Table 4.3: Correlation Coefficients of  $\Delta p^C$  and  $\Delta p^H$**

Belgium	0.669	Mexico	0.497
Canada	0.251	Netherlands	0.524
Chile	0.562	Norway	-0.071
Finland	0.619	Spain	0.544
France	0.563	Sweden	0.314
Germany	0.637	Turkey	0.912
Italy	0.596	United Kingdom	0.714
Japan	0.711	US	0.267
Rep. of Korea	0.443		

US = United States.

Source: Authors' calculations.

foreign-specific nominal effective exchange rates, the foreign-specific nominal effective exchange rates are excluded from the country-specific VARX\* models. Moreover, by reflecting the fact that the US is the only large open economy in the sample period, we assume that the foreign financial markets do not affect its economy. Thus,  $r_{it}^*$  is excluded from the US model. See Table 4.4 for details.

As for the global variables  $\omega_t$ , two commodity prices, log of crude oil price index  $p_t^O$ , and log of food price index  $p_t^F$ , are included in order to capture the impact of the international commodity market. In research literature, the standard GVAR models are estimated with only one global variable, i.e., the crude oil price, which represents the commodity “energy.” According to Table 4.5, which presents the World Bank Commodity Price Index weights, the share of crude oil in the energy index is 84.6%.

Besides “energy,” the World Bank publishes two more commodity indexes: “non-energy commodities” and “precious metals” (Table 4.5). Among the “non-energy commodities” group, the largest subcategory is “food,” which constitutes 40.0% of “non-energy commodities.” Since monetary authorities often pay special attention to the movement of core CPI inflation, which usually excludes energy and food products, we have included the food price index as a second variable in  $\omega_t$ .

**Table 4.4: Set of Variables Used for the GVAR Models**

	Country-Specific VARX*		Commodity VAR		
	Domestic $x_{it}$	Foreign $x_{it}^*$	Global $\omega_t$	Own $\omega_t$	Feedback $\bar{x}_t$
industrial production	$y_{it}$	$x_{it}^*$			$r$
producer price index	$p_{it}^p$	$p_{it}^{p*}$			
consumer price index (headline)	$p_{it}^H$	$p_{it}^{H*}$			
consumer price index (core)	$p_{it}^C$	$p_{it}^{C*}$			
short-term interest rate	$r_{it}$	$r_{it}^*$			
nominal effective exchange rate	$e_{it}$				
oil price			$p^C$	$p^C$	
food price			$F$		$I$

Note: The foreign-specific short-term interest rate,  $r_{it}^*$ , is excluded from the US's VARX\* model only.

Source: Authors' calculations.

**Table 4.5: World Bank Commodity Price Index Weights, in percentage**

Commodity	Share	Commodity	Share
<i>Energy Commodity</i>		<i>Non-energy Commodity</i>	
Coal	4.7	Agriculture	64.9
Crude Oil	84.6	Food	40.0
Natural Gas	10.8	Others	24.8
		Metals and Minerals	31.6
		Aluminum	8.4
<i>Precious Metals</i>		Copper	12.1
Gold	77.8	Iron Ore	6.0
Silver	18.9	Others	5.1
Platinum	3.3	Fertilizers	3.6

Source: World Bank, Development Prospects Group. Based on 2002–2004 developing countries' export values.

## 4.4.2 Testing the Unit Root

We begin by investigating the order of integration of each variable by using the weighted symmetric Dickey–Fuller tests (Park and Fuller 1995). The Akaike information criterion (AIC) is used for selecting the optimal lag length. The test results reported in Table 4.6 indicate that most of the variables in levels contain a unit root, but are stationary after a first differencing.<sup>7</sup>

## 4.4.3 Estimating the Country-Specific VARX\* Models

We estimated the country-specific VARX\* models by setting the maximum lag lengths of domestic variables,  $p$ , to three, and the maximum lag lengths of foreign and global variables,  $q$ , to one. The optimal length is determined by using the AIC, and the results are reported in Table 4.7.<sup>8</sup>

<sup>7</sup> We observe two exceptional cases for Turkey's headline CPI and core CPI. After a first differencing, the unit root test statistics are  $-1.63$  (cpiH) and  $-0.19$  (cpiC), respectively, both of which are larger than the 5% critical value,  $-2.55$ . They become stationary after differencing twice.

<sup>8</sup> For estimation and dynamic analysis, we used the Matlab program, the GVAR Toolbox 2.0, provided by Smith and Galesi (2014).



**Table 4.6: Unit Root Test Statistics for Variables**

	Brazil	Canada	Chile	PRC	Euro	India	Indonesia	Japan	Rep. of Korea	Malaysia	Mexico	Norway	Peru	Philippines	Saudi Arabia	Singapore	South Africa	Sweden	Thailand	Turkey	UK	US
Panel a) Unit Root Tests for the Domestic Variables																						
ip	-1.21	0.81	0.31	0.57	-3.32	1.59	0.88	-0.91	0.34	0.43	-0.44	-0.86	0.43	0.84	-1.63	-0.43	-1.68	-2.05	0.36	0.66	-1.76	-1.69
Dip	-8.42	-5.15	-12.88	-3.64	-4.57	-13.65	-9.62	-4.83	-9.20	-8.09	-5.31	-9.31	-8.15	-11.50	-7.21	-14.67	-11.83	-6.02	-7.03	-9.67	-8.07	-3.65
ppi	1.33	-0.20			-0.23	0.70	1.78	-2.28	-0.44	-0.03	0.98	-0.37	0.28	0.40	-1.01	-1.01	1.74	-0.26	0.25	2.91	-0.12	-0.75
Dppi	-4.75	-7.63			-5.91	-5.85	-5.39	-4.93	-5.81	-7.39	-5.41	-9.41	-5.82	-4.96	-8.07	-9.09	-8.82	-7.12	-3.33	-3.92	-3.92	-4.93
cpIH	1.68	2.10	0.95	0.26	0.87	2.30	3.18	-1.22	2.09	1.26	1.32	2.89	0.96	0.72	-0.25	0.03	0.83	0.45	0.29	1.97	1.43	1.58
DcpIH	-4.13	-8.07	-3.60	-5.39	-4.43	-8.69	-9.20	-7.99	-9.32	-4.74	-8.60	-6.81	-3.69	-4.50	-3.34	-3.55	-4.04	-3.86	-4.64	-0.90	-4.99	-8.77
cpIC	2.09	2.69			0.61			-0.37	3.19		0.83	2.37						1.05		1.90	3.12	1.65
DcpIC	-7.02	-7.49			-3.12			-7.96	-8.62		-4.03	-7.50						-9.69		0.78	-9.55	-7.68
r	-1.90	-0.93	-2.87	-2.73	-1.20	-1.67	-2.48	-2.15	-0.39	-2.96	1.42	-1.28	-2.41	1.28		-1.30	-2.26	-1.77	-2.17	3.63	-0.88	-0.73
Dr	-5.67	-5.30	-4.87	-10.15	-5.67	-11.09	-4.25	-7.13	-7.61	-5.60	-4.62	-3.53	-7.67	-4.12		-11.76	-5.17	-5.21	-5.70	-3.12	-6.85	-4.79
near	-1.60	-0.80	-2.64	-0.87	-1.56	-0.67	0.02	-2.01	-1.66	-2.22	0.11	-0.54	-0.83	-1.57	-1.19	0.34	-0.99	-2.60	-0.94	1.86	-1.44	-1.01
Dnear	-7.86	-8.48	-8.07	-5.50	-8.65	-8.96	-7.63	-7.64	-8.74	-8.79	-7.57	-7.25	-9.95	-6.97	-8.50	-5.72	-5.88	-9.09	-5.63	-4.99	-7.97	-6.17

*continued on next page*

Table 4.6 continued

	Brazil	Canada	Chile	PRC	Euro	India	Indonesia	Japan	Rep. of Korea	Malaysia	Mexico	Norway	Peru	Philippines	Saudi Arabia	Singapore	South Africa	Sweden	Thailand	Turkey	UK	US
Panel b) Unit Root Tests for the Foreign Variables																						
ip*	-0.51	-1.23	-0.23	-0.70	-0.29	-0.34	-0.06	0.34	0.06	0.10	-1.16	-2.19	-0.19	-0.21	-0.37	0.31	-0.29	-1.85	-0.14	-1.49	-1.55	0.05
Dip*	-4.05	-3.39	-4.60	-4.48	-4.48	-4.85	-5.91	-5.08	-4.61	-6.61	-3.51	-4.07	-4.61	-5.43	-4.49	-5.44	-4.64	-5.23	-4.85	-4.10	-4.06	-4.38
ppi*	-0.20	-0.67	0.17	-0.28	0.34	-0.01	-0.53	0.01	-0.07	-0.36	-0.68	-0.12	-0.27	-0.42	-0.03	0.08	-0.12	-0.01	-0.29	-0.16	-0.02	0.52
Dppi*	-4.78	-4.86	-4.52	-5.80	-6.31	-6.19	-6.34	-6.07	-5.96	-6.60	-4.84	-6.08	-4.75	-6.09	-5.91	-6.06	-5.79	-7.04	-6.05	-5.87	-6.23	-6.44
cpiH*	1.77	1.69	1.94	1.87	1.66	1.71	1.59	1.12	0.85	1.60	1.72	1.56	1.87	1.58	2.03	1.88	1.67	1.80	1.73	1.67	1.85	0.95
DcpiH*	-7.25	-8.61	-5.55	-7.80	-4.92	-5.31	-5.03	-6.34	-5.13	-6.59	-8.60	-4.84	-7.61	-6.88	-7.10	-7.19	-6.71	-5.18	-5.22	-4.54	-4.91	-5.58
cpiC*	0.85	1.49	0.92	1.33	1.33	0.92	2.26	0.83	1.54	1.89	1.49	0.99	0.86	2.09	1.26	1.19	0.89	0.92	2.40	0.55	0.80	1.11
DcpiC*	-5.47	-7.63	-5.61	-6.21	-4.02	-5.63	-7.81	-5.03	-5.58	-7.88	-5.70	-6.00	-5.06	-8.10	-4.83	-6.45	-5.49	-5.55	-7.86	-5.15	-4.55	-6.74
p*	-0.92	-0.72	-0.80	-1.27	-0.75	-1.17	-1.37	-1.04	-1.39	-1.14	-0.78	-1.28	-1.31	-1.07	-0.89	-1.60	-1.19	-1.17	-1.30	-1.27	-1.21	-0.46
Di*	-6.77	-4.75	-6.89	-5.12	-4.47	-5.84	-6.92	-7.71	-8.39	-7.22	-4.76	-4.85	-6.62	-6.98	-5.16	-6.74	-7.15	-4.87	-7.37	-6.27	-4.98	-4.62
Panel c) Unit Root Tests for the Global Variables																						
poll	-1.27																					
Dpoll	-7.28																					
pfood	-1.03																					
Dpfood	-6.74																					

SPRC = People's Republic of China, UK = United Kingdom, US = United States.

Source: Authors.

**Table 4.7: Final Specification of Country-Specific VARX (p, q) Models**

	VARX* models		Coint ranks	
	p	q	Original	Adjusted
Brazil	3	1	3	2
Canada	2	1	4	4
Chile	2	1	2	2
PRC	2	1	2	2
Euro	2	1	4	1
India	3	1	2	2
Indonesia	2	1	2	2
Japan	3	1	3	3
Rep. of Korea	2	1	4	4
Malaysia	2	1	1	1
Mexico	2	1	4	3
Norway	2	1	2	2
Peru	3	1	4	4
Philippines	2	1	2	2
Saudi Arabia	2	1	1	1
Singapore	3	1	2	2
South Africa	2	1	3	3
Sweden	3	1	2	2
Thailand	3	1	2	2
Turkey	3	1	3	3
UK	1	1	3	0
US	2	1	6	5

PRC = People's Republic of China, UK = United Kingdom, US = United States.

Source: Authors.

If there exist any co-integration relationships between  $x_{it}$ ,  $x_{it}^*$  and  $\omega_t$ , the imposition of such long-run relationships is desirable when we conduct the impulse response analysis. Thus, we estimated the co-integration rank country by country using the trace statistic. The results are shown in Table 4.7 (See the column titled “Original”). According to this test, 61 co-integrating vectors are found in total.

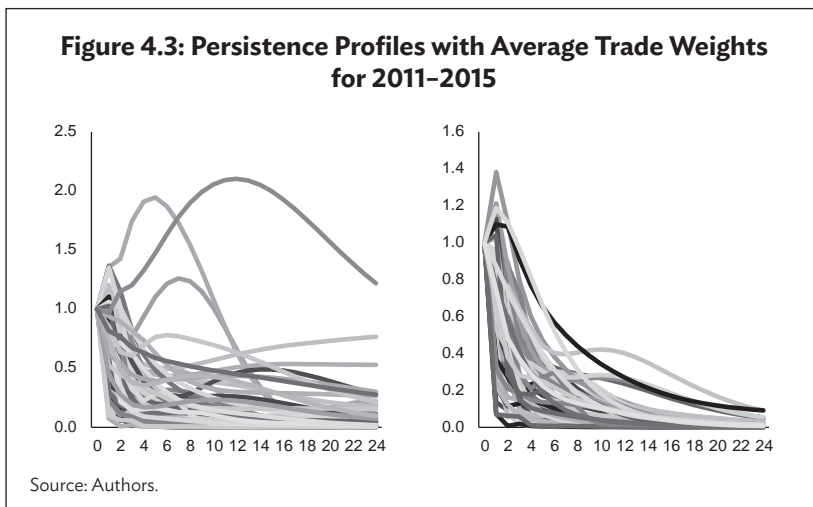
Since our treatment of the long-run relationships are atheoretical, we do not give any specific macroeconomic interpretation to the relationships we found. However, since the model includes three price indexes and one exchange rate, we postulate that one or two of

the detected co-integrating relations correspond(s) to the purchasing power parity of the exchange rate. Thus, it is worth examining if the detected long-run relationships are strong. For this purpose, we checked the shape of the persistence profiles (PPs).

If the detected vector is indeed a co-integrating vector, the value of the PPs should converge to zero, as the horizon goes to infinity after taking one at the time of impact. The left panel of Figure 4.3 shows the entire 61 PPs, some of which exhibit slow convergences with unusually large fluctuations.

We reduced the number of co-integrating vectors one-by-one, referring to the value of PPs at 24 months after the shock. Among those PPs at 24 months, we examine if they take values larger than 0.10. If we find such PP(s), then the PP with the highest value will be discarded. After this correction, the system is solved again, and a new set of PPs are calculated. This iteration continues until all the PPs at 24 months after the shock take values less than 0.10. For our sample data set, it took us nine iterations. Using this criterion, the number of the remaining co-integrating vectors is reduced to 52. The right panel of Figure 4.3 shows the PPs after this adjustment. As reported in the column titled “Adjusted” in Table 4.7, we have discarded one vector from Brazil, three from the Eurozone, one from Mexico, three from the UK, and one from the US.

Based on the “adjusted” co-integration ranks, the country-specific VARX\* models are transformed into the vector error correction form. We use these models to investigate the commodity price shocks to the sample countries.



#### 4.4.4 Diagnostic Tests

In the GVAR literature, it is a common practice that the country-specific VARX\* models, Equation (2), i.e., the equation of  $x_{it}^*$  is estimated on a country-by-country basis. On the other hand, the dynamics of  $x_{it}^*$  is not estimated, but defined by Equation (3). This enables us to reduce the number of parameters significantly and construct the world model.

There are several conditions that must be satisfied for this estimation procedure to be justified. First, the entire system must be stable. We have investigated the shape of persistence profiles, and the suspected unstable co-integration vectors are already eliminated. In addition, the stability of the system is numerically confirmed when the impulse response analysis is examined in the latter section.

Second, the weak exogeneity of  $x_{it}^*$  and  $\omega_t$  must be checked. For this purpose, we use the method developed by Dees, di Mauro, Pesaran, and Smith (2007). In this test, we examine the joint significance of the estimated error correction terms in the auxiliary equations for the country-specific foreign variables. For the lags of variables in the auxiliary equations, we assume that the lag length for the domestic variables is three, and that for the foreign variables it is four, for all the test equations. The test results are reported in Table 4.9. Out of 153 cases, the weak exogeneity assumption is rejected for five cases, which is 3.27%. Thus, we do not observe any significant violation of the weak exogeneity assumption.

Third, we investigate the parameter stability. Table 4.8 provides a series of structural break tests used in GVAR literature. Reflecting the fact that our sample includes the turbulent period of global financial crisis, the test results exhibit a slightly higher rejection frequency of stability. However, by comparing the standard versus heteroskedasticity-robust statistics, one can infer that a part of rejection comes from breaks in the error variances, not breaks in coefficients.<sup>9</sup>

Last, we examine the weak dependence of the idiosyncratic shocks (See Pesaran, Schuermann, and Weiner 2004). Table 4.10 provides the average pair-wise cross-section correlations for the levels and the first differences of  $x_{it}^*$ , as well as the associated VARX\* residuals.

In general, the average pair-wise cross-section correlations are high for the “Levels,” but they drop drastically after being differenced. The correlations further decline as their dynamics are modeled by VARX\*.

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<sup>9</sup> We appreciate a comment from Alexei Kireyev for drawing our attention to the importance of parameter stability in GVAR model. As for the possible additive outliers, they are detected and removed based on a simplified procedure of Chen and Liu (1993) prior to the estimation.

**Table 4.8: Testing for Parameter Stability**

Variables	ip	ppi	cpiH	r	neer	cpiC
PK sup	3	5	6	3	1	5
	[13.6]	[26.3]	[27.3]	[14.3]	[4.5]	[45.5]
PK msq	2	3	4	2	2	3
	[9.1]	[15.8]	[18.2]	[9.5]	[9.1]	[27.3]
Nyblom	2	3	2	7	1	3
	[9.1]	[15.8]	[9.1]	[33.3]	[4.5]	[27.3]
Robust Nyblom	2	2	2	3	1	3
	[9.1]	[10.5]	[9.1]	[14.3]	[4.5]	[27.3]
QLR	3	5	6	16	5	5
	[13.6]	[26.3]	[27.3]	[76.2]	[22.7]	[45.5]
Robust QLR	0	2	4	5	1	3
	[0.0]	[10.5]	[18.2]	[23.8]	[4.5]	[27.3]
MW	1	4	4	11	1	6
	[4.5]	[21.1]	[18.2]	[52.4]	[4.5]	[54.5]
Robust MW	1	3	4	4	1	3
	[4.5]	[15.8]	[18.2]	[19.0]	[4.5]	[27.3]
APW	3	5	6	17	5	6
	[13.6]	[26.3]	[27.3]	[81.0]	[22.7]	[54.5]
Robust APW	1	3	3	5	2	3
	[4.5]	[15.8]	[13.6]	[23.8]	[9.1]	[27.3]

Source: Authors.

**Table 4.9: F Statistics for Testing the Weak Exogeneity of the Country-Specific Foreign Variables and Global Variables**

		cv	ips	ppis	cpiHs	cpiCs	rs	poil	pfood
Brazil	F(2,129)	3.07	2.18	0.51	0.15	0.93	0.16	0.16	2.31
Canada	F(4,124)	2.44	0.47	0.56	0.48	0.17	1.31	1.59	1.26
Chile	F(2,129)	3.07	1.65	0.57	0.03	0.07	0.33	0.84	0.64
PRC	F(2,132)	3.06	0.86	2.23	1.50	0.09	0.01	2.72	1.41
Euro	F(1,127)	3.92	0.25	0.28	0.32	0.22	2.49	0.13	4.82
India	F(2,129)	3.07	1.60	0.04	0.23	0.65	1.47	0.48	0.74
Indonesia	F(2,129)	3.07	0.39	0.04	0.09	2.06	1.03	0.43	1.04
Japan	F(3,125)	2.68	1.92	1.30	0.02	1.00	1.16	3.52	1.82
Rep. of Korea	F(4,124)	2.44	0.53	1.22	0.69	0.26	0.35	1.26	1.24

continued on next page

**Table 4.9** *continued*

		cv	ips	ppis	cpiHs	cpiCs	rs	poil	pfood
Malaysia	F(1,130)	3.91	1.62	0.00	0.27	0.99	4.41	0.04	0.50
Mexico	F(3,125)	2.68	0.99	0.58	0.04	0.36	1.11	1.26	0.50
Norway	F(2,126)	3.07	0.69	0.31	1.23	0.34	0.37	0.04	0.47
Peru	F(4,127)	2.44	2.09	1.07	1.56	0.38	0.33	0.27	1.58
Philippines	F(2,129)	3.07	1.11	0.44	0.50	1.16	0.97	1.45	1.16
Saudi Arabia	F(1,136)	3.91	0.01	0.00	0.73	3.47	0.80	0.49	4.69
Singapore	F(2,129)	3.07	0.02	2.05	0.50	0.06	1.49	1.69	1.48
South Africa	F(3,128)	2.68	1.57	0.43	0.91	0.31	0.46	1.47	0.94
Sweden	F(2,126)	3.07	0.14	1.42	3.92	1.38	0.79	0.32	1.17
Thailand	F(2,129)	3.07	1.31	2.16	0.93	1.30	0.78	2.03	2.42
Turkey	F(3,125)	2.68	0.12	1.82	0.32	1.51	0.69	1.56	1.47
UK	F(0,128)								
US	F(5,127)	2.29	0.61	0.72	0.66	2.26		0.48	0.49

PRC = People's Republic of China, UK = United Kingdom, US = United States.

Source: Authors.

A closer look reveals that the VARX\* model with the contemporaneous “star” variables (Type-2) usually yields much weaker dependence of idiosyncratic shocks than that without the contemporaneous “star” variables (Type-1). This result is consistent with the idea that the contemporaneous “star” variables function as proxies for the common global factors. Thus, once country-specific models are formulated as being conditional on foreign variables, the remaining shocks across countries become weak, as expected.<sup>10</sup>

#### 4.4.5 Instantaneous Effects

Next, we examine the instantaneous effects of foreign variables on their domestic counterparts. Because the data are either log-differenced (for industrial production, three price indexes, and the nominal effective exchange rate) or differenced (for the short-term interest rate), one can interpret these estimates as impact elasticities. The estimates are shown in Table 4.11.

<sup>10</sup> Based on this observation, we use the block-diagonal specification for the error covariance matrix at the time of bootstrapping the generalized impulse response functions.

**Table 4.10: Average Pair-Wise Cross-Section Correlations of Variables Used in the GVAR Model and Associated Model's Residuals**

	industrial production, ip			producer price index, ppi			headline CPI, cpih		
	Levels	1st Diff	VECMX* Res	Levels	1st Diff	VECMX* Res	Levels	1st Diff	VECMX* Res
Brazil	0.626	0.109	Type-1 0.033	0.911	0.147	Type-1 0.069	0.930	0.036	Type-1 0.044
Canada	0.712	0.154	Type-2 0.092	0.907	0.321	Type-2 0.135	0.936	0.184	Type-2 0.102
Chile	0.690	0.032	0.006	0.008			0.940	0.209	0.112
PRC	0.685	0.050	-0.004	0.003			0.937	0.075	-0.013
Euro	0.284	0.166	0.113	0.944	0.468	0.163	0.936	0.239	0.089
India	0.680	0.080	0.050	0.006	0.296	0.086	0.933	0.007	-0.006
Indonesia	0.599	0.047	0.025	0.005	0.288	0.123	0.933	0.043	0.005
Japan	0.631	0.045	0.008	-0.027	0.369	0.087	-0.030	0.145	0.057
Rep. of Korea	0.698	0.120	0.069	0.016	0.423	0.162	0.935	0.159	0.016
Malaysia	0.706	0.107	0.085	0.014	0.386	0.119	0.934	0.049	-0.001
Mexico	0.719	0.072	0.048	0.025	0.222	0.103	0.940	0.035	-0.012
Norway	-0.686	0.032	0.031	0.013	0.328	0.094	0.937	0.028	0.010
Peru	0.689	0.074	0.033	0.027	0.266	0.072	0.940	0.113	0.036
Philippines	0.655	0.063	0.058	0.035	0.197	0.091	0.938	0.158	0.015
Saudi Arabia	0.541	0.030	0.022	0.001			0.925	0.109	0.007
Singapore	0.684	0.051	0.052	-0.034	0.391	0.151	0.921	0.145	0.055
South Africa	0.545	0.082	0.068	0.012	0.117	0.051	0.935	0.141	0.054
Sweden	0.450	0.025	0.026	-0.003	0.278	0.108	0.919	0.176	0.079
Thailand	0.670	0.052	0.040	-0.014	0.381	0.102	0.934	0.166	0.066
Turkey	0.705	0.072	0.075	0.004	0.172	0.086	0.916	0.008	0.022
UK	-0.255	0.085	0.067	0.001	0.431	0.150	0.936	0.186	0.068
US	0.695	0.114	0.051	-0.017	0.433	0.168	0.933	0.241	0.118

*continued on next page*



**Table 4.10** continued

	core CPI, cpiC			short-term interest rate, r			nominal effective exchange rate, neer		
	Levels	1st Diff	Type-1	Levels	1st Diff	Type-1	Levels	1st Diff	Type-1
Brazil	0.808	0.045	0.026	0.263	0.050	0.009	0.024	0.113	0.087
Canada	0.810	0.087	0.044	0.552	0.292	0.137	0.004	0.032	0.011
Chile	0.804	0.076	0.037	0.386	0.171	-0.025	0.052	0.093	0.075
PRC	0.804	0.076	0.037	-0.146	0.059	0.023	-0.079	-0.009	0.049
Euro	0.804	0.076	0.037	0.557	0.343	0.147	0.040	-0.195	-0.201
India				-0.291	-0.003	0.004	-0.033	0.115	0.095
Indonesia				0.320	0.040	0.026	0.002	0.066	0.059
Japan	-0.777	0.033	0.002	0.231	0.181	0.067	0.028	-0.184	-0.167
Rep. of Korea	0.806	0.070	0.023	0.554	0.286	0.096	-0.029	0.042	0.034
Malaysia				0.288	0.217	0.009	-0.001	0.114	0.111
Mexico	0.807	0.042	-0.010	0.469	0.107	0.004	-0.002	0.113	0.102
Norway	0.802	0.073	0.066	0.489	0.296	0.103	0.014	0.013	0.009
Peru				0.332	0.057	0.016	0.028	0.018	0.045
Philippines				0.443	0.094	0.017	-0.011	0.121	0.139
Saudi Arabia							-0.088	0.020	0.066
Singapore				0.387	0.036	0.047	0.015	0.033	0.021
South Africa				0.414	0.137	-0.012	-0.006	0.068	0.075
Sweden	0.778	0.074	0.045	0.538	0.232	0.047	0.011	-0.023	-0.045
Thailand				0.306	0.227	0.073	0.046	0.092	0.092
Turkey	0.787	0.060	0.005	0.364	0.099	0.041	-0.008	0.110	0.081
UK	0.798	0.027	0.054	0.517	0.276	0.175	0.001	-0.033	-0.038
US	0.809	0.042	0.028	0.484	0.244	0.157	0.047	-0.031	0.012

PRC = People's Republic of China, UK = United Kingdom, US = United States.

Source: Authors.

**Table 4.11: Instantaneous Effects of Foreign Variables on Domestic Counterparts by Countries**

	ip	ppi	cpiH	cpiC	r
Brazil	0.729 **	0.158	0.214		0.185
Canada	0.274 ***	0.308 ***	1.096 ***	0.121	0.373 ***
Chile	0.253		0.489 **	0.736 **	-0.080
PRC	0.026		0.937 ***		0.370
Euro	0.506 ***	0.346 ***	0.192 **	0.117 **	0.322 ***
India	0.554 ***	0.128	-0.105		-0.441
Indonesia	0.285	0.723 **	-0.582		0.236 **
Japan	0.050	0.119 *	0.113	0.037	0.017
Rep. of Korea	0.800 ***	0.553 ***	-0.154	0.128	0.128 **
Malaysia	0.420 ***	0.669 ***	-0.103		0.008
Mexico	0.222 *	0.104 *	-0.215	-0.014	-0.068
Norway	-0.082	0.925	0.627 **	1.474 ***	0.667 ***
Peru	0.353	0.065	0.357 *		-0.226
Philippines	-0.036	0.693 **	0.066		0.145
Saudi Arabia	-0.029		-0.174		
Singapore	1.652 ***	1.444 ***	0.740 ***		0.305
South Africa	0.672 ***	1.207	0.649 **		0.158
Sweden	0.851 ***	0.443 ***	0.758 ***	1.563 ***	0.427 **
Thailand	0.314	1.241 ***	-0.060		0.194
Turkey	1.916 ***	0.675 **	0.206	0.441	0.760
UK	0.363 ***	0.215 ***	0.318	0.430 *	1.161 ***
US	0.193 **	1.032 ***	0.700 ***	0.039	

PRC = People's Republic of China, UK = United Kingdom, US = United States.

Source: Authors.

For industrial production, the average elasticity is 0.468 and the median is 0.333. The impact elasticity of Turkey, 1.916, is the highest, followed by Singapore, whose coefficient is 1.652, both of which are significant at 1% level. Other than these two countries, the elasticities are less than one in general. Among other Asian countries, the industrial production indicators of India, the Republic of Korea, and Malaysia are sensitive to foreign industrial production. On the contrary, the coefficients of the PRC, Indonesia, Japan, the Philippines, and Thailand are statistically insignificant.

For the producer price index, significant foreign effects are observed for many Asian countries, except India. This might reflect the

value-chain relationship between these countries. Regarding headline CPI, although we observe many statistically significant coefficients, the foreign effects on domestic counterparts are less clear. In particular, for India, Indonesia, the Republic of Korea, Malaysia, and Thailand, the coefficients are negative although they are all insignificant. For the core CPI, although data availability is limited, the coefficients are insignificant for most of the countries. This might be because the fluctuation of the core CPI reflects domestic factors rather than foreign ones.

Last, the coefficients of the short-term interest rate are either positive and significant for 7 countries, as global financial integration predicts, or insignificant for 13 countries reflecting the independence of the monetary authority.

#### 4.4.6 Commodity Price VARX Model

Next, we estimated the inter-variable relationship between two commodity prices. For each equation, the optimal lag lengths are selected by the AIC. Since no co-integrating vector is detected by the trace test, we transform Equation (5) into a difference-stationary VARX form. The estimated coefficients as well as the error covariance matrix are as follows:

$$\begin{aligned}
 \begin{bmatrix} \widehat{\Delta p_t^O} \\ \widehat{\Delta p_t^F} \end{bmatrix} &= \begin{bmatrix} -0.5629 \\ -0.2934 \end{bmatrix} + \begin{bmatrix} 0.1907 & 0.3941 \\ -0.0631 & 0.4535 \end{bmatrix} \begin{bmatrix} \Delta p_{t-1}^O \\ \Delta p_{t-1}^F \end{bmatrix} \\
 &+ \begin{bmatrix} -0.0382 & 0.4371 \\ \times & \times \end{bmatrix} \begin{bmatrix} \Delta p_{t-2}^O \\ \Delta p_{t-2}^F \end{bmatrix} + \begin{bmatrix} 1.4968 \\ 0.3637 \end{bmatrix} \Delta \tilde{y}_{t-1} \\
 &+ \begin{bmatrix} \times \\ 1.1930 \end{bmatrix} \Delta \tilde{y}_{t-2} \\
 E \begin{bmatrix} \widehat{\eta}_t \widehat{\eta}_t' \end{bmatrix} &= \begin{bmatrix} 59.167 & 8.882 \\ 8.882 & 9.282 \end{bmatrix} \tag{6}
 \end{aligned}$$

Notice that, rather than adding a vector of feedback variables  $\tilde{x}_t$  to the model, we include only one feedback variable,  $\tilde{v}_t$ , which is the PPP-GDP weighted average of the industrial production indexes. We have included this variable as a proxy for global demand.

The element of coefficient matrix with “ $\times$ ” indicates that the corresponding variable is dropped by AIC. Thus, the oil price equation has two lags of own and food price (in difference), and one lag of global demand (in difference). On the other hand, the food equation has one lag of prices and two lags of global demand.

The  $F$ -statistics for the serial correlation test of residuals with three lags are 1.839 (for the oil price equation) and 0.292 (for the food price equation). Both of these statistics are much smaller than 2.657, the 5% significance level. Therefore, the dynamic properties of these prices are sufficiently modeled with the above specification.

The coefficient vector of  $\Delta \hat{v}_{t-1}$  implies that a 1% increase in global industrial production increases the subsequent period's oil price by more than 1.5%. Regarding the impact of a food price hike, its cumulative elasticity is estimated to be the same magnitude (1.5567% = 0.3637% + 1.1930%).

## 4.5 Impulse Response Analysis

In this section, we estimate the GIRFs using the estimated GVAR model. The concept of GIRFs was proposed by Koop, Pesaran, and Potter (1996) and has been applied to the VAR analysis by Pesaran and Shin (1998).

Mathematically, it is defined as:

$$GJRF(x_t; u_{it}, n) = E[x_{t+n} | u_{it} = \sqrt{\sigma_{iil}} \Omega_{t-1}] - E[x_{t-1} | \Omega_{t-1}] \quad (7)$$

where  $\sigma_{iil}$  represents the corresponding diagonal element of the residuals' variance-covariance matrix  $\Sigma_u$  and  $\Omega_{t-1}$  denotes the information set at time  $t-1$ .

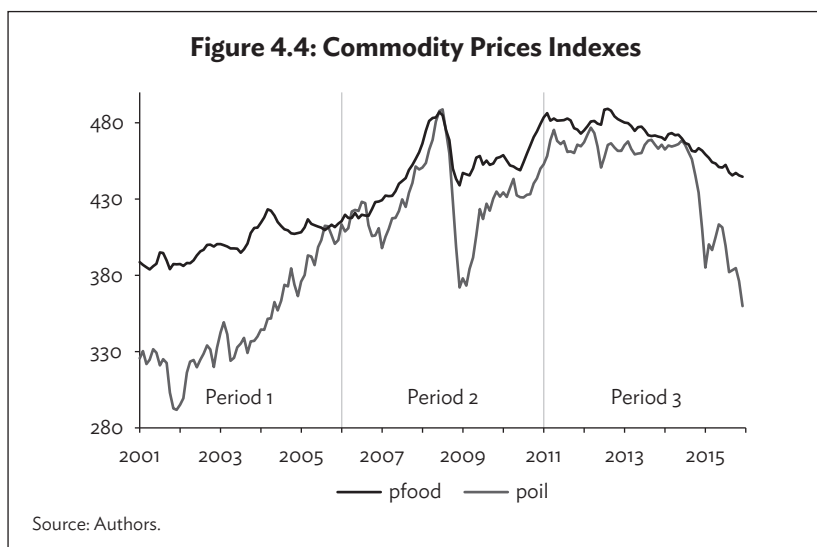
GIRFs are different from the standard IRFs proposed by Sims (1980), which assume orthogonal shocks. The standard IRFs are calculated using the Cholesky decomposition of the covariance matrix of reduced-form errors. Thus, if we calculate the IRFs using different orders of variables, the shape of the IRFs will be different. If a VAR contains two or three variables, we might be able to use the standard IRFs by assuming a relationship between the variables inferred from economic theory. However, the same approach is not useful for the GVAR model, since it contains a large number of variables. This implies that we cannot list a set of variables with a reasonable order that reflects economic theory. Therefore, rather than using the standard IRFs proposed by Sims (1980), we use the GIRFs, which produce shock response profiles that do not vary for different orders of variables.

In the next subsection, we investigate how a positive oil price shock is transmitted to Asian countries as well as to major developed economies.

As confirmed in section 4.2, the PRC's role in international trade has changed drastically since the early 2000s. In order to examine the effect of this change, we pay special attention to two subperiods:

2001–2005 (“Period 1”) and 2011–2015 (“Period 3”). Roughly speaking, the PRC was peripheral in the trade network in Period 1, and the country became a hub in Period 3. Moreover, as Figure 4.4 shows, both oil and food prices were increasing in Period 1 (pre-global financial crisis); however, they were falling in Period 3 (post-global financial crisis). (Period 2 is defined as 2006–2010.)

Our aim is to analyze how the changes in trade relations affect the propagation of commodity price shocks. Thus, the GIRFs in Period 1 are calculated based on the average trade weights for 2001–2005, and those in Period 2 and 3 are calculated using the average trade weight for 2006–2010 and 2011–2015, respectively.

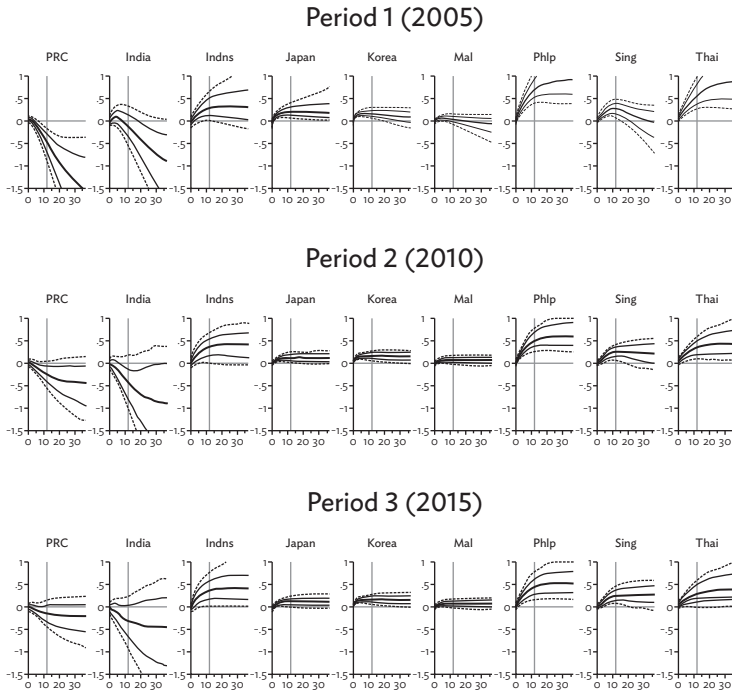


#### 4.5.1 The Oil Price Shock

Figure 4.5 shows the plot of responses of headline CPI,  $p^H$ , among Asian countries to one standard deviation (SD) increase in oil prices,  $p^O$ , in the pre-global financial crisis, global financial crisis, and post-global financial crisis period.<sup>11</sup> The median path and the 68% and 90% confidence intervals are constructed by using a bootstrapping method with 1,000 replications. A vertical black line in each graph corresponds to 12 months after the shock. For classification purposes, we use this vertical line to differentiate between the short- and long-term effects.

<sup>11</sup> A complete set of GIRFs is available upon request.

**Figure 4.5: Responses of  $p^H$  to One Standard Deviation Increase in  $p^O$**



Notes: Please refer to Table 4.1 for a glossary of acronyms. The lines correspond to the paths of median (thick line), 16th and 84th percentiles (line), and 5th and 95th percentiles (dash). The horizontal axis depicts the months after the shock and the vertical line corresponds to 12 months after the shock.

Source: Authors.

The first row of Figure 4.5 shows the responses in the pre-global financial crisis period. The magnitude of the short-term oil price shock diffusion on headline CPI, measured in the median responses, is positive for most of the countries, except the PRC and India. For instance, a one SD increase in oil prices increases headline CPI by 0.20% for Japan. For other Asian countries, the Philippines responded the most (0.70%), followed by Thailand (0.58%), Indonesia (0.29%), and Singapore (0.26%). The responses of the Republic of Korea (0.16%) and Malaysia (0.04%) are much smaller than that of Japan. For India (-0.12%) and the PRC (-0.49%), the responses are negative.

The second and the third rows of Figure 4.5 show the GIRF plots of the same headline CPI; however, they are calculated using the average

trade weights for 2005–2010, and 2011–2015, respectively. Recall that the weight  $\{w_i\}_{i=1}^N$  in the commodity price VARX model, Equation (6), is time-invariant. Thus, the standard error of the oil price equation's residual,  $7.692 = \sqrt{59.167}$ , in Figure 4.5 is the same.<sup>12</sup> This implies that the magnitudes are directly comparable.

For Indonesia, the Republic of Korea, the Philippines, and Thailand, we even observe positive and significant responses at the 90% confidence level for 3 years. However, compared with the cases in the pre-global financial period, the responses in the post-global financial phase have smaller medians in general. Thus, for Japan, Malaysia, and Singapore, the responses are only significant at the 68% confidence level. For the PRC and India, headline CPI does not respond to the oil price shock at all.

Last, we summarize the responses of core CPIs. Figure 4.6 shows the results. The data of the core CPIs,  $p^c$ , are available for a limited number of countries. In the pre-global financial period, the responses are significantly positive at the 90% level for Chile, the eurozone, Mexico, the UK, and the US. For Japan and Turkey, they are significantly positive at the 68% level only for the short term. However, the results are quite different in the post-global financial crisis period. The responses of core CPI become insignificant for most of the sample countries, except the eurozone and the UK, which exhibit a clear positive increase even at the 90% confidence level. For Japan, although the median response is slightly positive even after the 3-year period, indicating that a drop in oil prices has a slight long-run deflationary pressure, its 16th percentile crosses the zero line shortly after the shock. Thus the current decline in oil prices has a limited effect on deflation in the Japanese economy.

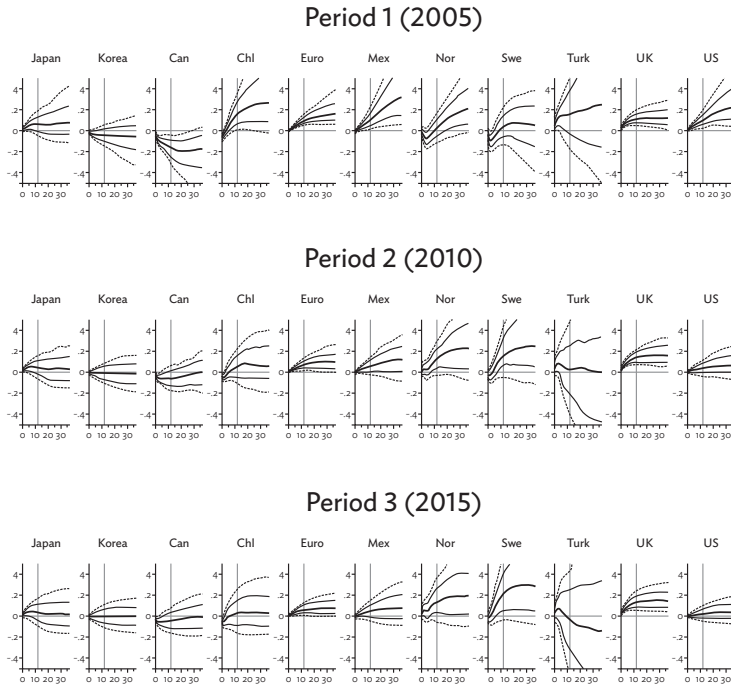
## 4.5.2 The Food Price Shock

We also examined the responses of headline CPIs to a food price shock. The size of a common shock, measured by the standard error of the food price equation's residual, is  $3.046 = \sqrt{9.282}$ . Recall that the standard error of the oil price model's innovation is 7.692. Thus the shock in the food price index is less than a half of that of the oil price index. The results are illustrated in Figure 4.7.

In the pre-global financial crisis period, the responses of headline CPIs to the food price shock in Figure 4.7 resemble those of the oil price shock in Figure 4.5, both in shape and magnitude. However, we observe

<sup>12</sup> The median value of one SD oil price shock was 7.903.

**Figure 4.6: Responses of  $p^c$  to One Standard Deviation Increase in  $p^o$**



Notes: Please refer to Table 4.1 for a glossary of acronyms. The lines correspond to the paths of median (thick line), 16th and 84th percentiles (line), and 5th and 95th percentiles (dash). The horizontal axis depicts the months after the shock and the vertical line corresponds to 12 months after the shock.

Source: Authors.

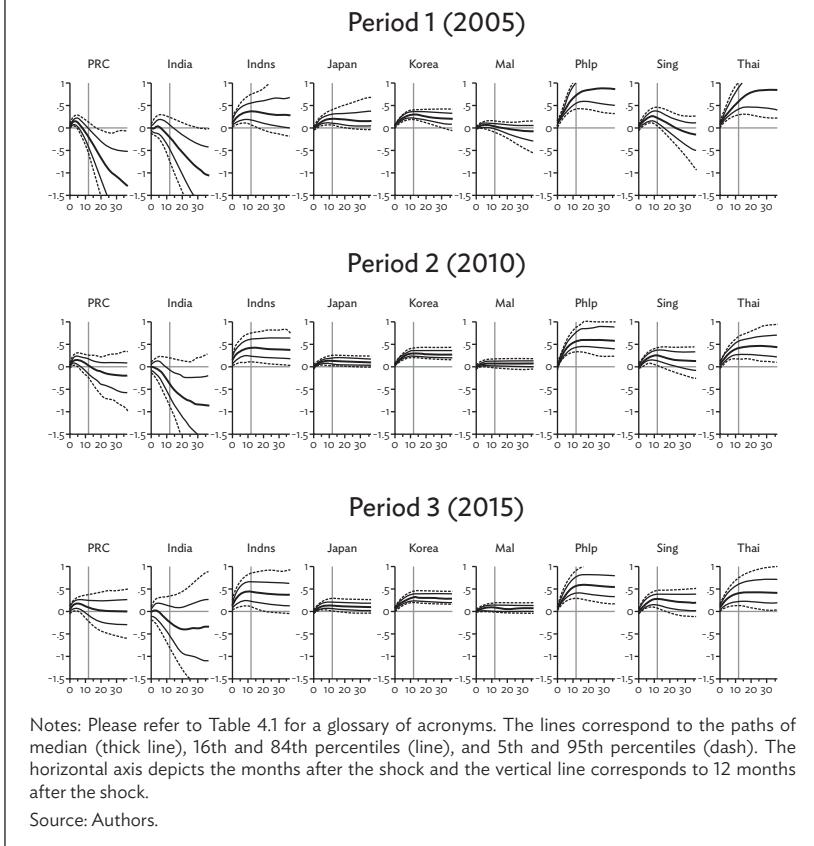
noticeable differences for the Republic of Korea, where one SD food price shock increases the long-term median inflation approximately twice compared with one SD oil price shock.

Likewise, in the post-global financial crisis period, the pattern of responses to a food price shock is very similar to the one obtained for an oil price shock. For India, the headline CPI does not respond to the food price shock at all. For the PRC, Indonesia, and Japan, however, the food price shock significantly increases inflation at the 90% level for the short term.

The pattern of the core CPI responses to the food price shock, illustrated in Figure 4.8, is almost the same as that of the responses to the oil price shock, for both trade weights. For Japan and the Republic of Korea, however, they exhibit very different results. For Japan, although



**Figure 4.7: Responses of  $p^H$  to One Standard Deviation Increase in  $p^F$**

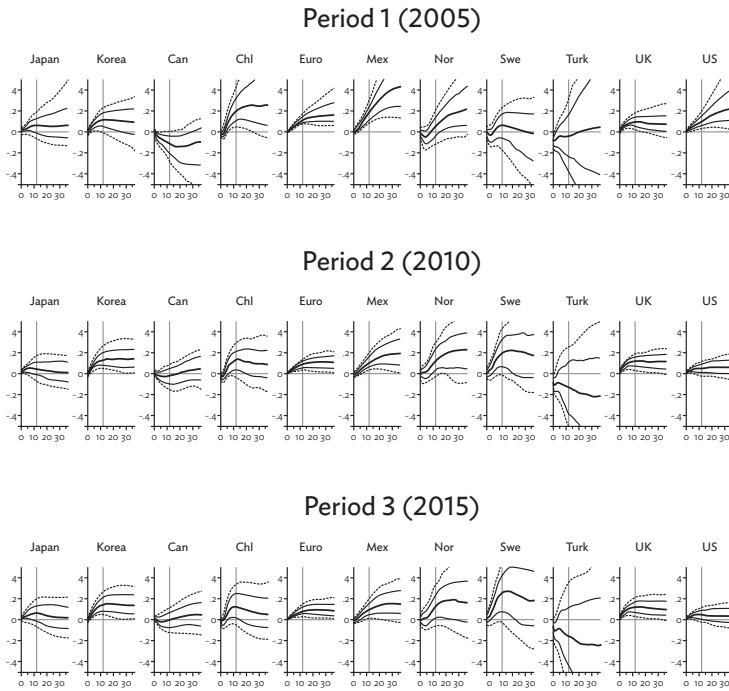


the median response paths are slightly positive in both periods, core CPI does not show any statistically significant response to the food price shock. On the other hand, for the Republic of Korea, the response is significant at the 90% level for the short term in the pre-global financial crisis period, and is even more significant for the long term in the post-global financial crisis period. This indicates that the current Republic of Korea economy is more vulnerable to a food price shock than an oil price shock.

### 4.5.3 The Responses of the Producer Price Index

Third, we investigated the responses of producer price indexes, as shown in Figure 4.9. The PPIs are not included in the model used by Galesi and

**Figure 4.8: Responses of  $p^c$  to One Standard Deviation Increase in  $p^f$**



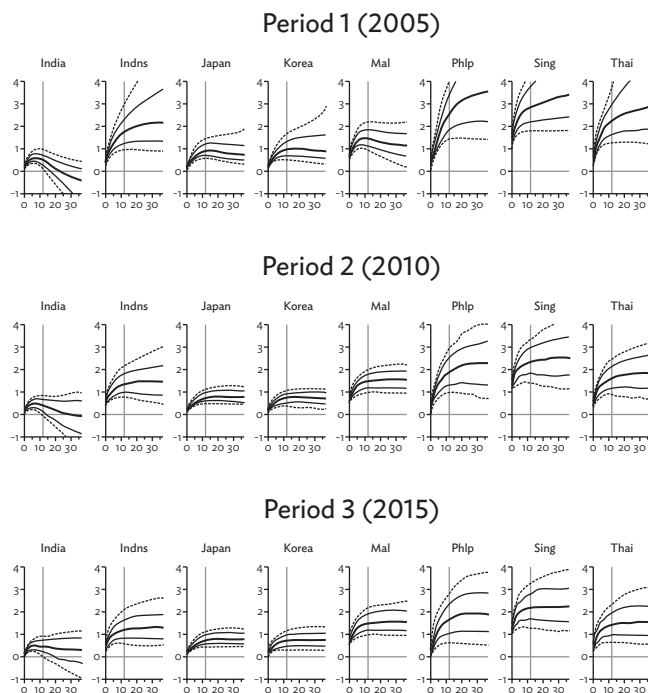
Notes: Please refer to Table 4.1 for a glossary of acronyms. The lines correspond to the paths of median (thick line), 16th and 84th percentiles (line), and 5th and 95th percentiles (dash). The horizontal axis depicts the months after the shock and the vertical line corresponds to 12 months after the shock.

Source: Authors.

Lombardi (2009), since they focused on the pass-through of a commodity price hike to the consumer price index. However, we included the PPIs in our model to analyze the recent problem of declining PPIs due to a fall in commodity prices.

Unlike the responses of CPIs, we observe positive, significant, and persistent responses at the 90% level for all the countries, except India, in the pre-global financial crisis period. Even for India, it exhibits a positive response for at least 1 year. Among the Asian countries, Singapore shows the highest short-term sensitivity. In Period 1, the PPI inflated by 2.87% in 12 months after the shock, and 3.40% in 3 years. It is followed by the Philippines (2.54% for the short term; and 3.56% for the long term), Thailand (2.27% and 2.88%), Indonesia (1.74% and 2.17%),

**Figure 4.9: Responses of  $p^P$  to One Standard Deviation Increase in  $p^O$**



Notes: Please refer to Table 4.1 for a glossary of acronyms. The lines correspond to the paths of median (thick line), 16th and 84th percentiles (line), and 5th and 95th percentiles (dash). The horizontal axis depicts the months after the shock and the vertical line corresponds to 12 months after the shock.

Source: Authors.

and Malaysia (1.47% and 1.16%). For the Republic of Korea and Japan, the responses are slightly lower than 1%.

Unlike the results for core CPIs and headline CPIs, the responses of PPIs are significantly positive for most of the sample countries in the post-global financial crisis period. Although India's responses are not significant at some horizons, its median response is still positive.

#### 4.5.4 The Responses of Industrial Production

Last, we examine the impact of the oil price hike on industrial production,  $y$ . The importance and influence of crude oil price fluctuations on the macroeconomic variables of countries such as the US, have been

analyzed by numerous researchers. Examples include Hamilton (1983, 1996, 2003), Hooker (1996), and Cunado and de Gracia (2005).

As illustrated in Figure 4.10, the oil price shock negatively impacted the industrial production for most of the sample countries in the pre-global financial crisis period. On the contrary, industrial production of the oil-producing countries, such as Brazil, Indonesia, and Saudi Arabia, have been positively impacted. These results in Figure 4.10 are consistent with the previous literature on oil price shocks.

However, the responses in the post-global financial crisis period are distinctly different from the ones in the pre-global financial crisis period. Surprisingly, for many non-oil-producing countries, the median responses are not negative but “positive,” and for some countries, they are even significant for a short term. We observe this tendency for many Asian countries, including the PRC, India, the Republic of Korea, Malaysia, the Philippines, Singapore, and Thailand.

Recall that, when we calculated the GIRFs for the three subperiods, we used the same estimated parameters of the GVAR model. Thus, the difference in the GIRFs across subperiods comes solely from the difference in trade weights, which are used for each calculation.

The results in this section indicate that the oil price hike had a negative impact on the non-oil-producing countries with the trade linkages of the pre-global financial crisis period, as theory suggests. However, this causal relationship from an oil price hike to a stagnation of industrial production has reversed, at least for a short time, for many sample countries with the trade linkages of the post-global financial crisis period.

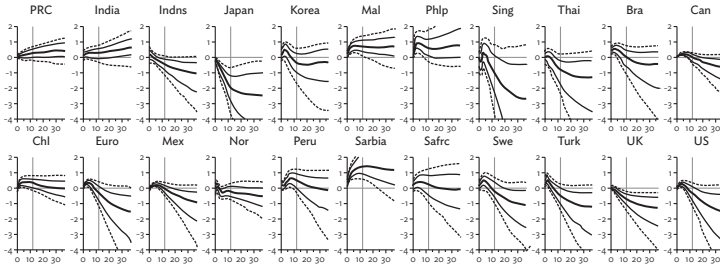
As we are currently experiencing a decline in commodity prices, this response pattern implies that the reduction in commodity prices reduces industrial production at least for a short period.

## 4.6 Conclusions

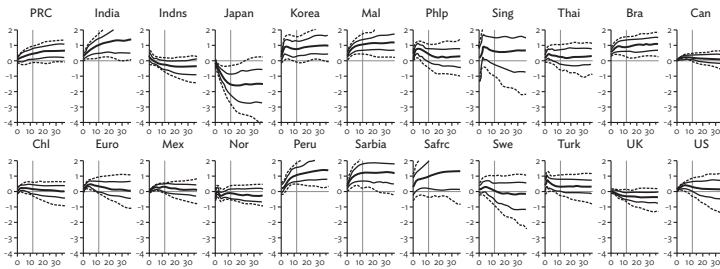
The PRC’s membership of the World Trade Organization in 2001 drastically changed the country’s role in the international trade network. The emergence of the PRC economy reformulated not only the Asian trade network, but also the trade flows with many Latin American countries. Through this transformation, the price transmission mechanism from raw materials to intermediate and final goods must have undergone a change. Based on this intuition, we investigated the impact of oil and food price shocks on CPIs, PPIs, and industrial production for 22 countries.

**Figure 4.10: Responses of  $y$  to One Standard Deviation Increase in  $p^o$**

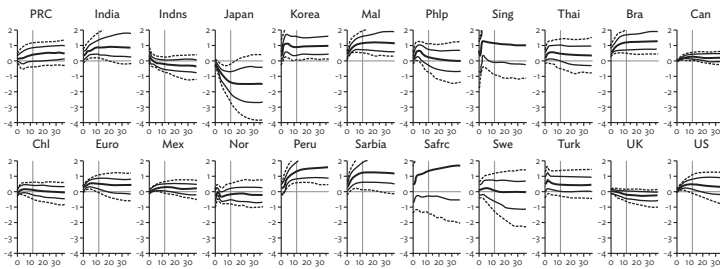
**Period 1 (2005)**



**Period 2 (2010)**



**Period 3 (2015)**



Notes: Please refer to Table 4.1 for a glossary of acronyms. The lines correspond to the paths of median (thick line), 16th and 84th percentiles (line), and 5th and 95th percentiles (dash). The horizontal axis depicts the months after the shock and the vertical line corresponds to 12 months after the shock. In alphabetical order, Asian countries are listed first followed by non-Asian countries.

Source: Authors.

The inflationary impact of commodity price shocks on headline CPI is confirmed for many sample countries. Although a direct comparison with the results obtained by Galesi and Lombardi (2009) is not possible due to a difference in sample countries and sample periods, our findings about CPIs in the pre-global financial crisis period, which overlaps the sample period of Galesi and Lombardi, are consistent with theirs in general for both oil and food price shocks.

However, when we investigated the recent price response patterns to an oil price shock in the post-global financial crisis period, the results have smaller medians in general. Among Asian countries, we observe positive, persistent, and significant responses at the 90% level for Indonesia, the Republic of Korea, the Philippines, and Thailand. However, for Japan, Malaysia, and Singapore, the responses are only significant at the 68% level. For the PRC and India, headline CPI does not respond to the oil price shock at all.

The responses of the headline CPIs to a food price hike resemble those of the oil price shock, both in shape and magnitude of the GIRFs. However, among Asian countries, the Republic of Korea seems to be an exception. The long-term median headline CPI from the food price shock is twice as big as that from the oil price shock. Also, the responses of core CPI are significant and persistent. This indicates that the economy of the Republic of Korea is more vulnerable to a food price shock as compared with that of oil prices.

Since the difference in the GIRFs for the three subperiods comes solely from the difference in trade weights used for each calculation, the results indicate that trade linkages play a significant role in the propagation of commodity price shocks.

Regarding PPIs, we have just reported the case of an oil price hike. Unlike the case of CPIs, the responses are positive and significant for many countries across the subperiods. This implies that the surge in oil prices has generated an inflationary pressure on a nation's PPI in the pre-global financial crisis period, while the recent decline in commodity prices has a deflationary impact on the PPIs in the post-global financial crisis period.

Last, we investigated the impact of an oil price hike on industrial production, and observed a clear negative impact in the pre-global financial crisis period, as theory predicts. However in the post-global financial crisis period, we observed many positive median responses, and some of them were even significant for a short term. Thus, the impact of an oil price hike has drastically changed, and this suggests that a change in trade linkages is a possible cause of the recent downward comovement between commodity prices and industrial production.

In the future, it would be worth examining the impact of financialization of commodity prices. As Tang and Xiong (2012) have shown, commodity prices had little co-movement with stocks prior to the early 2000s. However, through the financialization of commodities, their correlations have increased. This implies that the causal relationship between oil prices and industrial production might have also undergone a change. This suggests a possibility of extending the GVAR model with time-varying parameters.

## Appendix about Data Construction

We constructed the country data that cover the period between January 2000 and December 2015 by compiling the Organisation for Economic Co-operation and Development statistics data, the International Monetary Fund e-library data, the Bank for International Settlement's website (effective exchange rate), and CEIC Data's Global Database. Where the recent figures are missing in these databases, we obtained data from the government or central bank websites.

As for the PRC's industrial production series, the non-seasonally adjusted level data (from CEIC) were available only for the period from January 2011 to December 2015. For the period from January 2000 to December 2010, the series was extrapolated using the "Percent Change over Previous Year" series obtained from IFS (Code: 92466..XZF...; IFS CD-ROM, June 2015 version). The extrapolated data exhibit a strong and unique seasonal fluctuation. This is due to the phenomenon called "moving-holidays" of the Chinese New Year, stemming from the difference between the Lunar and the Gregorian calendars. We have used a simple correction method described in Roberts and White (2015).

For series  $y_{it}$ ,  $p_{it}^P$ ,  $p_{it}^H$ ,  $p_{it}^C$ , and  $e_{it}$ , seasonal fluctuations are detected and adjusted by the method explained in Appendix B of Smith and Galesi (2014). For the first difference of series,  $y_{it}$ ,  $p_{it}^P$ ,  $p_{it}^H$ ,  $p_{it}^C$ , and  $e_{it}$ , the additive outliers are detected and corrected prior to the estimation. See Chen and Liu (1993) for details. We use three standard deviations as a threshold. Two commodity prices are obtained from the World Bank's commodity price data downloaded from the website: <http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTDECPROSPECTS/0,,contentMDK:21574907 menuPK:7859231 pagePK:64165401 piPK:64165026 theSitePK:476883,00.html>

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# 5

## Global Shocks and Risk to Financial Stability in Asia

*Hans Genberg*

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### 5.1 Introduction

Twenty years ago, much of Asia was engulfed in a severe financial crisis that is still present in the memory of those who experienced it firsthand. The Asian financial crisis of 1997–1998 was a painful reminder of the harm that currency and banking crises can inflict on the real economy. Asian policy makers took notice and introduced policy reforms to strengthen their financial markets and render policy frameworks more resilient. Important components of these reforms were to allow greater exchange rates flexibility, strengthen regulatory and monetary policy institutions, and pursue liberalization of financial markets cautiously, among other things, by making use of what now is being referred to as macroprudential and capital account management policies.

These reforms have been credited with protecting Asian financial markets from the direct effects of the near-collapse of the financial systems in the United States (US) and the eurozone during the global financial crisis of 2007–2008. To be sure, some economies in the region, notably the Republic of Korea, did experience financial turmoil during the global financial crisis, but the region as a whole was remarkably resilient to the financial troubles in the US and the eurozone. The loss of employment and the slowdown of real economic growth in Asia were principally due to the decline in export demand associated with the crisis.

But nearly 20 years of relative financial stability should not be a reason for complacency. Reforms of regulatory systems must continue and monetary policy frameworks must adapt to new challenges. With respect to regulation and supervision Zamorski and Lee (2015) enumerate as many as nine areas that need to be watched carefully.

Several of these deal with aspects of compliance, with evolving international standards and cross-border supervisory challenges.<sup>1</sup> Reflecting on financial crises with a broader perspective, Zeti (2016) emphasizes the importance of putting in place appropriate governance arrangements to manage not only the aftermath of a crisis, but also to monitor and anticipate developments in financial markets that may signal stress. Such governance arrangements include international cooperation between central banks and regulatory authorities, and also cooperation within each jurisdiction between the different agencies that may be called upon to deal with a crisis.

While important lessons can be learned from periods of financial instability in the past, changes in the international financial landscape bring new challenges that need to be analyzed and incorporated in policy strategies. These challenges are principally the result of increased integration and globalization of financial markets, which enhances the potential for policy spillovers and transmission of shocks that may pose threats to financial stability. Among current developments that merit close observation are economic policies in developed economies and their consequences for international trade and capital flows, exchange rates, and asset prices; banking sector fragilities in the eurozone and the People's Republic of China (PRC); persistently sluggish growth in developed as well as emerging economies; and commodity price developments.

Focusing principally on monetary policy developments, this chapter reviews the sources of potential threats, discusses how they impact emerging market economies, and what policy makers in the affected economies might do to mitigate the fallouts of the threats should they materialize.

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<sup>1</sup> The following four recommendations (slightly adapted from the original) are particularly noteworthy in this regard: (i) ensure that bank regulators adopt the international standards promulgated by the Basel Committee and other international standards-setters, and conduct self-assessments of compliance with these standards using outside experts as assessors if necessary; (ii) ensure that the country's legal and regulatory frameworks support domestic and cross-border supervisory cooperation and information exchange, including the sharing of confidential supervisory information, between supervisors and other relevant authorities, such as deposit insurers; (iii) ensure that the organization's supervisory culture and training approach develops examiners' ability to understand bank strategy and risk-taking rather than simply assess compliance; and (iv) ensure that well-defined crisis management and resolution plans, including cross-border resolution plans, are in place so that nonviable banks can be resolved in an orderly manner. Domestic and foreign authorities should be clear on their roles and decision-making authority.

## 5.2 Potential Threats to Financial Stability in Emerging Economies

### 5.2.1 Monetary Policies in Developed Economies

#### Low and Negative Interest Rates Post the Global Financial Crisis

The immediate response of central banks in developed economies to the global financial crisis was to cut policy interest rates drastically and, in the case of the US Federal Reserve, to inject liquidity into the economy by means of asset purchases. No doubt, these measures prevented a complete collapse of financial markets not only in the US but also in Europe, whose banks were heavily exposed to toxic US mortgage-related securities. As such, aggressive policy easing also reduced the severity of the economic downturn caused by the financial turmoil, and thereby helped to dampen the decline in demand for emerging market economies' exports.

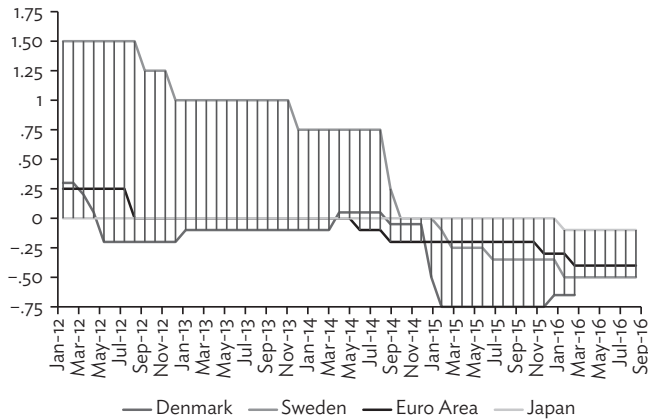
As the recession persisted and spread beyond the economies most affected initially, policy accommodation became widespread. By 2009, the Fed Funds rate in the US had declined to the so-called zero lower bound, which prompted the authorities to engage in what was termed unconventional monetary policy consisting of a quantitative easing program that expanded the balance sheet of the Federal Reserve from \$1,000 billion before the crisis to \$2,000 billion in 2009, \$3,000 billion in mid-2011, and finally to \$4,500 billion in 2014, a level at which it has remained since. The expansion of the balance sheet had the effect of easing monetary conditions further, according to some estimates by the equivalent of a four-percentage-point decline in the Fed Funds rate (Figure 5.1, lower panel). Other central banks followed suit, reducing policy rates to zero and even beyond (Figure 5.1, upper panel).<sup>2</sup>

The decline in policy rates has a counterpart in terms of declining longer-term interest rates. This is illustrated in Figure 5.2 by the decline in the US 10-year Treasury bill rate from close to 5% before the crisis to a trough of less than 1.5% in mid-2016. In Europe, corresponding rates have declined even further, so much so that as much as 40% of the value of outstanding European government bonds trade at negative yields.

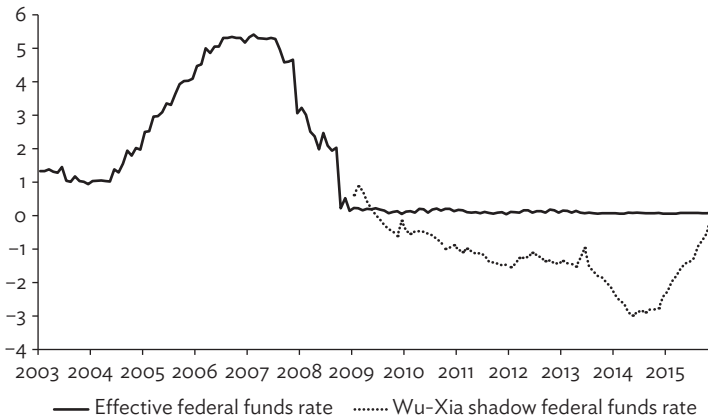
The impact of the expansionary monetary policies in developed economies on emerging market economies is felt both through a repricing of assets and through capital flows. There is ample evidence

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<sup>2</sup> The Bank of Japan had of course maintained zero policy rates for some time already. It also brought its rate into negative territory in 2016.

**Figure 5.1: Negative Policy Interest Rates**

Source: Author's calculations based on national sources.



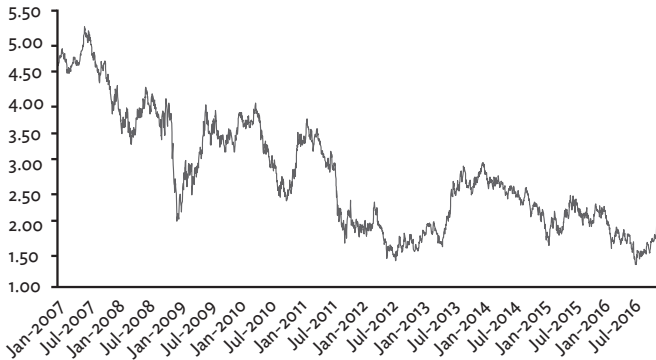
US = United States.

Source: Author's calculations based on data from the Federal Reserve Bank of Atlanta's website.

that declining interest rates in developed economies tend to increase asset prices in emerging market economies. As international financial markets have become more and more integrated, pricing of local assets is increasingly dependent on global factors. Expected cash flows from an asset depend on underlying business conditions, which are influenced by developments in global markets. Assessing the present value of the

**Figure 5.2: Long-term Interest Rates**

10-Year Treasury Constant Maturity Rate



Source: Author's calculations based on Federal Reserve Bank of St. Louis data.

cash flows, and hence their price, is being carried out by international investors who base their decisions on international financial conditions and risk preferences. As long as an economy is strongly integrated with the international goods and asset markets, asset prices will follow global real and financial cycles to a significant extent. Rey (2013), for example, argues that expansionary policy of the Federal Reserve reduces global risk aversion, which in turn increases equity prices in emerging markets. Likewise, Chen et al. (2014) report evidence that quantitative easing policies in developed economies lower government and corporate bond yields, compress credit default swap spreads, in addition to boosting equity valuations.

Expansionary monetary policy in developed economies also encourages capital flows to emerging markets. The effect of interest rate differentials as a push factor for capital flows into emerging markets is a long-standing empirical finding. Recently, the term “search for yield” has been used to describe this phenomenon. As interest rates on low-risk assets in developed economies decline, investors seek out higher-yielding securities in emerging markets. In addition to being the consequence of the normal substitution effect when yields change, two other mechanisms may be at work. Institutional investors that have obligations promising a certain return feel the pressure to switch to higher-risk, higher-return investments. Likewise, managers of hedge

funds and similar institutions, who face demands for redemptions as returns decline, will also seek to invest in higher-yielding instruments, among them from the emerging markets.

Capital inflows pose a dilemma for policy makers as they put appreciation pressures on the domestic currency, threatening to erode the competitiveness of local firms. As discussed in more detail in section 5.3, intervening in the foreign exchange market to moderate appreciation trends may lead to increased growth in domestic credit and threaten financial stability.

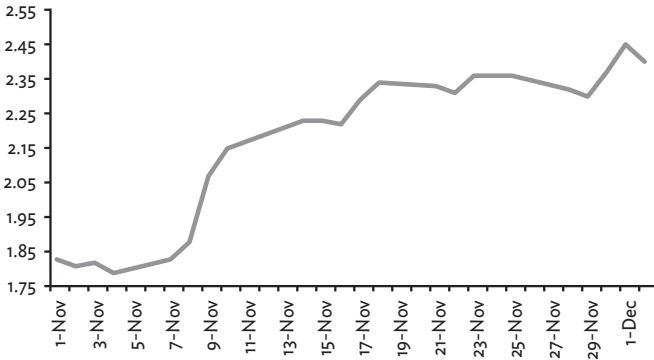
## Rising Interest Rates in the United States

As the US economy has begun to recover, emerging market policy makers have switched from being concerned about the consequences of capital inflows to preparing for the possibility of abrupt capital outflows. The “taper tantrum” episode in May 2013 serves as a reminder of the disruptions that can come from actions of central banks that are unanticipated or misunderstood by financial markets. In a testimony before the US Congress on 1 May 2013, Chairman Bernanke signaled that the Federal Reserve would likely slow the rate at which it purchased assets from the banking system later in the year. In other words, he signaled that US monetary policy would become slightly less expansionary. The announcement led to a sell-off of emerging market sovereign bonds, leading to a sharp rise in yields and a substantial decline in values of the corresponding currencies. Volatility of the yields also increased significantly.

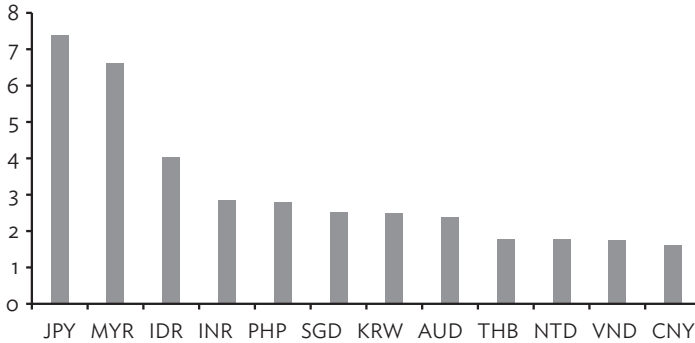
While there is now a better understanding of the Fed’s policy strategy and hence a reduced likelihood of surprises from its policy moves, a new source of significant uncertainty has emerged with the victory of Donald Trump in the US presidential election. While the full details of his economic policy priorities are yet to be revealed, it is generally believed that they involve some combination of government expenditure increases and tax cuts, thus leading to substantially higher interest rates in the US and renewed pressures on emerging market bond yields and currencies. Figure 5.3 shows the evolution of the 10-year US Treasury yield, which recorded an increase in the order of 50 basis points during the month of November 2016 (upper panel), most of which occurred after the voting in the US on 8 November 2016. The lower panel in the figure shows the widespread depreciation of Asian currencies during the same time period, ranging from around 1¾% in the case of the yuan, the dong, the NT dollar, and the baht to almost 7½% and 6¾%, respectively, for the yen and the ringgit.

**Figure 5.3: Market Reaction to the Outcome of the US Presidential Election**

10-Year Treasury Constant Maturity Rate



Source: Author's calculations based on Federal Reserve Bank of St. Louis data.



AUD = Australian dollar; CNY = People's Republic of China yuan; IDR = Indian rupee; INR = Indonesian rupiah; JPY = Japanese yen; KRW = Korean won; MYR = Malaysian ringgit; NTD = Taipei,China dollar; PHP = Philippine peso; SGD = Singapore dollar; THB = Thai baht; VND = Vietnamese dong.

Source: Author's calculations based on data from the website of Bank Negara Malaysia.

### Divergent Monetary Policies between the United States and Europe/Japan

Even if “normalization” of US monetary policy goes smoothly and without surprises, the divergence between monetary policies in the US



on the one hand and Europe/Japan on the other will persist for some time. This has the potential for creating divergent paths in exchange rates of the US dollar against the euro and Japanese yen, which in turn has consequences for Asian currencies. As already noted, during the month of November 2016, the yen depreciated by close to 7½% and the euro lost slightly over 3% relative to the US dollar. On a trade-weighted basis the Asian corporations will be cushioned by the divergent paths of the dollar, the yen, and the euro. Overall changes in trade competitiveness will hence be muted. However, exporters that are concentrated in only one of the markets will feel the full effect of the bilateral currency movements.

External asset and liability positions are likely to be affected by divergent exchange rate movements depending on their currency denomination. As discussed below, some Asian economies have incurred substantial debts denominated in US dollars and will see the domestic currency value of these debts increase as the dollar strengthens. External assets denominated in euro or yen will experience corresponding reduction in value.

Finally, divergent monetary policies in developed economies may also bring about greater volatility in exchange rate markets, which could give rise to financial stability concerns depending on external asset and liability positions of local Asian financial institutions and corporations.

## 5.2.2 De-Globalization and Protectionism

Globalization has contributed to improved living standards for millions of citizens of emerging market economies, as they have integrated into the world economy. Manufacturing facilities and service providers have been established, generating numerous employment opportunities in emerging economies, while at the same time reducing the prices of imported goods and services in developed economies, hence improving living standards there as well. But globalization has also contributed to rendering some economic activities in developed economies uncompetitive, leading to extended job losses for those sector-specific skills that are no longer in demand. While it has been shown that technological change is a far more important reason than international trade for the loss of low-skilled jobs, there has still been a backlash against globalization, which has been blamed not only for the decline in employment in developed countries, but also for the increase in income inequality. Nowhere has this backlash had consequences as significant as in the US where President Trump has abandoned the Trans-Pacific Partnership on trade and called in question the benefit of the North American Free Trade Agreement. Mr. Trump has also hinted

that he might introduce tariffs on imports from the PRC. While these statements are so far just pronouncements and not actual policies, there is a risk that the policy of the US administration will be less supportive of international trade, and that it could, in an extreme scenario, trigger retaliatory actions and a significant reduction in global trade.

Should protectionist policies prevail, economic growth would likely suffer, particularly for export-oriented economies. Financial stability would be indirectly affected through the impact of slower economic growth on the debt service capacity of corporate borrowers and hence on the size of nonperforming loans on the balance sheets of financial institutions and on the value of outstanding corporate bonds. Equity prices could also suffer, leading to a wealth-induced reduction in aggregate demand and further slowdown in economic growth.

## 5.3 Impact and Vulnerabilities

### 5.3.1 Capital Inflows, Currency Appreciation, and Asset Price Inflation

Capital flows from developed economies seeking high returns in emerging markets create pressure on the host country's exchange rate, and without official intervention the currency will appreciate. Such an appreciation reinforces the gains from the carry trade based on the interest differential, and may induce further self-reinforcing inflows, potentially leading to significant currency misalignment. The consequence may be a prolonged period of weakened profitability in the export-oriented segments of the economy.

This well-known narrative is the reason why authorities in many emerging markets intervene in the foreign exchange market to limit “volatility” in the foreign exchange market, where “volatility” in this context refers to some notion of deviations from the equilibrium and not to the typical measure used in financial literature that is intended to capture very high frequency (e.g., day-to-day) swings in the exchange rate.

Interventions in the foreign exchange market, the purchase of foreign exchange in exchange for bank reserves denominated in domestic currency, leads to an expansion of domestic-currency liquidity in the economy, thereby easing monetary conditions. This can be a cause for concern because the increased liquidity may cause unsustainable asset price increases and general overheating in the economy. For this

reason interventions are typically “sterilized” by a corresponding sale of a domestic short-term asset—a treasury bill or a central bank bill—to “mop up” the bank reserves that have been created. This policy creates its own potential problems, however. The first is that the effectiveness of the intervention on the exchange rate may be limited. A sterilized intervention in the foreign exchange market is effectively an exchange of foreign assets coming into the economy for domestic assets. If the two types of assets are close substitutes, the intervention will have limited effect on the value of the currency. Instead, as the domestic interest rate remains relatively high due to the sale of domestic assets, further capital inflows may be induced.

The second problem associated with sterilized foreign exchange market intervention is that the interest rate the central bank has to pay on the domestic asset it has sold is almost always higher than the interest rate it earns on the foreign asset it has purchased. This carry cost, often referred to as a “quasi-fiscal cost,” can be substantial.<sup>3</sup>

Central bank interventions to smooth exchange rate movements can be thought of as providing insurance to the private sector against the risk of losses due to large exchange rate movements. As with any insurance this could give rise to a moral hazard problem whereby the private sector takes on more foreign exchange risk than it otherwise would. An alternative to providing such insurance therefore would be to put the burden on private agents themselves to hedge their foreign exchange exposures. This, however, requires that the necessary hedging instruments are available at a reasonable cost, which in turn requires that the foreign exchange market is well developed. But this entails a catch-22 problem—the private sector will not engage in significant foreign currency hedging until a deep and efficient foreign exchange market exists to provide the necessary instruments, and the foreign exchange market will not develop as long as the central bank provides the implicit insurance. There is no simple solution to this dilemma, as it will require some period of time during which exchange rate fluctuations are allowed to be larger than what might be thought of as “comfortable” to allow for the development and use of market-based hedging.

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<sup>3</sup> Calculated on the total stock of foreign exchange reserves the quasi-fiscal cost is frequently cited as a major reason why self-insurance against the risk of a balance of payments crisis can be expensive. For example, if reserves constitute 25% of gross domestic product (GDP) and the interest differential is 4%, the annual cost will be 1% of GDP.

### 5.3.2 External Borrowing

The image of push factors leading to capital flows from developed to emerging markets obscures an important source of capital flows, namely external borrowing by domestic financial and nonfinancial corporations. Low interest rates in global financial markets create an incentive for domestic institutions to finance their operations by borrowing in international markets. For institutions in emerging markets, such borrowing is predominantly denominated in foreign currency, typically the US dollar. While banks and other financial institutions have traditionally been the principal intermediaries in this process, recently nonfinancial corporates have become involved on a nontrivial scale. The way many of them have carried out this borrowing has only recently been highlighted in available statistics. Traditional balance of payments statistics are compiled on a residence basis, and external borrowing of nonfinancial corporates has been captured in these data. However, if a corporate in an emerging market economy borrows through a subsidiary located in a developed economy the transaction will not be recorded in balance of payments statistics. Researchers at the Bank for International Settlements (BIS) have compiled data on these statistics and highlighted the differences between these data based on the nationality of the corporate and the balance of payments data that are based on the residence.<sup>4</sup> Figure 5.4 illustrates the difference between the two measures for a set of Asian economies, which in some cases is substantial.<sup>5</sup>

Data for the PRC illustrate the most remarkable difference. While on a residence basis there appears to be relatively little external borrowing by PRC nonfinancial corporates, the nationality-based measure shows a very rapid growth of external borrowing especially during the period of exceptionally low global interest rates in the aftermath of the North Atlantic financial crisis. A similar, albeit less spectacular, pattern can also be seen in the other economies depicted in the figure, with the exception of Indonesia where the increase in external borrowing has been carried out principally by resident corporates.

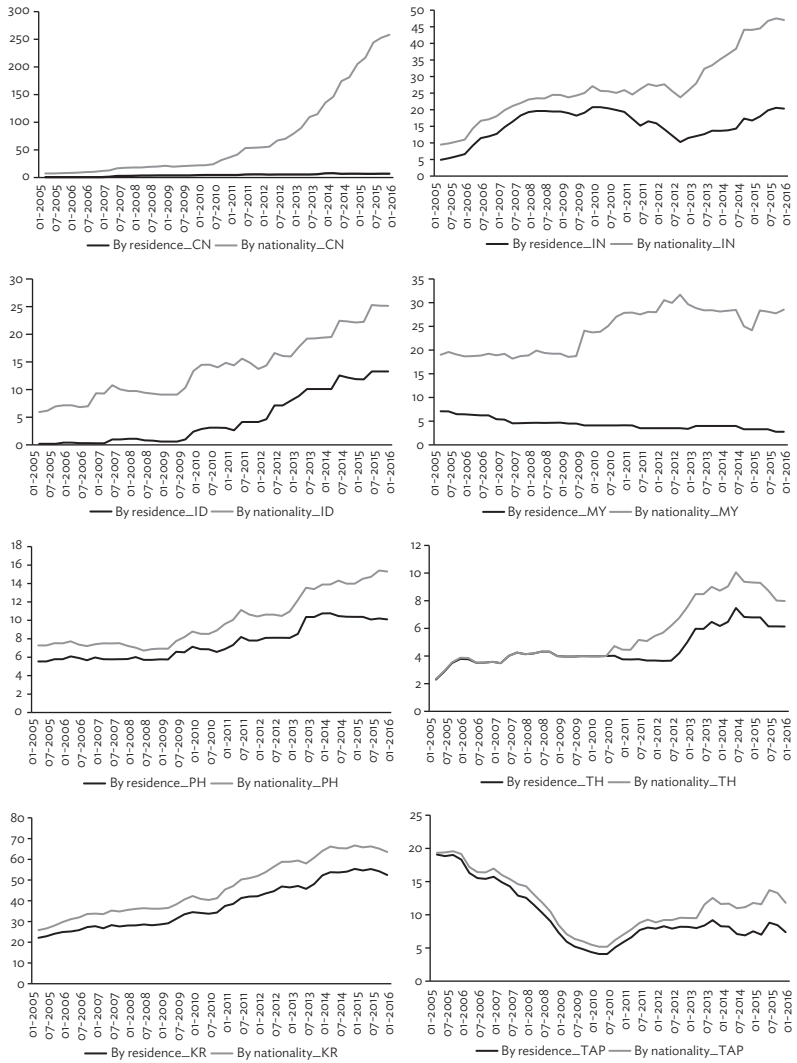
What are the consequences for financial stability of the external borrowing by nonfinancial corporates? First, as I discuss at some length below, the external debt is likely to imply a certain amount of currency risk for the corporate, which may materialize when there are substantial movements in the exchange rate as compared with the

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<sup>4</sup> See, for example, Chui, Kuruc, and Turner (2016).

<sup>5</sup> I am grateful to Michael Chui of the BIS for providing the underlying data.

**Figure 5.4: External Borrowing by Nonfinancial Corporates**  
(\$ million)



PRC = People's Republic of China; INO = Indonesia; IND = India; KOR = Republic of Korea; MAL = Malaysia; PHI = Philippines; TAP = Taipei,China; THA = Thailand; USA = United States.

Source: Author's calculations based on data provided by M. Chui and used in Chui, Kuruc, and Turner (2016).

currency in which the debt is denominated. In addition, the corporate can effectively become an intermediary of external funds to the economy, fueling domestic credit creation and possible overheating asset and goods markets. This can occur in several ways. For example, if the parent company has foreign currency commitments it can discharge these obligations by borrowing through its subsidiary located in the foreign economy, rather than using its domestic funds, converting them to foreign exchange and transferring them abroad. The domestic funds can be placed in the domestic banking system sustaining elevated credit creation in the domestic market.

### 5.3.3 “Sudden Stops,” Rising Funding Costs, Increased Value of External Debt

A contributing factor to the Asian financial crisis was foreign currency denominated borrowing by entities that did not have corresponding foreign currency denominated sources of revenue to service the debt. As currencies depreciated, the domestic currency equivalent of both the debt servicing costs and the principal increased sharply, leading to widespread insolvencies. Loans could not be rolled over as capital inflows ceased. Is there a corresponding risk that the corporate borrowing discussed in the previous section will lead to similar problems? The answer hinges on the degree of currency mismatches on the balance sheet and income statement of the borrower. A currency mismatch arises when a significant portion of the liabilities of an entity is denominated in a different currency from the assets, or when a significant portion of expenditures is denominated in a different currency from revenues. In the case of a corporate that has debts denominated in dollars and assets denominated in pesos, a fall in the value of the peso will increase liabilities relative to assets. Interest expenditures will also increase relative to revenues in so far as the latter are principally in pesos, making debt service payments more onerous. An exporter that has export revenues denominated in dollars, on the other hand, is naturally hedged as far as the income statement is concerned, but will still face the problem associated with an increased peso value of the principal.

Corporates that do not have natural hedges in the form of foreign currency assets with similar maturity structures as the foreign currency debts and foreign currency receipts matching foreign currency commitments can of course hedge the currency mismatch by engaging in the appropriate forward, futures, or options contracts. But this merely transfers the currency mismatch risk to the counterparty. If that counterparty is a domestic financial institution, the risk to the financial stability of the economy as a whole may not be diminished,

unless the entity selling the insurance is naturally hedged against currency fluctuations.

Officials in jurisdictions where corporates have engaged in significant external borrowing either on their own account or through subsidiaries abroad have expressed confidence that the associated financial stability risks are contained because of requirements that such borrowing be done on a hedged basis. Data on the extent to which this is actually the case are not publicly available, however, and cannot be independently verified. Furthermore, as noted in the previous paragraph, if the counterparty selling the currency risk insurance is also a domestic entity, the risk to the economy as a whole may not be reduced.

### **5.3.4 Expansionary Fiscal Policy, Tight Monetary Policy, and Protectionism: A Toxic Mix for Emerging Markets**

The policy agenda that emerged from the electoral campaign of Mr. Trump amounts to a toxic mix for emerging markets. It hints at expansionary fiscal policy focusing on infrastructure investment and tax reductions, as well as on trade policy measures that could lead to a significant reduction in international trade. Furthermore, the implication of the fiscal policy agenda is an increase in the federal budget deficit, increased borrowing requirement, and therefore higher interest rates.<sup>6</sup> If the Federal Reserve continues to raise its policy interest rate as expected, the upward pressure in market rates will be strengthened.

If enacted, the consequences of this policy mix are likely to be problematic for the emerging markets. Higher interest rates are likely to be transmitted through the integrated global financial system, and will have contractionary real effects on emerging market economies. Some of the challenging effects of capital flows and exchange rate changes have already been discussed above. Will the depreciation of emerging market currencies relative to the US dollar provide a counterbalance through increased competitiveness and growth of exports? If the protectionist measures in the Trump agenda are implemented, the answer is no, since the growth of global trade is likely to decline and possibly turn negative. In addition, even if the US economy were to pick up as a result of the increase in infrastructure investment, the impact on Asian emerging economies is likely to be muted as the dependence in the region has shifted toward the PRC. Finally, if threats of imposing tariffs on PRC goods exported to the US are carried out, the knock-on effects of the consequent slowdown in the PRC will be felt strongly in emerging Asia.

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<sup>6</sup> As shown in Figure 5.3, the increase in interest rates has already materialized.

If the policy agenda Mr. Trump advocated during his campaign is enacted, the prospects for emerging markets will not be good. Latin America will be the most vulnerable, but Asian economies will not be spared, either.

## 5.4 Policy Responses to Vulnerabilities and Financial Stability Risks

The use of conventional policy measures, principally changes in a short-term interest rate controlled by the central bank, to address financial stability risks is controversial. In the early 2000s the broad consensus among central bankers and academics was that central bank policy should focus on inflation as the primary, if not only, objective, which would ideally be implemented using the inflation-targeting strategy pioneered by the Reserve Bank of New Zealand in 1990. Several Asian emerging market central banks were skeptical, however, emphasizing the importance of paying attention to a wider set of variables, in particular the potentially damaging effects of exchange-rate misalignments, and taking measures to limit excessive volatility of the exchange rate using interventions in the foreign exchange market.

Some economists had also questioned the exclusive focus on inflation, suggesting that central banks should also pay attention to financial imbalances building in the economy.<sup>7</sup> But the status quo was robustly defended. (In Bernanke and Gertler 2001, for example.) One facet of this defense was that it would not be desirable to use interest rates to lean against asset price increases, since it was not possible to determine whether such increases were due to fundamental economic developments or irrational exuberance in financial markets. All central banks could, and needed to, do was to clean up the financial wreckage should a collapse of asset prices lead to a widespread failure of financial institutions. Furthermore, it was also widely thought that the policy interest rate was too blunt an instrument to correct asset price misalignments.<sup>8</sup>

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<sup>7</sup> Borio and Crockett (2000); Borio and Lowe (2002); Borio and White (2004); Cecchetti et al. (2000).

<sup>8</sup> “The evolving consensus, which is by no means settled, is that monetary policy is too blunt a tool to be routinely used to address possible financial imbalances; instead, monetary policy should remain focused on macroeconomic objectives, while more-targeted microprudential and macroprudential tools should be used to address developing risks to financial stability, such as excessive credit growth” Bernanke (2011).



The global financial crisis of 2007–2009 in the US and Europe led to widespread acceptance of the idea that financial stability should be added to inflation as a policy objective of central banks.<sup>9</sup> The crisis thus underscored the need for relevant national authorities, primarily central banks, to improve surveillance systems to detect, at their incipient stages, the build-up of macroeconomic risks, and vulnerabilities or threats that could jeopardize financial system stability. At the same time it was recognized that the traditional interest rate tool needed to be supplemented with other policy instruments, in particular macroprudential policies and capital account management policies, to deal with the additional policy objective.

In its purest form the post-global financial crisis consensus saw the short-term interest rate as focusing exclusively on inflation, or macroeconomic stability more generally, and leaving regulatory measures, macroprudential policies, to focus exclusively on financial stability (e.g., Bernanke 2011; Svensson 2012). But this strict division of labor between the policy interest rate and macroprudential policies has been challenged. For example, there is evidence that changes in the short-term monetary policy interest rate can have an impact on risk taking by economic agents (Borio and Zhu 2008). In addition, macroprudential instruments are often focused on specific markets and as such may not fully guard against more diffuse risks to financial stability. In such cases, using interest-rate policy may be justified as it “gets into all the cracks,” as Professor Jeremy Stein once said when he was one of the Governors of the US Federal Reserve (Stein 2013).

Recent research by Filardo and Rungcharoenkitkul (2016) also suggests that an interest rate policy that leans against the financial cycle in addition to the macroeconomic cycle can improve economic performance. The distinguishing feature of their analysis is a focus on a systematic reaction to the full financial cycle. Previous analysis of the costs and benefits of leaning against a financial cycle such as that found in IMF (2014) and Svensson (2014) had considered a one-time intervention by a central bank in the midst of a financial boom and found that the macroeconomic costs of a tighter policy would outweigh the benefits of reducing the probability and severity of a financial bust. But Filardo and Rungcharoenkitkul (2016) show that this calculus is likely to be turned on its head when the central bank adopts a systematic lending policy over the whole financial cycle, thus altering the nature of this

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<sup>9</sup> In some jurisdictions the task of implementing macroprudential policies is vested in a separate institution from the central bank. This raises issues of coordination with decisions taken at the central bank, which may also have consequences for economy-wide financial stability. See section 5.41 for a detailed discussion.

cycle as economic agents adjust their behavior in response to the policy maker's strategy.

Preserving financial stability is now widely accepted as a legitimate objective of public policy. Staff of international financial institutions as well as authorities in central banks, regulatory bodies, and finance ministries are actively looking for appropriate policy instruments, analyzing their effects, and setting up governance arrangements for their implantation.

Facing potential turbulence in the global economy and having to take account of the domestic vulnerabilities described in the previous sections, central banks in Asian emerging markets are likely to take an eclectic approach in designing their policy strategies. Filardo, Genberg, and Hofmann (2016) described this approach as a three-pillar approach in which foreign exchange market intervention is used to deal with short-run currency volatility; traditional interest rate policy is used for targeting macroeconomic stability; and macroprudential policies and current account management policies are implemented to reduce the risk of financial instability. However, implementing this policy strategy must be done with care regarding the potential pitfalls associated with each of the pillars and with the considerable linkages between the policies.

### 5.4.1 Monetary Policy and Macroeconomic Stability

Since the Asian financial crisis, central banks in Asia have been quite successful in achieving their core macroeconomic stability objectives. Filardo and Genberg (2010) document that the performance of inflation in the Asia and Pacific region has been admirable. They argue that greater focus by central banks on inflation control has translated into a lower and more stable inflation environment. They also show that it is difficult to document big differences in inflation performance between explicit inflation targeters and non-inflation targeters. In other words, there is no one-size-fits-all recipe for ensuring macroeconomic stability, provided there is a broad consensus about the importance of inflation control.

Changes in central bank governance have been supportive of the successful policy outcomes after the Asian financial crisis. In particular, central banks in the region have gained legal and/or political independence during the past decade. Improvements in governance have usually been associated with enhanced ability to achieve inflation control.

There are thus reasons to be optimistic that central banks in Asia will be able to navigate the uncertain global economic waters going

forward. Policy frameworks have been calibrated to the needs of individual economies and are not bound by unquestioned adherence to what used to be called “best practices” in central bank policy.

An important component of policy frameworks is the willingness to tolerate greater variations in nominal exchange rates. This has provided some degree of policy independence despite the growing influence of international financial markets on domestic interest rates. At the same time, however, central banks stand ready to intervene in foreign exchange markets to maintain orderly conditions. Purists may argue that such interventions go too far in limiting currency movements, and that it would be preferable for the private sector to learn to live with greater exchange rate volatility. However, this requires deep and well-functioning foreign exchange markets, which do not yet exist in many jurisdictions.

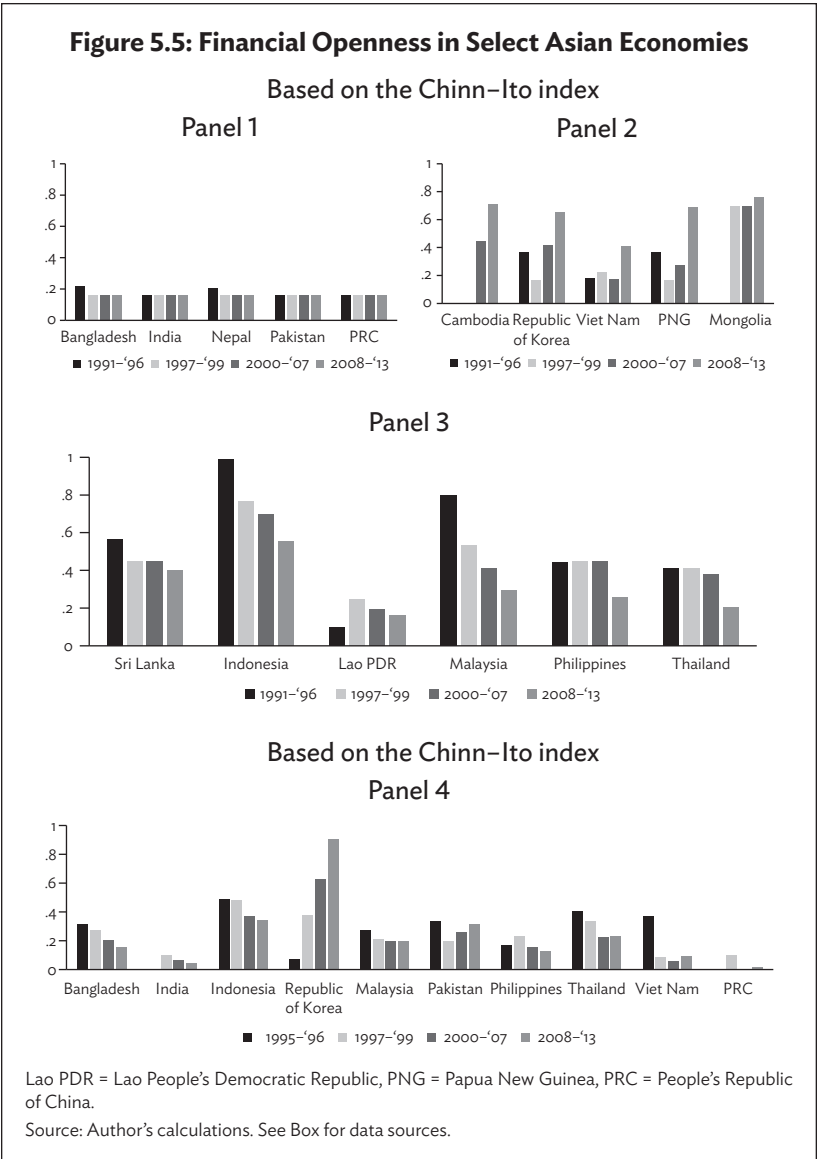
#### 5.4.2 Capital Flow Measures

The attitude toward the use of capital flow measures varies substantially across Asia. In countries with the most advanced financial systems—Australia; Hong Kong, China; Japan; New Zealand; and Singapore—capital account transactions are largely free of restrictions and exchange rates are either freely floating (Australia, Japan, and New Zealand) or a closely managed policy instrument (Hong Kong, China; and Singapore).<sup>10</sup> In terms of the classification of exchange rate regimes along a spectrum, from freely floating to rigidly fixed, these economies are thus situated at the two ends. While both groups have abolished capital controls, the former has retained monetary (interest rate) independence, whereas the latter has foregone such independence in favor of a rigid exchange rate based monetary policy.

In other jurisdictions, policies involving capital flow management measures are eclectic. Figure 5.5 shows measures of legal financial openness for select Asian economies for four separate periods: before and during the Asian financial crisis, after the Asian financial crisis, before the global financial crisis, and after the global financial crisis.<sup>11</sup> Panel 1 shows that in some jurisdictions capital account transactions are tightly

<sup>10</sup> Hong Kong, China’s currency board arrangement features a rigidly fixed exchange rate as compared with the US dollar, whereas Singapore conducts its monetary policy by choosing a level and slope of the value of the Singapore dollar relative to an unannounced currency basket. As predicted by the Mundellian Trilemma, in both cases the short-term interest rate in the economy will be completely determined by the exchange rate policy given that international capital flows are free of restrictions.

<sup>11</sup> See Box 1 for a brief description of the indexes used and a reference to alternative actual measures.



controlled and have been so for a long time.<sup>12</sup> Panel 2 shows jurisdictions in which capital account transactions have been liberalized to a certain

<sup>12</sup> The index covers conditions only up to 2013. Since then, liberalization measures have been introduced in the PRC and India, which are not reflected in the figure.

### Box 5.1: Measuring Financial Openness De Jure versus De Facto\*

In discussions about financial openness, a distinction is often made between de jure openness, which is meant to capture the legal regime in place in a jurisdiction, and de facto openness, which attempts to show the size of actual cross-border flows and cross-border asset diversification.

De jure measures are typically based on the International Monetary Fund publication *Annual Report of Exchange Arrangements and Exchange Restrictions*, which provides descriptive accounts of measures taken by members to restrict capital account transactions. A number of authors have converted these descriptions into numerical measures of financial openness. One example is the Chinn–Ito index described in Chinn and Ito (2006) and available online at [http://web.pdx.edu/~ito/Chinn-Ito\\_website.htm](http://web.pdx.edu/~ito/Chinn-Ito_website.htm). The Chinn–Ito index is calculated as the first principal component of indexes indicating the presence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions, and requirements to surrender export proceeds. It is available for 182 countries for the period 1970 to 2013.

A more granular index has just been constructed and described in Fernandez et al. (2015) and also made available online. It focuses only on capital account transactions, but takes into account 10 different types of assets and distinguishes between capital inflows and outflows. It has been tabulated for 100 countries over the period 1995 to 2013.

As noted, de facto quantity-based indexes of financial openness attempt to record the extent to which domestic residents hold foreign financial assets in their portfolios and correspondingly what proportion of domestic financial instruments are held by nonresidents. There are two difficulties associated with constructing and interpreting these indexes. First, while balance of payments statistics provide reasonably comprehensive data on the cross-border flow of financial assets, there is much less information about international investment positions which are the results of these flows, but which are also affected to an important extent by valuation changes. In addition, cumulating flows to obtain stock figures require accurate starting values if they are to be reliable.

The second problem associated with quantity-based measures of financial openness relates to interpretation. What would be the extent of international portfolio diversification in the absence of statutory restrictions on such diversification? Calculating the benchmark so defined would require a model of optimal international diversification, rendering the interpretation of the index dependent on the appropriateness of the model.

\* For a more detailed discussion including a comparison of de jure and de facto measures of financial openness, see Genberg (2016).

extent during these periods, especially after the Asian financial crisis.

Panel 3 is the most interesting in that it shows that financial openness has actually been reduced over time in Sri Lanka, Indonesia, the Lao People's Democratic Republic, Malaysia, the Philippines, and

Thailand, according to the Chinn–Ito index. This is consistent with the notion that authorities have been reluctant to embrace a fully open capital account as a principle to strive for, at least in the short run. But this finding is surprising given that four of the five economies identified as having tightened restrictions on financial integration are members of the Association of Southeast Asian Nations (ASEAN), a group of countries striving for greater economic integration over time.<sup>13</sup>

Panel 4 is included as a cross-check. It uses a different index of financial openness and shows results for a group of countries that overlap with those in panels 1–3. The conclusions that emerge are broadly consistent with those just presented. In particular, the declining trends in openness for Indonesia, Malaysia, the Philippines, and Thailand are confirmed.

It appears then that Asian policy makers have dealt with vulnerabilities related to capital flows in part by retaining some controls on capital account transactions and in some cases actually tightening them. They have also dealt with vulnerabilities in other ways since the Asian financial crisis. Figure 5.6 shows that the share of foreign currency denominated debt in the economy's total debt has generally been reduced since the Asian financial crisis, in some cases substantially so. It is also well established that official foreign exchange reserves have increased markedly. Both developments have rendered the economies more resistant to currency fluctuations. Nonetheless, the recent uptick in foreign currency denominated debt in Indonesia and Malaysia, as well as the external borrowing of nonfinancial corporates discussed in section 5.2, warrant monitoring.

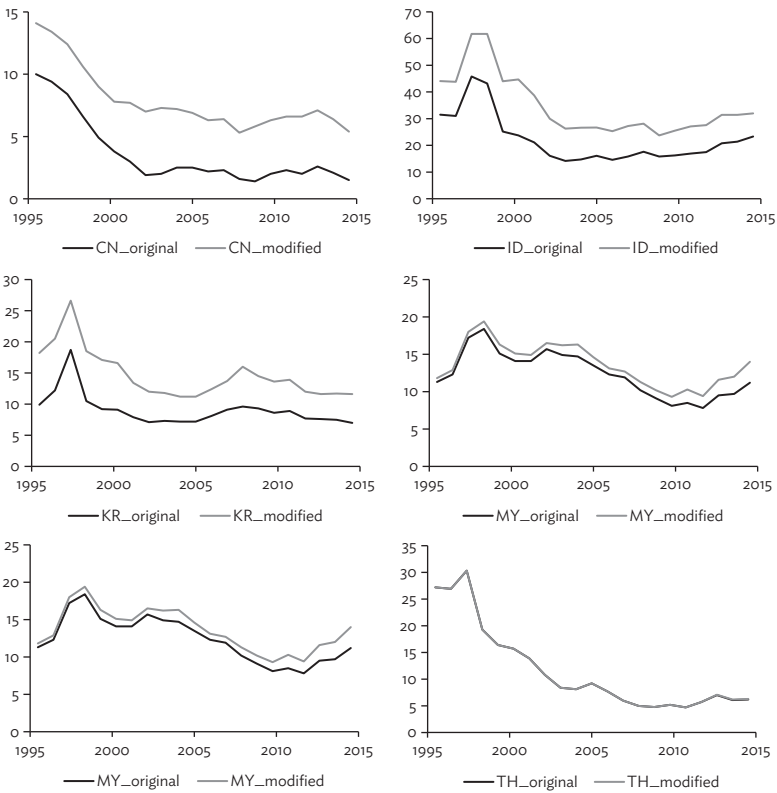
### 5.4.3 Macroprudential Measures

Asian policy makers have also been active regarding the application of macroprudential policies. Data presented in IMF (2014) and Zhang and Zoli (2014) as well as in Cerutti, Claessens, and Laeven (2015) show that economies in emerging Asia have increased the use of such measures substantially in the aftermath of the Asian financial crisis. By some measures they are far ahead of policy makers in other jurisdictions in this respect, and arguably this contributed to the fact that Asian economies were relatively modestly affected by the financial aspects of the global financial crisis, although they were of course heavily influenced by the slowdown in import demand from the US and Europe as these economies entered recessions.

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<sup>13</sup> See Genberg (2016) for a further discussion and an attempt to reconcile the two seemingly contradictory trends.

**Figure 5.6: Foreign Currency Debt as a Percentage of Total Debt\***



PRC = People’s Republic of China, INO = Indonesia, KOR = Republic of Korea, MAL = Malaysia, PHI = Philippines, THA = Thailand.

\* The series denoted as “original” assumes that debt between domestic residents is denominated in domestic currency, whereas the series denoted “modified” is adjusted to take into account foreign-currency denominated debt between domestic residents. See Chui, Kuruc, and Turner (2016) for a discussion.

Source: Author’s calculations based on data provided by M. Chui and used in Chui, Kuruc, and Turner (2016).

Macroprudential policies take many forms, reflecting the diffuse nature of “financial stability.”<sup>14</sup> For example, there are measures

<sup>14</sup> The European Systemic Risk Board (2014) lists five measures that will be covered by a European Union (EU) Directive, three measures covered by a regulation, and an additional three that are not covered by EU legislation but that member countries may use. Cerutti, Claessens, and Laeven (2015) report the result of a survey of IMF member countries on their use of macroprudential measures. They identify no less than 12 such measures.

intended to influence the aggregate growth of credit to the private nonfinancial sector; measures that focus on credit growth or price developments in particular sectors of the economy; measures to affect maturity mismatches and liquidity mismatches on banks' balance sheets; and measures to curtail currency mismatches in the financial sector of the economy.

A common feature of these measures is that they tend to be relatively narrowly targeted at a particular sector or activity, contrary to interest rate policies, which affect the financial system and the economy more generally. This feature is often viewed as an advantage because the policy can focus on the epicenter of a potential financial crisis as opposed to being a "blunt instrument" affecting all sectors. But this assumes that it is possible to identify where the epicenter is located, and when there is a risk that a financial crisis will erupt. But this is not necessarily the case. Consider, for example, housing price development or the growth of bank credit as the intermediate target of macroprudential measures. Can we be certain that the housing market or bank credit growth is really the underlying source of financial system risk or not just a readily observable symptom? If it is the latter, then a targeted macroprudential policy will not solve the underlying fundamental problem. An instrument that "gets into all the cracks" may be preferred.

In addition, analyzing the example further, while both housing prices and bank credit growth can be readily measured, it is not a simple matter to decide when they have reached levels that threaten financial stability. Both variables evolve over time in response to fundamental economic forces, and policies should react only to growth rates over and above what these forces dictate. In other words, we are faced with exactly the same difficulty as that identified in the debate about whether interest rate policy should react to asset prices, except now the problem is associated with the introduction of macroprudential policies.

Targeted macroprudential policies are typically focused on a particular type of institution (e.g., limits on the growth of credit extended by commercial banks or countercyclical capital buffers required of regulated banks), a particular financial activity (e.g., maximum loan-to-value ratios on mortgage lending or a minimum net stable funding ratio for a commercial bank), or the financial strength of bank clients (e.g., ceilings on debt-to-income ratios). As such they aim to reduce risks associated with the institution, the financial activity, or the type of individual being targeted. While the measures taken may well be successful in curbing these risks, the more difficult question to answer is whether they succeed in significantly reducing overall financial risk in the economy, or whether the risk is transferred somewhere else in the financial system: from regulated banks to shadow banks or the



capital market; from mortgage lending to credit-card lending; and from borrowing from commercial banks to borrowing from “curb-market” money lenders.<sup>15</sup> If so, the risk in the system may not decrease substantially, and it may in fact become more opaque. There is also a danger that the transfer of risk will beget additional macroprudential policies targeted at the new activities resulting in multiple layers of policies whose aggregate effects may be hard to assess.<sup>16</sup>

#### 5.4.5 The Need for Coordinated Policies

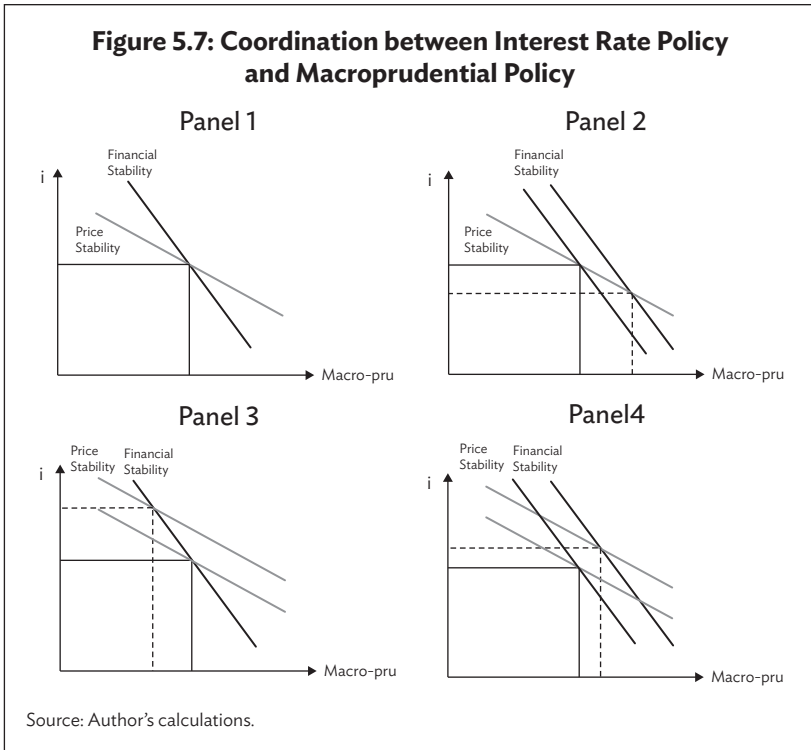
As central banks take on multiple objectives and by implication start using multiple instruments, the question naturally arises about the need for coordinating policy decisions. This need arises because each instrument is likely to have an impact not only on the policy objective it is seeking to reach but also on other objectives. A clear example would be the spillover effects of interest rate policy decisions on financial stability and those of macroprudential policies on macroeconomic stability. A loosening of monetary policy (an interest rate reduction) will increase economic activity, but will simultaneously increase the risk of financial instability, for example by increasing credit growth in the economy or by inducing additional risk taking. To counter the increased risk of financial instability, macroprudential policy may need to be tightened. Similarly, a tightening of macroprudential policies may slow economic activity, which, if this was considered inappropriate, would have to be countered by an expansionary monetary policy.

The implications of this interaction between the two types of policies can be illustrated in the well-known Swan diagram where the two policy instruments are measured along the respective axes, and the lines in the diagram show those combinations of the two instrument settings that result in reaching the policy objectives.<sup>17</sup> In Figure 5.7, panel1, the basic setup is illustrated by the grey line signifying combinations of interest rates and macroprudential settings that

<sup>15</sup> As an illustration, Cerutti, Claessens, and Laeven (2015) cite results indicating that the existence of macroprudential policies in an economy aimed at curbing lending by domestic financial institutions is associated with larger cross-border financial claims consistent with the idea that borrowers switch from domestic to foreign sources of funds in response to domestic macroprudential regulations.

<sup>16</sup> The arcade game “whack-a-mole” offers an apt analogy. In this game the player faces “moles” that appear temporarily from different holes in the game console, and the goal is to whack each mole before it disappears. The application of macroprudential policies must guard against the temptation to chase each type of new risk that appears in what might be called a “whack-a-risk” fashion.

<sup>17</sup> This diagram was used in the same context in Bean (2015).



achieve macroeconomic (price) stability, and the black line signifying those combinations that yield financial stability. The relative slopes of the lines are based on the assumption that interest rate policy has a relatively stronger impact on price stability and that macroprudential policy has a relatively stronger impact on the financial stability objective.

Panel 2 illustrates the case of an increase in financial stability risk, which shifts the black line to the right. A tightening of macroprudential policy would counteract the risk, but at the cost of slowing economic activity. To maintain both macroeconomic and financial stability, a simultaneous tightening of macroprudential policy and easing of monetary policy would be needed as shown by the intersection of the dashed blue line with the solid red line.

Panel 3 illustrates the case of a pure inflation shock, which in isolation would require a tightening of monetary policy. However, with the interdependence of the two policy instruments, a simultaneous tightening of monetary policy and easing of macroprudential policy would be appropriate.

In these two cases the adjustment of the two policy instruments would go in opposite directions. Panel 4 illustrates a case where they would be adjusted in the same direction. This corresponds to a case of a simultaneous inflation and financial stability shock, perhaps because of capital inflows leading to rapid credit creation and asset price inflation threatening financial stability, and an increase in aggregate demand putting upward pressure on inflation. In this situation, the appropriate policy response would be a tightening of both monetary and macroprudential policy.

The need for coordination raises not only the technical problem of how to calibrate the policy adjustments in response to shocks, but also requires a governance structure that promotes interactions between the bodies that are responsible for each instrument.

Furthermore, coordinating monetary policy and macroprudential policy also gives rise to communication challenges in particular when the two policy instruments have to be altered in opposite directions. Care must be taken to avoid giving the impression that those responsible for monetary policy and those responsible for setting macroprudential policies are working at cross-purposes.

## 5.5 Concluding Remarks

A number of features of current global financial and trade relationships pose challenges for policy makers in emerging markets. Combined with structural vulnerabilities, these create risk of financial instability. This chapter argues that emerging Asia has been quite successful in maintaining both macroeconomic and financial stability in this turbulent global environment. Policy frameworks and governance structures have been adapted based on lessons learned from the Asian financial crisis. In general, policy makers have adopted an eclectic approach to achieving monetary and financial stability using more than a single policy instrument to reach their objectives. Interventions in the foreign exchange markets are used in many jurisdictions to limit currency volatility; short-term interest rates are aimed at attaining macroeconomic stability interpreted mainly, but not exclusively, as price stability; and macroprudential policies have been employed in attempts to reduce the risk of financial instability.

The use of multiple instruments to reach multiple goals is not without risk, however. At a minimum it requires coordination among the entities that are responsible for each instrument, which in turn necessitates proper governance both within the central bank and between the central bank and other agencies that may be involved.

As the chapter argues, including a wider set of objectives than price stability in the tasks assigned to central banks also raises questions about the central bank's ability to attain these objectives while avoiding the pitfalls associated with trying to do so.

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# 6

## The Correlations of the Equity Markets in Asia and the Impact of Capital Flow Management Measures

*Pornpinun Chantapacdepong*

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### 6.1 Introduction

One of the major concerns of policy makers in emerging Asia is the problem of volatile capital flows, especially short-term flows, such as debt and portfolio flows, which can change abruptly. A surge in inflows is harmful to the recipient countries in several ways, for example, by creating an asset price surge as well as the risk of capital flight. In order to mitigate the volatility of capital inflows, national authorities have relied on various unilateral macroprudential measures, such as taxes on certain inflows, minimum holding periods, and reserve requirements. The variation of the measures depends mainly on the institutional setup, policy constraints, resilience of the economy's real sectors to shocks, and financial conditions.

Over the past few decades, the behavior of portfolio inflows and outflows of emerging Asian economies has exhibited a unique pattern. Minor cross-country differences have emerged, mainly determined by global risk sentiment rather than domestic factors.<sup>1</sup> Foreign investors have shown an increase in appetite for financial assets in the region for several reasons: the expected appreciation of the local currency, low

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<sup>1</sup> From 2005 until the Lehman Brothers crisis, most Asian economies experienced high equity inflows. However, during the eruption of the global financial crisis, all the economies in the region experienced severe portfolio outflows. During the post-crisis period, the global liquidity surge led many economies in the region to experience strong portfolio inflows once again.

exchange rate volatility, strong economic fundamentals, and the low interest rate environment in the advanced economies. This suggests that the correlation of portfolio flows has tended to increase recently. The growing financial interlinkages could create vulnerability with respect to a surge in inflows to the region. A negative shock to one country could easily transmit to other countries in the region, even if there are few real linkages between the two countries and the economic fundamentals of the second country are strong. Unfortunately, the current macroprudential framework at the regional level is confined to monitoring, consultation, and reserve pools. Studying whether the financial markets in Asia are subject to common risks is thus crucial, especially with respect to large and volatile capital flows. This has policy implications for the suitability of regional coinsurance and the possible side effects of the unilateral capital flow management measures.

This chapter adds to existing literature by examining the financial interlinkages within emerging Asian economies and determining whether the recent financial distress has become systemic. The study examines the volatility co-movements of financial variables for the countries in the region. The co-movements can be measured by the conditional correlation of volatility or shocks in asset prices. The dynamic conditional correlation (DCC) GARCH model by Engle (2002) is employed to analyze the volatility of Asian financial markets and to assess the linkages between them. The model accounts for the time-varying correlation behavior of the Asian financial market data and can inform the development of the degree of financial interdependence over time.

This chapter answers the following research questions: (i) How connected/linked are these volatilities in emerging Asia? This question requires an assessment of the degree of volatility interdependence between emerging Asian countries through the level of market correlation. The high correlation among countries implies that the markets move together; and the exposure to common risks among emerging Asian countries' financial markets tends to increase. In contrast, if the individual countries' financial markets move independently, their financial market risk is driven mainly by country-specific factors. (ii) Do these periods of highly correlated stock market movements provide evidence of contagion among the countries in the region? During normal circumstances the resulting higher correlation reveals greater financial interdependence and integration within the region. However, during a crisis the greater calculated conditional correlation suggests contagion of the risk factor(s). Financial distress can become systemic. (iii) What major factors determine the recent increase in financial dependence? The study's analysis will examine the importance of several elements,



such as country-specific factors, global risk sentiment, and regional factors. The study will also examine the impact of the introduction of capital flow management (CFM) measures.

With the introduction of CFM measures, the correlation behavior and the behavior of capital flows could change in response to the barriers to the flows. It may be possible that the CFMs introduced by a country could create uncertainty and effectively stop the flows or drive them away from other countries in the region. If the financial markets in the region move differently after the measure's implementation, the negative externality from the CFM measure will be examined. The study aims to assess whether the control of capital inflows can significantly reduce the volume of certain types of capital flows into a country or simply shift the challenges of large inflows, such as asset price bubbles and currency appreciation, to other countries. In contrast, if markets move together, it could imply that foreign investors regard emerging markets as a common financial market and make investment decisions based on global or regional factors rather than on only domestic ones.

This chapter does not prove whether coordinated action is superior to unilateral capital flow measures, nor does it assess the effectiveness of capital flow measures in relation to their objective. Instead, it identifies the mechanism of the spread of turmoil across countries in the region and assesses whether CFM affects these relationships, which could create the possibility of externalities. If the spread of turmoil and externalities exists, it could suggest that the multilateral arrangement can be justified;<sup>2</sup> for instance, the coordinated restriction on capital flows to avoid discriminate actions that would simply redirect flows to other countries and the circumvention of capital controls.

The chapter starts with the background of emerging Asia's challenges in coping with volatile capital flows. The next section analyzes the connectedness of the volatile capital flows in emerging Asia and the mechanism for the connection. The final section discusses the multilateral impacts of CFM and offers conclusions.

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<sup>2</sup> This is in the same spirit as the argument by Forbes and Rigobon (1999), who suggested that evidence of contagion could justify multilateral (International Monetary Fund [IMF]) intervention, as the aid could prevent the second economy from experiencing a financial crisis. On the other hand, if the two countries are linked to each other through the economic fundamental, the transmission of shocks would not constitute contagion. The second economy should adjust to this shock itself. A multilateral arrangement, such as a bailout fund, would just prolong the adjustment and be a suboptimal solution. A multilateral arrangement would thus be less effective and harder to justify in this case.

## 6.2 Volatile Capital Flows and Authorities' Responses

Policy makers in many emerging Asian economies have had to cope with increasingly volatile capital flows. In the aftermath of the global financial crisis, capital flows to emerging economies, especially in Asia, have bounced back strongly from their 2008 slump. Investors from developed countries that are faced with exceptionally low interest rates and even those from the emerging Asian economies have regained their appetite for risk and, in particular, the carry trade. Liberalization of the capital account in the emerging Asian economies and certain push and pull factors are among the main factors behind the surge in capital flows in the region. The push factors include factors determining the supply of global liquidity surges, such as low interest rates in advanced countries, as a result of the easing monetary and fiscal policies, slow growth, and a lack of investment opportunities. The pull factors are robust economic performance, improved investment climate, and expectation of currency appreciation in the emerging Asian economies. Some researchers have argued that the push factors are more important in driving inflows, as countries with different economic fundamentals and cyclical positions have all attracted large inflows (Pradhan et al. 2011). Others have given more importance to the pull factors, as the better economic prospects are a key driver of the liquidity surges. Brockmeijer and Husain (2011) concluded that global push factors play a significant role in explaining the emergence of a liquidity surge, while pull conditions determine the magnitude of the surge.

The nature of the capital flows to emerging Asia has been changing, especially in terms of composition and behavior. The composition changes toward portfolio and banking flows are raising concerns among policy makers in the region, as these are more volatile and short term in nature. For instance, the People's Republic of China (PRC) has seen a shift from foreign direct investment to banking flows, while India has experienced a change in the composition of inflows from banking flows to portfolio flows. In Asia's newly industrialized economies, except the Republic of Korea, the recent surge is dominated by extraordinary banking-related flows. The portfolio flows dominate the current surge in the case of the Republic of Korea and the ASEAN 5. Portfolio investment was strong in the first half of 2011, but reversed in the second half of the year following the decline in international investor sentiment. The behavior of flows has changed in such a way that the pace of inflow surges has risen markedly. In addition, the shift in attitudes toward risk has led to large swings in global portfolio investment flows and increased volatility in global equity and bond markets.

Although the recent trend of sustained large capital inflows has become less severe due to the better recovery of the United States (US) economy, the sovereign debt crisis in Europe needs to be monitored. With the changing nature and pattern of the flows, questions about the impact of a potential capital pull-out in the future are likely to surface.

Previously, the sustained large capital inflows posed a challenge regarding monetary policy and the management of capital flows in several ways. First, it placed considerable pressure on the exchange rate. The combination of persistent current account surpluses, rising capital inflows, and the accumulation of foreign exchange reserves in the emerging Asian economies, along with persistent US deficits exerted upward pressure on exchange rates. As the pressure could be either one-way or two-way, it could hamper international trade and investment activity. Second, it created a fiscal burden as a result of the management of sustained large capital inflows, such as sterilized intervention. Third, it could hamper the monetary transmission mechanism. Fourth, it imposed risk on financial stability, such as pressure on asset markets, bank lending booms, volatile foreign exchange markets, and capital flow reversals. The capital inflows could result in credit booms and economic overheating by pushing inflation expectations upward, while the risk of capital flows suddenly stopping or reversing within a short period could result in sharp currency depreciation or reserve depletion.

The surge in foreign capital has led to a renewed focus on capital controls, which is a policy option to manage large inflows, in addition to exchange rate policy and monetary policy. It has been widely agreed that emerging markets share a common concern about surges and volatile capital flows; however, their policy responses have varied widely based on policy limitations and the differences in their economic fundamentals. The limitations can be political economy issues (such as opposition to nominal appreciation) and institutional concerns (such as the cost of sterilization).

Policy makers in emerging Asia have responded to the surge in capital inflows by allowing appreciation in their currency while intervening to slow its pace. As the inflows have been large and persistent, foreign exchange intervention seems to be an arduous task. For instance, Thailand and Indonesia allowed significant exchange rate appreciation, although their reserves increased rapidly and are currently 60% above their precrisis levels. Pradhan et al. (2011) argued that, as long as the expectation of currency appreciation is maintained and the inflows are persistent, inflows may be even stronger with reserve accumulation and intervention to resist exchange rate appreciation.

Recipient countries have used macroeconomic policies to deal with the recent surges in inflows; more direct measures and CFM measures have also gained in popularity, and the IMF has recognized them as a

legitimate part of tool kits to manage large capital inflows. This was motivated by concerns about overheating, external competitiveness, financial stability, and the sterilization costs of reserve accumulation (Pradhan et al. 2011). Many researchers have agreed that the measures have been effective in altering the composition of inflows and in limiting credit growth and asset price inflation, while not affecting aggregate capital flows.<sup>3</sup> CFM measures are more desirable for policy makers than traditional capital control measures. The measures allow the domestic capital market to remain integrated with the global capital market while insulating it against volatile short-term capital flows. However, CFM measures have their limitations, as they can be regarded as temporary tools. In addition, they should be employed under specific circumstances when the economy is approaching its potential and the exchange rate is not undervalued (Ostry et al. 2010).

Appendix Table 1 presents a series of CFM measures and their details, classifying them by their choice of policy tools. The choice of CFM measure varies depending on the nature of the problem. Indonesia; the Republic of Korea; the Philippines; Taipei, China; and Thailand used CFM to stem volatile capital flows. The measures range from limiting foreign exchange exposure of the private sector to limiting foreign access to domestic financial assets, restricting external borrowing, imposing a withholding tax on bonds, and introducing minimum holding periods. Some measures are the reintroduction or intensification of existing measures rather than the introduction of new instruments. The PRC; Hong Kong, China; and Singapore have used CFM mainly to stem credit growth and prevent bubbles in the housing market. Malaysia has only liberalized capital outflows and has not introduced any capital flow measures. This partly reflects the resilience of the economies (especially that of the real sectors) in these countries to foreign exchange rate appreciation.

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<sup>3</sup> In principle, the effectiveness of capital controls, which tends to diminish over time as the market finds ways to circumvent them, depends on the time horizon and tool selection. The type of capital control is also important. The measures, however, tend to be only of temporary use. Many studies have concluded that capital control is more effective in changing the composition of inflows and their maturity structure than in reducing the volume. Unfortunately, suggestions regarding the ideal tools are lacking; there are only a few guidelines. For instance, the measure should be designed such that it can last long enough to counter the capital flow surge and can be withdrawn quickly when it is no longer needed. The measure should also be flexible enough to adapt to sudden changes in investor sentiment.

### 6.3 Review of Earlier Literature

Spillovers and contagion via global asset prices are typically found to dominate trade channels (IMF 2011a). In addition, spillovers via financial market channels could be significant regardless of the geographic location and extensive capital controls. The volatility spillover effect is the primary process for transmitting financial risk. Many research papers have found that contagion was present during every major financial crisis in the last decade or so (King and Wadhvani 1990; Lee and Kim 1993; Calvo and Reinhart 1996).

The earlier literature has examined volatility spillovers in the stock market in the case of developed countries (Karolyi and Stulz 1996; Harris and Pisedtasalasai 2006); in Asia (Chou, Lin, and Wu 1999; Joshi 2011); and in other emerging markets (Scheicher 2001). These research papers found significant volatility spillovers between developed countries and emerging markets and spillovers among emerging markets. Shamiri and Isa (2009) examined volatility spillovers from the US to Southeast Asia using stock return data and the bivariate GARCH model. Their results showed that Singapore; the Republic of Korea; and Hong Kong, China are among the Southeast Asian markets that are vulnerable to shocks generated by US investors due to the large proportion of US investors participating in their stock markets. Studies on intraregional financial spillovers remain limited.

A review of earlier literature shows that there is no consensus on the precise definition of contagion. It is mostly defined as the spread of market turmoil from one country to other financial markets.<sup>4</sup>

This chapter follows the definition of contagion used by Forbes and Rigobon (1999). They defined contagion as a significant increase in cross-market linkages after a shock to one country (or a group of countries). Interdependence or linkages refers to a situation in which two markets show a high degree of co-movement during a period of stability. The analysis in this chapter aims to show that market volatility is transmitted across emerging Asian economies. Contagion occurs if the cross-market co-movement increases significantly after the shock. If the co-movement does not increase significantly, the continued high level of market correlation suggests strong linkages/interdependence between the two countries. The analysis simply tests whether this volatility transmission changes significantly after the shock/crisis.

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<sup>4</sup> Masson (1998); Allen and Gale (2004); Kyle and Xiong (2001); Kiyotaki and Moore (2002); Kaminsky, Reinhart, and Vegh (2003); Brunnermeier and Pedersen (2005); and Naoui, Liouane, and Brahim (2010).

However, the caveats of the tests for contagion based on the cross-market correlation coefficients are the biasedness and inaccuracy due to heteroskedasticity (Forbes and Rigobon 1999).<sup>5</sup> In other words, cross-market conditional correlation coefficients are conditional on market volatility. During a crisis, markets are more volatile and the estimates of the conditional correlation coefficients tend to increase and can be biased upward. Regarding this issue, the ARCH GARCH class frameworks offer advantages, as they incorporate heteroskedasticity into their models and can thus correct for such a bias.

Modern literature has also emphasized the need to consider the dynamic/time-varying aspects of correlations (Engle 2002). The dynamic conditional correlation (DCC) GARCH model has gained popularity in handling this issue. The earlier studies that examined contagion in Asian financial markets using the DCC GARCH model are those by Chiang, Jeon, and Li (2005) and Cho and Parhizgari (2008). The former examined whether there was any significant increase in DCC during the Asian financial crisis by employing the regression method with dummy crisis variables. The latter employed the mean difference t-test and median difference z-test to identify the contagion by investigating whether there are significant differences in the estimated time-varying correlation coefficients between the periods of stability and turmoil. They also argued that the DCC GARCH model is superior to the volatility-adjusted cross-market correlations employed by Forbes and Rigobon (1999). The main reason is that the DCC GARCH model continuously adjusts the correlation for the time-varying volatility.

A few studies have examined the relationship between various international financial markets after the introduction of capital controls. The IMF (2011b) assumed a linear relationship between equity returns/equity fund flows and measures in the region by employing the case of selected Latin American and Asian countries and evaluating the impact of CFM in one country on the level of equity returns and equity fund flows of other countries by linear regression, and got mixed results. Edison and Reinhart (2001) studied the impact of capital controls in Brazil (1999), Malaysia (1998), and Thailand (1997) on financial variables using the GARCH test with dummy variables for capital

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<sup>5</sup> The earlier literature has analyzed correlation using co-movements, causality, error correction models, co-integration, and the vector autoregression methodology (Eun and Shim 1989; Chung and Ng 1992; Parhizgari, Dandapani, and Bhattacharya 1994; Karolyi and Stulz 1996; Darbar and Deb 1997; Bhattacharya and Samanta 2001; Pascaul 2003; Ahmad, Ashraf, and Ahmed 2005; Chelley-Steeley 2005; and others). However, modern literature has recognized the bias in the simple correlation coefficient that arises from the increased volatility during the crisis (Forbes and Rigobon 1999).

controls and found that only in the case of Malaysia were a higher interest rate and greater exchange rate stability achieved after the introduction of capital controls. The capital control dummy variable was placed in the conditional variance equation of the univariate GARCH model to gauge the impact of the control. The results showed that equity markets continue to be linked internationally, despite the introduction or escalation of capital controls during the Asian financial crisis. In addition, following the introduction of capital controls, one should expect the following phenomena in the financial variables: (i) a decline in volatility spillovers; (ii) evidence of structural breaks around the introduction of controls; (iii) less contemporaneous movement with international variables, especially interest rates and exchange rates; and (iv) a weaker causal impact of foreign financial variables on domestic ones. Nevertheless, the analysis of the international transmission of shocks and the international financial linkages in their work can be improved using multivariate GARCH analysis. There is room for further research by allowing the interaction of individual country shocks in the calculations of the conditional mean and variance of the financial variables.

## 6.4 Data and Research Methodology

Stock index data and foreign fund flows into stock markets are employed in this study due to the availability of cross-country data with high frequency and a long time span, and the importance of such data in explaining financial markets. Volatile flows, especially portfolio flows, into bond and equity markets are frequently viewed as a destabilizing force in asset markets and financial systems. Hence, the aim of reducing volatility in asset prices is one of the main reasons for the introduction of controls.

The data descriptions are presented in Appendix Table 2. The daily returns of the stock index (closing price) are examined in the analysis of the cross-country correlations. The daily returns are identified as the first difference in the natural logarithm of the closing index value for two consecutive trading days. The period of analysis for the stock index is from November 1992, when all the data are available, through August 2013. The starting date of November 1992 is considered to be the stable period. The sample period includes the Asian financial crisis<sup>6</sup>

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<sup>6</sup> The turmoil periods are 2 July 1997, when the Thai baht was devalued, and 17 October 1997, when the Hong Kong, China stock market crashed.

(January 1997–December 1998), the pre-global financial crisis period (January 1999–December 2007), the eruption of the US crisis<sup>7</sup> (January 2008–September 2009),<sup>8</sup> the intensification of the global financial crisis through the euro sovereign debt crisis (October 2009–December 2011), and the economic recovery from crisis period (2012–2013). In the last part of the chapter, we examine the event study of the impact of CFM on foreign equity flows. Both the data for the stock prices and the data for the foreign flows into stock markets are obtained from Bloomberg LP.<sup>9</sup>

The dynamic conditional correlation (DCC) GARCH model by Engle and Sheppard (2001) and Engle (2002) is employed to examine the time-varying correlation coefficients, since it has the flexibility of univariate GARCH models coupled with the parsimonious parametric model for correlations. In addition, it takes time-varying volatility into account and addresses possible feedback effects. It also helps in avoiding the bias in examining volatility spillovers and contagion that would occur with the standard correlations, as stated by Forbes and Rigobon (1999). The DCC GARCH model assumes time-varying correlation, which is dynamic enough to account for the continuous change in the market and to fit the transmission process of contagion. The DCC GARCH estimation is simple and consists of two steps: the first is the univariate GARCH calculation and the second is the correlation estimates allowing for the interaction of the innovations in the conditional variance equations.

## 6.5 The Analysis of the Degree and Evolution of the Interconnectedness of Volatile Capital Flows

The time series plots of the daily behavior of gross foreign equity flows and daily returns<sup>10</sup> on the equity index in Appendix Figure 1 suggest that

<sup>7</sup> The period includes the collapse of Lehman Brothers on 22 August 2008.

<sup>8</sup> Prior to the current capital inflow surges, there were two waves of large inflows into emerging Asian economies: (i) the early 1990s until the Asian financial crisis in 1997, and (ii) the early 2000s until the global financial crisis in 2008.

<sup>9</sup> The gross foreign equity flow data provided by Bloomberg are the transactions by institutional investors. In contrast, Emerging Market Portfolio Research (EPFRs) data are mainly for mutual funds. EPFRs represent net flows, while the data from Bloomberg provide gross flows.

<sup>10</sup> Visual inspection of the time series plots of the stock index shows that all the series are non-stationary, and the unit root test confirms this notion. Therefore, the daily stock index returns are taken so that they can be applied to the DCC-GARCH estimation. Not surprisingly, the return of the series (in Appendix Figure 1) exhibits



the degree of financial instability among emerging Asian economies has increased in the current period of volatile capital flows.<sup>11</sup> Many questions arise from this observation: (i) Was there an increasing degree of financial interdependence in Asian financial markets during calm periods, and is there significant evidence of financial contagion among emerging Asian economies during the financial crisis?; and (ii) If contagion exists, did the impact of the crisis generated outside the region outweigh that of Asia's own financial crisis?

These questions can be addressed by examining the linkages between markets in emerging Asian economies through the co-movements in stock market volatility, in other words, the coincidence of periods of increased/decreased stock market volatility across countries. Such linkages can be examined through the time-varying conditional correlation coefficients derived from the DCC GARCH estimation.

The analysis includes stable periods (the pre-Asian crisis and pre-global financial crisis periods) and crisis periods (the Asian crisis, the Lehman Brothers crisis, and the euro crisis). Any evidence of a strong contemporaneous relationship across stock markets during calm periods defines the interdependence of the equity markets among countries. This can be assessed by checking the statistical significance of the calculated conditional correlation coefficients. The possibility of contagion is further defined as a significant shift in these cross-country linkages during crises.

### 6.5.1 The International Volatility Linkages During Calm Periods

Financial interdependence can be examined from the international volatility linkages during calm periods. The stronger co-movements in the financial variables could relate to the greater developments and international integration in normal events. The resulting pairwise conditional correlation coefficients of the equity returns during the pre-Asian crisis period (September 1992–December 1996) and the pre-US crisis period (January 1998–December 2006) are illustrated in the third and fifth panels of Appendix Table 3.

The estimation results in the table and the time series plots suggest stronger interregional and intraregional financial integration,

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volatility clustering, which we can fit into the GARCH (1,1) model. The volatility of the returns was also quite large during the Asian and US crises.

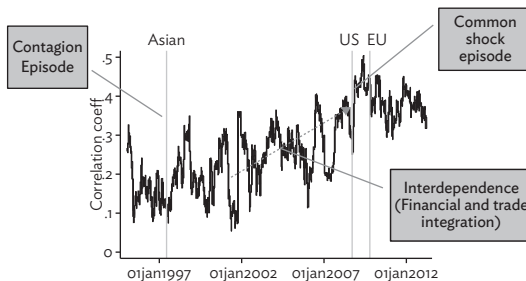
<sup>11</sup> The time series plots of the daily returns on equity index reveal that the volatility of the stock index in all countries rose rapidly during the Asian and US financial crises.

as reflected in the higher correlation coefficients of the equity returns among Asian countries as well as in Asia in relation to the US stock market. In fact, the pairwise correlation coefficients within the region are greater than their correlations with the US market.

The time series plots of the pairwise conditional correlation coefficients of each country's stock index return versus the Thai stock index return (Appendix Figure 2) also indicate strong evidence of volatility co-movements across countries during the pre-1997 crisis and pre-US crisis periods, except in the case of the PRC. This suggests the interdependence and linkages of the stock markets in the region. The existence of a minor relationship with the PRC is unsurprising, since the country only recently opened its equity market to foreign trading. The correlation between the PRC's equity market and that of other Asian economies remains low. The correlation coefficients of the PRC with Taipei, China and Thailand are weakly significant. The correlations of the PRC stock market with the US stock market and the rest of the Asian economies are insignificant. Hong Kong, China is the only exception, for which the correlation coefficient with the PRC is strongly significant, since Hong Kong, China is the de facto financial center for the PRC. These results indicate the low level of international integration of the PRC stock market.

The degree of fundamental linkages, such as increasing trade and financial integration, between the emerging Asian economies and the US is also increasing. In the pre-1997 crisis period, the correlation coefficients between US stock returns and those of emerging Asian economies remained low and insignificant (Appendix Figure 3). There

**Figure 6.1: Correlation Coefficients of the Indian and Thai Stock Markets**



EU = European Union, US = United States.

Source: Author's calculations.

were insignificant interlinkages between the stock market in the US and those of the emerging Asian economies in general; thus, the change in volatility tends to be determined mainly by own-country-specific factors. However, since 1998 the interlinkages of the US stock returns and those of the emerging Asian economies have increased significantly. As illustrated in the correlation table in Appendix Table 3, the degree of integration has increased substantially and became significant during the pre-US crisis period in all Asian countries except Malaysia, Indonesia, and the PRC. During the pre-US crisis period, there were strongly significant correlation coefficients for Singapore; Hong Kong, China; the Republic of Korea; and Taipei, China. Singapore is the most vulnerable to shocks generated by the US, as the conditional correlation coefficient of the stock returns between the two countries was 0.97 ( $t = 373.7^{***}$ ) prior to the US crisis.

## 6.5.2 Evidence of Crisis Contagion

The common movement of the equity markets among emerging Asian economies can be used to trace the contagion and spillovers during crisis periods. If the equity markets of each country move independently, then it is likely that the financial risk is driven by country-specific factors. In contrast, if the correlation coefficients rise dramatically, reflecting that the volatility moves together, all the equity markets in emerging Asian economies would be perceived by investors as being subject to common risks. This could imply that foreign investors make their investment decisions based on global risk sentiment or regional factors rather than on only country-specific factors.

The existence of contagion during crises could be justified on theoretical grounds. The reason for the increase in cross-market linkages after the occurrence of shocks was explained by Masson (1998) as the ability of a crisis in one country to coordinate investor expectations. A co-movement in price would exist because of the correlation in memories rather than fundamentals. The DCC GARCH estimation confirms the existence of contagion. The subperiod examination shows that the correlations of the Asian equity markets picked up significantly, especially during the global financial crisis.

Statistically, contagion has been defined as a significant increase in co-movements in asset prices, which can be gauged from the comparison of the correlation coefficients when dividing the data into pre- and post-crisis subperiods.<sup>12</sup> The results are presented in Appendix

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<sup>12</sup> Another measure suggested in the previous section is to add the crisis dummy variable in the conditional variance equation of the DCC GARCH to examine whether there

Table 3; panels 3 and 4 compare<sup>13</sup> the resulting changes in the conditional correlation coefficients during the pre- and post-Asian financial crisis periods. The correlation coefficients of several country pairs became statistically significant during the Asian financial crisis. Nevertheless, the correlation coefficients of some country pairs remained weak and insignificant, even during the Asian crisis period; for instance, there was no significant relationship between Singapore and other Asian countries. There was also an insignificant relationship between India and other Asian countries except the Republic of Korea and Thailand.

The resulting increase in the conditional correlation coefficients, during the pre-, during-, and post-US crisis periods, is more dramatic, as presented in panels 5, 6, and 7 of Appendix Table 3. The correlations of equity markets among Asian countries increased markedly during the pre-US crisis period. This was partly due to the stronger intraregional financial integration prior to the US crisis; the dependence of each country's market thus progressively intensified. The correlation coefficients of the majority of the country pairs were statistically significant during the pre-US crisis period, except the PRC and Singapore pair. During the US crisis period, the correlation coefficients of all the pairs rose rapidly and became strongly statistically significant. Note that the correlation coefficients among the Asian countries are generally higher than those between the US and each Asian country. This suggests a strong linkage of the stock indexes within the region. Hence, a common shock could create a volatility spillover from one country to another. In addition, the global liquidity surge during US quantitative easing directly flooded the equity and bond markets in Asia, as stated in panel 7 (the crisis recovery period) of the table. This is considered a common shock to Asian countries that could create greater systemic risk in the region. The spread of news that determines global risk sentiment also plays an important role. In the risk-on period, stock returns rose sharply with an improvement in sentiment toward the global economic

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is any significant increase in the conditional correlation and conditional variance of equity markets during a crisis. However, the estimation results are omitted here due to computational difficulties.

<sup>13</sup> The existence of contagion can also be assessed by the statistical significance of the crisis dummy variables in the conditional variance equation of the DCC GARCH model. The crisis dummy variables take the value of 1 during a crisis and 0 otherwise. The statistically significant positive relationship of the crisis dummy variables in the conditional variance equation implies a significant increase in the conditional correlation and conditional variance of equity markets during a crisis. This method allows us to control for the factors determining conditional variance and conditional mean of equity. The alternative measure in existing literature is the regression-based contagion test, which can be performed by regressing the correlation coefficients with the crisis dummy variable to observe structural changes.

recovery. However, they fell when there was bad news about the slower pace of the global economic recovery, such as uncertainty about the US economic recovery plan, intensification of the euro sovereign debt crisis, and the possibility of a hard landing in the PRC. This results in the global aspects of changes in stock return volatility, possibly leading to contagion. Global factors thus influence the stock markets in Asia. This suggests that the instability arising outside the region could aggravate the volatility spillover of the financial markets within the region.

Last, the time series plots of the estimated dynamic correlation coefficient illustrate the development of the correlation during each episode. The correlation coefficients of the Thai stock returns against each of the other Asian stock returns are shown in Appendix Figure 2. Thailand was chosen as the crisis originator in 1997 and can illustrate the case of intraregional spillover. The correlation coefficients of the individual Asian countries' stock returns against US stock returns are presented in Appendix Figure 3 to illustrate its impact as the crisis originator in 2008. The resulting implied correlation coefficients increased sharply, confirming the role of the Thai financial market as the crisis originator in 1997. However, the pairwise correlation coefficients showed a more dramatic rise in response to the shock originating outside the region, that is, the global financial crisis in 2008. The correlation increased even further after the euro sovereign debt crisis in some cases. These results reflect that the US crisis was perceived by investors as a major event and contributed to the integration of the equity markets among the emerging Asian economies. The intensification of the euro crisis further contributed to the uncertainty in the global financial markets. This confirms the existence of the contagion effects of the crisis.

## **6.6 The Analysis of the Behavior of Equity Flows and Volatility Spillovers After the CFM Measures**

The findings in the previous sections suggest that equity markets are more linked internationally through financial integration during calm periods. The link is stronger through volatility contagion during crisis periods. During periods of market turbulence, CFM is introduced to safeguard financial stability in the domestic market. The introduction of controls is expected to reduce the spillover/contagion of the shock. The following section explores the impact of CFM on the linkages among the stock markets of emerging Asian countries.

The analysis can be divided into two parts to analyze the impact of CFM from different angles. The first part considers the change in the international correlations of equity prices after the introduction of CFM through the DCC GARCH framework. The second part contains an event study of the impact of CFM on gross foreign purchases and sales in the local equity market. The first part analyzes the significance of a CFM dummy in the GARCH model. The examination of the dummy of control in the DCC GARCH investigates the structural change in the conditional correlation coefficient and the conditional variance. It is an assessment of the medium- to long-term impact of CFM measures. The second part is an event study of gross equity flows, which is an assessment of the temporary and extreme capital movement around the introduction of the control.

### **6.6.1 The Examination of the Correlation of Stock Prices After the Measure**

This section examines the effect of the control on the volatility spillover of the equity index. This part consists of two steps. The first step analyzes the significance of the CFM dummy in the GARCH model. It is an analysis of structural change in conditional variance, which aims to assess the medium- to long-term impact of CFM. The second step is an examination of the changes in the international correlations of stock index returns after the introduction of CFM through the DCC GARCH framework. Several questions arise in this section. For instance, does CFM curb or raise the volatility of asset prices in each country? Does the measure enhance volatility contagion among emerging Asian economies?

Following a priori Edison and Reinhart (2001), one should expect a lower degree of co-movement for a country that has imposed controls during the period in which CFM is in place. This implies that the introduction of the measure dampens the volatility interdependence between the countries instituting controls and their neighboring countries. If the measure results in lower volatility across the board or if it only changes the volatility in the country where the measure was instituted without creating side effects for others, there is no negative externality. Another possible contrast scenario is that the control originating in a country could (or could not) not only successfully reduce uncertainty in its own equity market, but also raise volatility in its neighbors' markets. A negative externality would result from such a measure.

The capital control episodes analyzed in this chapter are listed in Appendix Table 1. They include examples of emerging Asian economies

resorting to capital controls during periods of market stress. The resulting univariate GARCH calculation of each economy's equity return after controlling for CFM is presented in Appendix Table 4A. The dummy variable for CFM is introduced in the conditional variance equation of the GARCH calculation. The term *dummy<sub>c</sub>* is a dummy variable that takes the value of 1 during the control period and 0 otherwise. The announcement date is selected instead of the official active date to address the issue of some capital control measures having been anticipated by the financial markets.

The conditional mean equation<sup>14</sup> consists of the US 3-month LIBOR–OIS spread (bicloiss) and the return on the exchange rate (in terms of the local currency versus the US dollar). The US 3-month LIBOR–OIS spread helps to control for liquidity conditions in the US. The change in the local currency in relation to the US dollar is the proxy for the change in the country-specific factors. The conditional variance equation consists of the dummy variable of the control and the VIX index. Since CFM is introduced in periods of turbulence, the study attempts to separate the impact of the measures from that resulting from the financial crisis. The risk sentiment index, as reflected in the VIX index, helps to control for the risk sentiment in the global financial market.

The results show that the dummies of all the CFM measures have a significant negative relationship with the variance of stock market returns, implying that the introduction of the control is associated with lower volatility of stock market returns. The conditional volatility of stock market returns is found to have declined in all countries in the study every time CFM measures were introduced. This phenomenon was seen in the country instituting the control and its neighbors, which suggest that the equity markets in both the home country and its neighbors are calmer every time the measures are introduced. The introduction of capital controls tends to be associated with smaller international volatility spillovers among emerging Asian economies. This suggests that there is no negative externality from CFM in the medium to long term. In fact, the measure helps to calm the equity markets in the region in the medium to long term.

The VIX index significantly determines the variance of the stock returns in all the countries, while the LIBOR–OIS spread is significant for the majority of the sample countries. This partly reflects that the introduction of CFM does not alter the contemporaneous movement of equity returns with international variables. There is no clear evidence

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<sup>14</sup> Not all the measures in Appendix Table 1 are analyzed for two main reasons. First, some measures are introduced consecutively after others. Second, adding the dummy variable of some measures resulted in flat log likelihood in the GARCH calculation.

of a weaker impact of foreign variables on domestic ones around the introduction of the measure.

The second step of the GARCH calculation yields pairwise conditional correlation coefficients of the equity returns in Asia. The results are presented in Appendix Table 4B. The pairwise correlation coefficients reduce drastically after including the measure dummy in all the cases. The control is thus associated with smaller international correlations of stock returns among emerging Asian economies. This suggests that CFM tends to reduce international risk sharing in the medium to long term.

The caveat for this study is that several CFM measures were introduced in Asia, some weeks after others. It is difficult to separate fully the impact of each of the CFM measures.

## 6.6.2 The Event Studies of Foreign Equity Flows After the Measures

This section analyzes the impact of a CFM announcement on foreign equity flows in each Asian economy. It investigates the daily flows (in US dollar terms) of sales and purchases made by foreign institutional investors in the local equity markets. The data are available for India; the Republic of Korea; the Philippines; Taipei, China; Indonesia; and Thailand since 1999. The examination of gross flows can be performed by identifying the “extreme<sup>15</sup> capital flow movement” around the period of the introduction of CFM. This helps in isolating the small change or fluctuation of capital flows from the analysis.

Given that we want to find the impact of CFM measures on gross flows, daily analysis is required to investigate the market’s response. There are two main criteria for counting events as extreme movements. First, within the episode the change in gross sales and purchases must be more than 1 standard deviation above the rolling mean. Episodes end when the movement falls within the 1 standard deviation band. Second, for the episode to qualify as an “extreme event,” there must be at least 1 day when the change in the gross flow is at least 2 standard deviations above its mean.

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<sup>15</sup> Forbes and Warnock (2012) identified extreme capital flow movement by observing quarterly gross capital flow data in the balance of payments. A positive value is interpreted as inflows from foreign investors. Episodes of extreme capital flow movement can be divided into four types: a “surge” is a sharp increase in gross capital inflows; a “stop” is a sharp drop in capital inflows; a “flight” is a sharp increase in gross capital outflows; and “retrenchment” is a sharp decrease in gross capital outflows. The flight and retrenchment episodes are defined as activities driven by domestic investors.



Appendix Table 5 exhibits the behavior of the foreign institutional investors involved in purchases (column 4) and sales (column 5) in emerging Asian economies' equity markets. The star sign in the table indicates the economy that introduced the measure. The extreme movements of foreign purchases are defined as the dark red area, while extreme foreign sales are represented by the dark grey area. The pale red and pale grey areas represent the near-extreme event episodes, in which the change in capital flows is above the 1 standard deviation band but below the 2 standard deviation band.

The results from the event studies show that the extreme movements lasted for only a few days to a week. We present some interesting findings from the event studies.

First, an economy's CFM measures temporarily reduce the flow of foreign purchases in its domestic equity market. In addition, they are associated with irregular foreign purchases of equity in other countries. Examples are the Republic of Korea's measures to limit private foreign exchange exposure (on 19 November 2009 and 19 May 2011), the Republic of Korea's decision to impose a withholding tax (on 18 November 2010), the Republic of Korea's restriction on external borrowing (on 19 December 2010), and Indonesia's decision to increase the minimum holding period (on 13 April 2011). The reduction of foreign purchases in the equity markets of these countries is above 1 standard deviation, as represented by the shaded light grey area. In addition, around the period the control measures were introduced in these markets, there is evidence of irregular foreign purchases in other markets. Most of the measures above are associated with a surge in equity inflows into Thailand, such as around the Republic of Korea's introduction of measures to limit private foreign exchange exposure (19 November 2009 and 19 May 2011), Indonesia's decision to increase the minimum holding period on Bank Indonesia's certificates from 1 month to 6 months (13 April 2011), and the Republic of Korea's introduction of a withholding tax on government bonds and central bank securities (18 November 2010). The Republic of Korea's restriction on external borrowing (19 December 2010) is associated with a surge in equity inflows into Indonesia. There was either no change or a reduction in the daily flow of foreign sales in the equity market of the countries that initiated the measures. It seems that investors tended to reduce their transactions in these countries to gauge the clarity of the impact of the measures. Although these measures do not impose a direct cost on investors in the equity market, they signal that the government is less supportive of foreign portfolio flows. Hence, investors tend to divert flows into other countries in the short term.

Second, some measures have no impact on the flow of foreign purchases in local equity markets, but are associated with a surge in an

inflow into other markets. Examples are India's restriction on external borrowing (9 December 2009), Indonesia's decision to increase the minimum holding period on bonds (16 June 2010), Taipei,China's limit on nonresidents' access to central bank instruments (9 November 2010), Taipei,China's and Indonesia's decision to increase the reserve requirement (30 December 2010), and measures to limit private foreign exchange exposure in the Republic of Korea (13 June 2010 and 26 November 2012) and in the Philippines (5 November 2010, 28 October 2011, and 26 December 2012). Thailand seems to be the major recipient of the flows, followed by the Republic of Korea; Taipei,China; Indonesia; and the Philippines. An economy's measure also results in foreign sales in its domestic equity market. In column 5 of Appendix Table 5, foreign sales in equity markets soared by more than 2 standard deviations in the case of Indonesia's decision regarding the minimum holding period on bonds (16 June 2010) and by more than 1 standard deviation in the case of the Philippines's limit on nonresidents' access to central bank instruments (17 July 2012). This happened even when the market was experiencing risk-on sentiment, as represented by the low VIX index. Hence, it confirms that capital flows were diverted from countries that introduced CFM to other countries. There is no data on foreign purchases and sales of equity in the PRC. However, we find that the introduction of the PRC's restriction on external borrowing on 31 March 2010 is associated with a surge in inflows into many countries, such as Indonesia; Thailand; the Republic of Korea; and Taipei,China.

Last, measures targeting fixed-income investments are associated with a surge in inflows into the economy's domestic equity market in some cases. The decision to limit nonresidents' access to the central bank's special deposit account facility in the Philippines on 17 July 2012 is an example. The measure aimed to reduce the volatility of speculative flows, as the time deposit account is a vehicle for conducting carry trades. It is likely that the controls in the deposit account could instead have diverted the funds away from the original vehicle for carry trades into the equity market. Therefore, the measure could not stop the volatility of the flows. The measure is also associated with an outflow (i.e., foreign sales in the equity market), even though there is risk-on sentiment in the market.

## 6.7 Conclusion

This chapter attempts to identify the relationship between the various Asian equity markets. Over the past 2 decades, the degree of volatility interdependence of the Asian equity markets has been increasing during

calm periods, reflecting stronger fundamental linkages. Higher financial integration has intensified the contagion effects across markets. During the global financial crisis period, the equity markets of the emerging Asian economies exhibited stronger correlations, confirming the existence of contagion and the intensification of systemic risk. However, correlation is not always bad, as integration brings yields benefits in terms of growth and market development (Kose, Prasad, and Terrones 2009). In addition, higher correlation may be a sign of risk-sharing at work.

The study also tested the effects of CFM on changes in cross-border volatility links in the context of equity markets. The introduction of CFM measures is associated with a reduction in the conditional variance of the equity markets in the economy instituting the controls as well as in its neighbors. In all the cases in the study, the measure is associated with a reduction in the volatility dependence of the stock index within the region. This implies that CFM could calm the markets in the medium to long term. In the short term, the event of flow diversion into other markets seems to appear with the introduction of the measure.

Regarding multilateralism, the degree of externality with respect to CFM is not clear. In addition, all policies entail spillovers in general, such as interest rates, exchange rate intervention, and reserve accumulation. International policy coordination may not be limited to the case of CFM. However, Asia remains a very diverse region. Differing objectives and priorities complicate policy coordination (Truman 2011). Given these challenges, policy coordination has focused on building the regional resilience to shocks and multilateral crisis management facilities. Last, the major externalities remain external to Asia; hence, a cohesive Asia increases the region's bargaining power.

**Appendix Table 1: Capital Flow Management Measures  
in Asian Economies**

Policy Tool (Objective)	Example (Announcement Date)
<p><b>1. Limit private FX exposure</b> (to dampen speculation in FX markets)</p>	<p><b>Rep. of Korea (19 Nov 2009)</b>—Capped the FX forward position for exporters to up to 125% of the underlying position and required banks to raise their long-term foreign currency borrowing from 80% to 90% of long-term lending.</p> <p><b>Rep. of Korea (13 Jun 2010)</b>—Capped banks' FX forward positions at 50% of regulatory capital for domestic banks and 250% for foreign banks. Reduced firms' hedging limit from 125% to 100% of export receipts.</p> <p><b>Rep. of Korea (19 May 2011)</b>—Cut the ceiling on FX derivative contracts owned by domestic banks from 50% to 40% of equity and by foreign bank branches from 250% to 200%, effective July 2011.</p> <p><b>Rep. of Korea (26 Nov 2012)</b>—Cut the ceiling on FX derivative contracts owned by domestic banks from 40% to 30% of equity and by foreign bank branches from 200% to 150%, effective November 2012.</p> <p><b>Rep. of Korea (21 Feb 2013)</b>—Declared the plan for new measures that could tighten KRW NDF trading rules and an additional levy on banks' FX debt or tax for FX and bond transactions.</p> <p><b>Philippines (5 Nov 2010)</b>—Starved the market of US dollars by "rolling-off" the FX forward book to stem peso appreciation.</p> <p><b>Philippines (28 Oct 2011)</b>—Increased capital adequacy or the capital charge on NDF positions from 10% to 15%, effective 1 January 2012.</p> <p><b>Philippines (26 Dec 2012)</b>—Pre-termination of NDFs no longer allowed. Banks' NDF exposure cannot exceed 20% of qualified capital for local banks and 100% for foreign banks.</p>
<p><b>2. Raise the restriction on external borrowing</b> (to limit access to foreign credit and prevent high-cost borrowing)</p>	<p><b>India (9 Dec 2009)</b>—Reinstated the interest rate cap on private external borrowing.</p> <p><b>Rep. of Korea (19 Dec 2010)</b>—Banks' levy on non-deposit FC liabilities, effective 1 August 2011 (&lt;1 year = 0.2%, 1–3 years = 0.1%, &gt;3 years = 0.05%).</p> <p><b>Indonesia (30 Dec 2010)</b>—Re-imposed a limit on banks' ST foreign borrowing to 30% of capital, effective March 2011.</p> <p><b>PRC (31 Mar 2010)</b>—SAFE cut the short-term debt quota by 1.5% to \$32.4 to prevent abnormal capital inflows, effective April 2010.</p> <p><b>Rep. of Korea (29 Jul 2011)</b>—The government imposed a levy of 0.02%–0.2% on foreign debt, less FCD held by banks, effective August 2011.</p>

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**Appendix Table 1** *continued*

Policy Tool (Objective)	Example (Announcement Date)
<b>3. Minimum holding period</b> <i>(to limit the volatility of flows)</i>	<b>Indonesia (16 Jun 2010)</b> —From 7 July 2010, all SBI buyers are subjected to a 1-month holding period. <b>Indonesia (13 Apr 2011)</b> —Increased the holding period to 6 months, effective 13 May. <b>Philippines (7 Dec 2012)</b> —Possible announcement of a new measure, i.e., a minimum holding period of 90 days for domestic fixed-income instruments. It is possible that there is a further reduction in the NDF exposure limit or a further increase in risk weighting for NDFs, effective Q1 2013.
<b>4. Limit foreign access to central bank instruments</b> <i>(stop the vehicle for carry trade to reduce flows' volatility)</i>	<b>Indonesia (16 Jun 2010)</b> —Issued 9- and 12-month SBIs to replace 1- and 3-month and expanded the supply of non-tradable term deposits up to 6 months' tenor for local banks; effective 7 July 2010. <b>Taipei, China (10 Nov 2009)</b> —Barred nonresidents' access to time deposit accounts. <b>Taipei, China (9 Nov 2010)</b> —Restricted offshore funds from investing more than 30% of their portfolio in money market products and government debt with maturity of less than a year. <b>Philippines (17 July 2012)</b> —Banned foreigners from investing in the central bank's special deposit account (SDA) facility.
<b>5. Reserve requirements on FC and NRs' account</b>	<b>Taipei, China (30 Dec 2010)</b> —Raised the reserve requirement on the local currency account held by nonresidents. <b>Indonesia (30 Dec 2010)</b> —Raised the reserve requirement on foreign currency accounts from 1% to 5% in March and to 8% in June 2011 (to reduce banks' incentive to intermediate ST inflows).
<b>6. Withholding tax on foreign holdings of government bonds</b>	<b>Thailand (12 Oct 2010)</b> —Reinstated 15% interest income and capital gains tax on nonresident purchases of government bonds (to slow the inflow into bond markets) <b>Rep. of Korea (18 Nov 2010)</b> —Reinstated 14% tax on government bonds and central banks' securities, effective 1 January 2011.
<b>7. Other FX control measures</b>	<b>PRC (15 Nov 2010)</b> —Introduced 7 FX controls, including placing a floor on banks' long FX spot risk and clamping down on exporters' over-invoicing. <b>Indonesia (30 Sep 2011)</b> —Required banks to submit complete, accurate, and timely data on foreign exchange flows to BI. <b>Philippines (15 Dec 2011)</b> —All applications for FDI registration must be filed with the BSP within 5 years of the date of inward remittance/actual transfer of assets to the Philippines.

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**Appendix Table 1** *continued*

Policy Tool (Objective)	Example (Announcement Date)
<b>8. Measures on property</b>	<p><b>Hong Kong, China (Jun 2010)</b>—Raised the minimum down payment for home purchases by 10% for borrowers who receive their main income from abroad.</p> <p><b>Singapore (Dec 2011)</b>—Foreigners and corporate entities need to pay an extra 10% stamp duty when buying residential property.</p> <p><b>Hong Kong, China (Oct 2012)</b>—5% tax on property purchases by foreigners.</p> <p><b>Singapore (Jan 2013)</b>—Sets of measures to cool the heated property market: increased stamp duty for certain home buyers, a tighter loan-to-value limit, and a higher payment requirement for purchasing additional property.</p>
<b>9. Encourage outbound investment</b>	<p><b>Malaysia (Oct 2010), the Philippines (Nov 2010 and Jan 2011), Thailand (Feb and 23 Sep 2010), and Thailand (Jun 2010)</b>—Raised the limits on financial account accumulation by residents, including FDI.</p>

PRC = People's Republic of China, US = United States.

Sources: Brockmeijer and Hussain (2011); International Monetary Fund (2011b); Pradhan et al. (2011).

**Appendix Table 2: Description of Variables**

Variable Name	Description
rSpx	The first difference of the S&P 500 index (SPX), US (% change daily)
rHsi	The first difference of the Hang Seng index (HIS), Hong Kong, China (% change daily)
rShcomp	The first difference of the Shanghai Stock Exchange index (SSE), PRC (% change daily)
rJci	The first difference of the Jakarta Composite index (JKSE), Indonesia (% change daily)
rKospi	The first difference of the Korean Stock Exchange index (KOSPI), Republic of Korea (% change daily)
rSet	The first difference of the Thailand Stock Exchange index (SET), Thailand (% change daily)
rSensex	The first difference of the Bombay Stock Exchange index (BEX), India (% change daily)
rFbmkhci	The first difference of the KL Stock Exchange index (FBMKLCI), Malaysia (% change daily)
rPcomp	The first difference of the Philippines Stock Exchange index, Philippines (% change daily)
rTwse	The first difference of the TWSE, Taipei, China (% change daily)

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**Appendix Table 2** *continued*

Variable Name	Description
rHKD	The first difference of the Hong Kong, China dollar against the US dollar (% change daily)
rCNY	The first difference of the Chinese yuan against the US dollar (% change daily)
rIDR	The first difference of the Indonesian rupiah against the US dollar (% change daily)
rKRW	The first difference of the Republic of Korea's won against the US dollar (% change daily)
rTHB	The first difference of the Thai baht against the US dollar (% change daily)
rINR	The first difference of the Indian rupee against the US dollar (%change daily)
rMYR	The first difference of the Malaysian ringgit against the US dollar (% change daily)
rPHP	The first difference of the Philippines peso against the US dollar (% change daily)
rTWD	The first difference of the Taipei,China dollar against the US dollar (% change daily)
Bicloiss	The spread between the 3-month London interbank rate and the fixed interest rate offered in the overnight swap index (OIS) over the 3-month maturity
VIX	The Chicago Board Options Exchange Market Volatility Index, which measures the implied volatility of S&P 500 index options
Cesiusd	The US economic surprise index
Cesieur	The EU economic surprise index
Cesiapac	The Asia and Pacific economic surprise index
rFX	The return of the local currency versus the US dollar
arch	Autoregressive conditional heteroskedasticity models. They assume volatility clustering in the equity return when the variance of the current error term is related to the size of the earlier periods' error terms.
garch	The generalized autoregressive conditional heteroskedasticity (GARCH) process. It assumes that the volatility of the stock return in the current period depends on past squared observations and past variances.

EU = European Union, PRC = People's Republic of China, US = United States.

Sources: Author's compilation from Bloomberg LP and the Thai Stock Exchange Commission.

**Appendix Table 3: Calculated Correlation Coefficients from the DCC GARCH Estimation of the Stock Returns in Various Periods**  
(with the t-value in parentheses)

Economy Pairs	Full Sample 3 Sep 1992– 14 Aug 2013	Pre-Asian Crisis		Asian Crisis		Pre-US Crisis		US Crisis		Crisis Recovery	
		3 Sept 1992– 30 Dec 1996	2 Jan 1997– 31 Dec 1997	5 Jan 1998– 29 Dec 2006	3 Jan 2007– 30 Dec 2011	4 Jan 2012– 14 Aug 2013					
p_US,TH	-0.03(-0.26)	0.05(1.58)	-0.01(-0.17)	0.07(2.03)**	0.22(6.9)***	0.25(5.36)***					
p_US,PH	-0.04(-0.37)	0.03(1.01)	0.07(1.08)	0.06(1.83)*	0.07(1.98)**	0.14(3.12)***					
p_US,PRC	0.01(0.09)	-0.02(-0.54)	-0.08(-1.01)	-0.01(-0.41)	0.07(1.8)*	0.13(2.88)***					
p_US,INDO	-0.03(-0.2)	0.06(1.79)*	-0.06(-0.92)	0.05(1.42)	0.18(5.45)***	0.15(2.79)***					
p_US,TAP	0.02(0.17)	0.01(0.22)	-0.07(-1.05)	0.1(2.84)***	0.15(4.21)***	0.14(2.77)***					
p_US,KR	0.02(0.18)	0.04(1.07)	0.13(1.82)*	0.12(3.55)***	0.2(5.96)***	0.24(4.88)***					
p_US,SG	-0.04(-1.43)	0(0.1)	0.99(961.9)***	0.97(373.7)***	0.99(947.3)***	0.99(740.9)***					
p_US,HK	0.05(0.46)	0.09(2.86)***	0.15(2.26)**	0.14(4.3)***	0.2(6.04)***	0.27(5.55)***					
p_US,INDIA	-0.03(-0.27)	-0.01(-0.41)	0.09(1.18)	0.07(1.78)*	0.27(9.04)***	0.24(4.24)***					
p_US,MY	0.02(0.13)	0.09(2.81)***	0.04(0.55)	0.03(0.95)	0.16(4.24)***	0.05(0.86)					
p_PRC,TH	0.01(0.07)	0.02(0.28)	0.07(0.98)	0.06(1.84)*	0.25(7.25)***	0.29(6.55)***					
p_PRC,INDO	-0.01(-0.08)	0.02(0.5)	0.06(0.98)	0.03(0.65)	0.31(9.35)***	0.32(7.22)***					
p_PRC,TAP	0.01(0.09)	0.02(0.75)	0.06(0.79)	0.06(1.71)*	0.34(10.46)***	0.38(7.57)***					
p_PRC,KR	-0.07(-0.73)	0.01(0.44)	0.04(0.46)	0.05(1.45)	0.35(11.27)***	0.33(7.26)***					
p_PRC,SG	-0.01(-2.92)***	0.02(0.03)	-0.06(-0.84)	-0.02(-0.64)	0.09(2.25)**	0.12(2.55)**					

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Appendix Table 3 *continued*

Economy Pairs	Full Sample		Pre-Asian Crisis		Asian Crisis		Pre-US Crisis		US Crisis		Crisis Recovery	
	3 Sep 1992– 14 Aug 2013	0.03(0.38) 0.04(0.5)	3 Sept 1992– 30 Dec 1996	2 Jan 1997– 31 Dec 1997	5 Jan 1998– 29 Dec 2006	3 Jan 2007– 30 Dec 2011	4 Jan 2012– 14 Aug 2013					
p_PRC,HK	0.03(0.38)	0.02(0.25)	0.14(2.27)**	0.1(2.86)***	0.5(19.7)***	0.55(16.38)***						
p_PRC,INDIA	0.04(0.5)	0.11(2.29)**	0.03(0.53)	0.06(1.46)	0.25(7.97)***	0.25(5.25)***						
p_PRC,MY	0.02(0.26)	0.04(0.46)	-0.04(-0.62)	0.05(1.47)	0.29(8.36)***	0.28(5.79)***						
p_PRC,PH	0.00(0.02)	0(-0.04)	0.13(2.01)**	0.03(0.92)	0.21(5.61)***	0.23(4.18)***						
p_MY,TH	0.21(1.86)*	0.38(11.32)***	0.18(2.97)***	0.3(9.5)***	0.47(16.36)***	0.31(6.83)***						
p_MY,PH	0.04(0.24)	0.26(5.86)***	0.32(4.4)***	0.22(5.59)***	0.48(18.25)***	0.32(5.18)***						
p_MY,INDO	0.24(1.67)*	0.29(1.54)	0.37(5.59)***	0.27(7.77)***	0.54(18.79)***	0.39(7.9)***						
p_MY,TAP	0(0.01)	0.08(2.32)**	0.17(2.76)***	0.24(7.48)***	0.49(17.13)***	0.34(6.76)***						
p_MY,KR	0.01(0.12)	0.05(1.57)	0.09(1.23)	0.26(6.62)***	0.51(19.31)***	0.27(4.78)***						
p_MY,SG	-0.03(-5.49)***	-0.12(-0.48)	0.03(0.49)	0.01(0.36)	0.17(4.19)***	0.06(1.02)						
p_MY,HK	0.23(2.26)**	0.4(12.15)***	0.28(5.02)***	0.31(8.96)***	0.54(16.7)***	0.32(6.66)***						
p_MY,INDIA	0.08(0.78)	0.05(0.75)	0.07(1.07)	0.15(3.99)***	0.4(12.01)***	0.19(3.38)***						
p_TH,PH	0.10(0.76)	0.24(5.12)***	0.11(1.61)	0.25(6.32)***	0.36(11.73)***	0.40(9.48)***						
p_TH,INDO	0.19(1.33)	0.28(1.93)*	0.25(3.99)***	0.32(10.63)***	0.5(15.23)***	0.48(11.72)***						
p_TH,TAP	-0.03(-0.27)	0.05(1.39)	0.04(0.56)	0.28(7.17)***	0.44(16.35)***	0.40(9.53)***						
p_TH,KR	0.06(0.47)	0.11(3.22)***	0.2(3.1)***	0.34(8.42)***	0.47(17.48)***	0.40(9.65)***						

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Appendix Table 3 *continued*

Economy Pairs	Full Sample		Pre-Asian Crisis		Asian Crisis		Pre-US Crisis		US Crisis		Crisis Recovery	
	3 Sep 1992– 14 Aug 2013		3 Sept 1992– 30 Dec 1996		2 Jan 1997– 31 Dec 1997		5 Jan 1998– 29 Dec 2006		3 Jan 2007– 30 Dec 2011		4 Jan 2012– 14 Aug 2013	
p_TH,SG	-0.02(-4.41)***		-0.1(-0.34)		-0.02(-0.25)		0.04(1.3)		0.23(7.33)***		0.23(4.9)***	
p_TH,HK	0.17(1.66)*		0.37(10.38)***		0.14(2.15)**		0.37(10.09)***		0.56(21.44)***		0.53(15.09)***	
p_TH,INDIA	0.08(0.67)		0.04(0.71)		0.1(1.79)*		0.22(6.8)***		0.46(14.42)***		0.43(10.21)***	
p_PH,INDO	0.17(0.99)		0.28(1.33)		0.36(7.03)***		0.25(7)***		0.4(11.53)***		0.35(7.65)***	
p_PH,TAP	0.00(0)		0.07(2.24)**		0.17(2.74)***		0.21(4.21)***		0.4(11.86)***		0.38(8.2)***	
p_PH,KR	0.00(0.02)		0.05(1.35)		0.02(0.34)		0.25(5.87)***		0.43(16)***		0.39(9.23)***	
p_PH,SG	0.00(0.14)		-0.15(-0.67)		0.07(1.13)		0.04(1.2)		0.08(2.28)**		0.13(2.85)***	
p_PH,HK	0.10(0.98)		0.23(4.93)***		0.32(4.83)***		0.25(6.45)***		0.44(16.33)***		0.39(9.22)***	
p_PH,INDIA	0.13(1.21)		0.07(0.98)		-0.02(-0.31)		0.16(4.43)***		0.28(8.03)***		0.20(3.88)***	
p_INDO,TAP	0.08(0.82)		0.05(1.32)		0.16(2.62)***		0.25(7.38)***		0.5(16.95)***		0.40(7.52)***	
p_INDO,KR	0.12(0.92)		0.06(1.79)*		0.05(0.74)		0.29(7.67)***		0.5(15.03)***		0.46(12.15)***	
p_INDO,SG	-0.01(-1.98)**		0(0)		-0.07(-0.95)		0.02(0.59)		0.19(5.68)***		0.14(2.56)**	
p_INDO,HK	0.15(1.3)		0.25(1.67)*		0.34(5.82)***		0.33(10.59)***		0.6(21.53)***		0.53(15.82)***	
p_INDO,INDIA	0.05(0.52)		0.07(0.85)		0.1(1.6)		0.24(6.78)***		0.45(13.96)***		0.39(8.58)***	
p_TAP,KR	0.05(0.52)		-0.02(-0.47)		0.18(2.24)**		0.43(14.3)***		0.69(36.06)***		0.62(17.52)***	
p_TAP,SG	0.01(2.68)***		0.01(0.12)		-0.07(-1.08)		0.09(2.43)**		0.16(4.64)***		0.14(2.79)***	

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Appendix Table 3 continued

Economy Pairs	Full Sample		Pre-Asian Crisis		Asian Crisis		Pre-US Crisis		US Crisis		Crisis Recovery	
	3 Sep 1992– 14 Aug 2013	0.05(0.65)	3 Sept 1992– 30 Dec 1996	0.13(3.87)***	2 Jan 1997– 31 Dec 1997	0.11(1.45)	5 Jan 1998– 29 Dec 2006	0.39(13.59)***	3 Jan 2007– 30 Dec 2011	0.61(26.02)***	4 Jan 2012– 14 Aug 2013	0.57(13.74)***
p_TAP, HK	-0.01(-0.08)	0.02(0.59)	-0.05(-0.75)	0.12(1.66)*	0.23(7.05)***	0.38(12.73)***	0.22(6.57)***	0.66(32.7)***	0.27(5.42)***	0.35(6.94)***	0.63(22.11)***	0.41(9.64)***
p_TAP, INDIA	0.01(1.71)*	0.07(2.01)**	0.18(2.1)**	0.14(2.24)**	0.3(8.47)***	0.42(13.27)***	0.05(1.3)	0.55(19.94)***	0.23(4.08)***	0.24(4.81)***	0.50(10.86)***	0.27(5.42)***
p_KR, SG	0.00(-0.57)	-0.01(-0.07)	0.09(1.31)	0.14(2.05)**	0.12(3.56)***	0.22(6.41)***	0.01(0.89)	0.01(2.13)	0.01(5.57)	0.01(5.57)	0.03(3.01)	0.03(3.01)
p_KR, HK	0.02(3.48)***	0.01(0.14)	0.08(1.03)	0.07(2.01)**	0.05(1.3)	0.08(1.03)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)
p_KR, INDIA	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)	0.01(0.14)
p_SG, HK	0.01(10.76)	0.03(4.04)	0.01(0.89)	0.03(4.04)	0.01(0.89)	0.01(0.89)	0.01(2.13)	0.01(2.13)	0.01(5.57)	0.01(5.57)	0.03(3.01)	0.03(3.01)
p_SG, INDIA	0.01(10.76)	0.03(4.04)	0.01(0.89)	0.03(4.04)	0.01(0.89)	0.01(0.89)	0.01(2.13)	0.01(2.13)	0.01(5.57)	0.01(5.57)	0.03(3.01)	0.03(3.01)
p_HK, INDIA	0.01(10.76)	0.03(4.04)	0.01(0.89)	0.03(4.04)	0.01(0.89)	0.01(0.89)	0.01(2.13)	0.01(2.13)	0.01(5.57)	0.01(5.57)	0.03(3.01)	0.03(3.01)
Alpha	0.01(10.76)	0.03(4.04)	0.01(0.89)	0.03(4.04)	0.01(0.89)	0.01(0.89)	0.01(2.13)	0.01(2.13)	0.01(5.57)	0.01(5.57)	0.03(3.01)	0.03(3.01)
Beta	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)	0.99(10.67)

DCC = dynamic condition correlation, HK = Hong Kong, China; INDO = Indonesia; KR = Republic of Korea; MY = Malaysia; PH = Philippines; PRC = People's Republic of China; SG = Singapore; TH = Thailand; TAP = Taipei, China; US = United States.

Source: Author's calculations.

**Appendix Table 4: The Impact of Capital Flow Management Measures**  
**Appendix Table 4A: Step 1: The Univariate GARCH Calculation with Determinant Factors in the Mean and Variance Equation**

Variables	Coefficient (z value)									
	i = krfxe1	i = krfxe3	i = phfxel	i = indoborw	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2		
<b>rset</b>										
bicloiss	0(3.42)***	0(3.44)***	0(3.33)***	0(3.36)***	0(3.43)***	0(3.35)***	0(3.41)***	0(3.33)***		
rthb	-0.19(-2.78)***	-0.19(-2.77)***	-0.19(-2.76)***	-0.19(-2.75)***	-0.2(-2.84)***	-0.19(-2.75)***	-0.19(-2.76)***	-0.19(-2.76)***		
arch	0.18(6.3)***	0.17(6.52)***	0.18(6.39)***	0.17(6.43)***	0.18(6.3)***	0.18(6.41)***	0.17(6.46)***	0.18(6.39)***		
garch	0.61(10.55)***	0.72(14.56)***	0.65(11.71)***	0.67(12.6)***	0.62(10.84)***	0.66(12.03)***	0.7(13.21)***	0.65(11.72)***		
vix	0.04(5.01)***	0.08(3.07)***	0.05(4.1)***	0.06(3.86)***	0.04(4.91)***	0.05(3.96)***	0.07(3.26)***	0.05(4.08)***		
dummy(i)	-1.19(-3.24)***	-0.46(-0.76)***	-0.94(-2.42)***	-0.85(-2.08)***	-1.13(-3.09)***	-0.9(-2.26)***	-0.64(-1.29)***	-0.94(-2.4)***		
_cons	-1.91(-4.47)***	-3.94(-2.85)***	-2.57(-3.84)***	-2.91(-3.63)***	-2.05(-4.42)***	-2.73(-3.72)***	-3.5(-3.04)***	-2.58(-3.82)***		
<b>rfbmkici</b>										
bicloiss	0(3.22)***	0(3.07)***	0(2.97)***	0(2.98)***	0(3.19)***	0(2.99)***	0(3.08)***	0(2.96)***		
rmyr	-0.08(-2.59)***	-0.08(-2.41)***	-0.09(-2.53)***	-0.08(-2.43)***	-0.09(-2.61)***	-0.08(-2.43)***	-0.08(-2.33)***	-0.09(-2.54)***		
arch	0.1(4.63)***	0.12(5.21)***	0.11(5.01)***	0.11(5.07)***	0.1(4.74)***	0.11(5.05)***	0.12(5.14)***	0.11(5.01)***		
garch	0.05(0.69)	0.12(1.24)	0.1(1.09)	0.1(1.15)	0.07(0.91)	0.1(1.11)	0.1(1.11)	0.1(1.08)		
vix	0.03(10.76)***	0.04(10.68)***	0.03(10.49)***	0.03(10.53)***	0.03(10.79)***	0.03(10.53)***	0.04(10.69)***	0.03(10.48)***		
dummy(i)	-0.8(-11.96)***	-0.7(-8.67)***	-0.66(-8.91)***	-0.65(-8.63)***	-0.74(-10.7)***	-0.66(-8.8)***	-0.72(-3.1)***	-0.65(-8.89)***		
_cons	-1.43(-10.75)***	-1.64(-9.8)***	-1.56(-9.99)***	-1.58(-9.99)***	-1.5(-10.55)***	-1.57(-10.22)***	-1.62(-3)***	-1.56(-9.89)***		

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Appendix Table 4A continued

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxel	i = indoborrow	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rpcomp</b>								
bicloiss	0(3.47)***	0(3.51)***	0(3.46)***	0(3.48)***	0(3.56)***	0(3.48)***	0(3.49)***	0(3.47)***
rphp	-0.36(-5.97)***	-0.36(-5.77)***	-0.37(-5.91)***	-0.36(-5.85)***	-0.37(-6.02)***	-0.36(-5.86)***	-0.36(-5.78)***	-0.37(-5.89)***
arch	0.21(6.53)***	0.22(5.76)***	0.21(5.87)***	0.21(5.9)***	0.21(6.36)***	0.21(6.00)***	0.22(6.12)***	0.21(5.89)***
garch	0.39(4.46)***	0.5(3.62)***	0.51(3.81)***	0.5(3.82)***	0.45(4.32)***	0.49(3.9)***	0.47(3.99)***	0.51(3.85)***
vix	0.04(7.07)***	0.05(3.91)***	0.04(4.01)***	0.04(4.42)***	0.04(5.68)***	0.04(4.5)***	0.04(4.87)***	0.04(4.05)***
dummy(i)	-0.75(-5.5)***	-0.72(-2.5)***	-0.72(-2.51)***	-0.73(-2.69)***	-0.82(-3.83)***	-0.73(-2.88)***	-0.72(-3.1)***	-0.73(-2.54)***
-cons	-1.15(-3.92)***	-1.79(-2.49)***	-1.76(-2.56)***	-1.71(-2.66)***	-1.43(-3.34)***	-1.65(-2.79)***	-1.62(-3.0)***	-1.75(-2.59)***
<b>rshcomp</b>								
bicloiss	0(-0.9)	0(-0.84)	0(-0.9)	0(-0.82)	0(-0.83)	0(-0.83)	0(-0.9)	0(-0.89)
rcny	0.08(0.27)	0.08(0.28)	0.13(0.46)	0.11(0.4)	0.08(0.29)	0.13(0.47)	0.08(0.29)	0.14(0.49)
arch	0.08(3.44)***	0.09(3.24)***	0.09(3.55)***	0.08(3.43)***	0.07(3.33)***	0.08(3.46)***	0.09(3.37)***	0.09(3.55)***
garch	0.07(0.68)	0.05(0.3)	0.04(0.32)	-0.02(-0.19)	0.04(0.37)	0(-0.03)	0.08(0.5)	0.03(0.29)
vix	0.02(5.49)***	0.02(5.41)***	0.02(5.28)***	0.02(5.31)***	0.02(5.65)***	0.02(5.26)***	0.02(5.34)***	0.02(5.28)***
dummy(i)	-0.82(-11.04)***	-0.82(-9.94)***	-0.83(-10.77)***	-0.87(-11.38)***	-0.84(-11.46)***	-0.88(-11.39)***	-0.84(-9.9)***	-0.83(-10.75)***
-cons	0.49(3.03)***	0.43(1.89)***	0.5(3.06)***	0.57(3.76)***	0.52(3.61)***	0.55(3.6)***	0.41(1.81)***	0.5(3.03)***

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Appendix Table 4A continued

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxe1	i = indoborrow	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rjci</b>								
bicloiss	0(4.21)***	0(4.1)***	0(4.07)***	0(4.08)***	0(4.22)***	0(4.09)***	0(4.1)***	0(4.07)***
ridr	-0.06(-1.61)	-0.07(-1.92)	-0.07(-1.94)	-0.07(-1.89)	-0.07(-1.72)	-0.07(-1.9)	-0.07(-1.93)	-0.07(-1.94)
arch	0.17(6.05)***	0.19(6.2)***	0.19(6.22)***	0.19(6.18)***	0.19(6.26)***	0.19(6.19)***	0.19(6.15)***	0.19(6.21)***
garch	0.03(0.38)	0.05(0.75)	0.05(0.68)	0.04(0.54)	0.05(0.73)	0.04(0.55)	0.04(0.62)	0.04(0.66)
vix	0.04(12.5)***	0.04(12.6)***	0.04(12.37)***	0.04(12.44)***	0.04(12.53)***	0.04(12.43)***	0.04(12.6)***	0.04(12.37)***
dummy(i)	-0.48(-7.19)***	-0.47(-5.95)***	-0.47(-6.26)***	-0.49(-6.51)***	-0.46(-6.58)***	-0.5(-6.66)***	-0.5(-6.41)***	-0.47(-6.27)***
-cons	-0.5(-3.34)***	-0.61(-4.15)***	-0.57(-3.88)***	-0.56(-3.79)***	-0.58(-3.85)***	-0.55(-3.79)***	-0.58(-3.99)***	-0.57(-3.87)***
<b>rtwse</b>								
bicloiss	0(0.95)	0(0.86)	0(0.86)	0(0.82)	0(1)	0(0.83)	0(0.86)	0(0.86)
rtwd	-0.17(-2.34)**	-0.16(-2.19)**	-0.16(-2.26)**	-0.16(-2.27)**	-0.17(-2.36)**	-0.16(-2.26)**	-0.16(-2.22)**	-0.16(-2.26)**
arch	0(-0.21)	0(0)	0(0.1)	0(0.13)	0(-0.01)	0(0.13)	0(0.03)	0(0.1)
garch	-0.24(-3.09)***	-0.38(-4.26)***	-0.34(-3.78)***	-0.36(-3.99)***	-0.25(-3.2)***	-0.35(-3.91)***	-0.38(-4.34)***	-0.34(-3.79)***
vix	0.05(15.73)***	0.05(15.87)***	0.05(15.7)***	0.05(15.78)***	0.05(15.65)***	0.05(15.75)***	0.05(15.83)***	0.05(15.71)***
dummy(i)	-0.52(-8.79)***	-0.31(-5.1)***	-0.37(-5.97)***	-0.33(-5.4)***	-0.5(-8.28)***	-0.34(-5.58)***	-0.32(-5.34)***	-0.36(-5.95)***
-cons	-0.34(-3.01)***	-0.9(-2.48)***	-0.29(-2.53)***	-0.29(-2.47)***	-0.33(-2.97)***	-0.29(-2.49)***	-0.28(-2.45)***	-0.29(-2.54)***

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Appendix Table 4A continued

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxe1	i = indoborrow	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rkospi</b>								
bicloiss	0(2.85)***	0(2.82)***	0(2.77)***	0(2.74)***	0(2.88)***	0(2.75)***	0(2.76)***	0(2.77)***
rkrw	0.01(0.39)	0.01(0.41)	0.01(0.39)	0.01(0.33)	0.01(0.31)	0.01(0.33)	0.01(0.4)	0.01(0.38)
arch	0(-0.11)	0(0.08)	0(0.08)	0(0.13)	0(0.03)	0(0.13)	0(0.15)	0(0.08)
garch	-0.21(-3.84)***	-0.22(-2.77)***	-0.21(-2.99)***	-0.21(-2.8)***	-0.2(-3.3)***	-0.21(-2.82)***	-0.19(-2.46)***	-0.22(-3)***
vix	0.05(18.76)***	0.05(19.14)***	0.05(18.94)***	0.05(18.97)***	0.05(18.86)***	0.05(18.95)***	0.05(19.04)***	0.05(18.92)***
dummy(i)	-0.64(-12.57)***	-0.42(-7.26)***	-0.46(-8.56)***	-0.45(-8.14)***	-0.61(-11.52)***	-0.46(-8.39)***	-0.4(-7.0)***	-0.46(-8.54)***
_cons	-0.05(-0.61)	-0.15(-1.49)	-0.2(-1.23)	-0.13(-1.35)	-0.09(-1.03)	-0.13(-1.34)	-0.17(-1.61)	-0.12(-1.18)
<b>rsgx</b>								
bicloiss	0(4.16)***	0(4.02)***	0(4.07)***	0(4.05)***	0(4.13)***	0(4.06)***	0(4.04)***	0(4.07)***
rsgd	-0.03(-2.79)***	-0.03(-2.68)***	-0.03(-2.69)***	-0.03(-2.69)***	-0.03(-2.75)***	-0.03(-2.69)***	-0.03(-2.69)***	-0.03(-2.7)***
arch	0.02(1.66)*	0.03(1.92)*	0.03(1.86)*	0.03(1.87)*	0.03(1.74)*	0.03(1.86)*	0.03(1.92)*	0.03(1.86)*
garch	-0.07(-1.95)*	-0.06(-1.68)*	-0.06(-1.79)*	-0.06(-1.75)*	-0.07(-1.85)*	-0.06(-1.76)*	-0.06(-1.73)*	-0.06(-1.81)*
vix	0.08(29.62)***	0.08(29.52)***	0.08(29.51)***	0.08(29.45)***	0.09(29.69)***	0.08(29.47)***	0.08(29.52)***	0.08(29.49)***
dummy(i)	-0.27(-5.69)***	-0.19(-3.42)***	-0.22(-4.4)***	-0.21(-3.98)***	-0.23(-4.78)***	-0.22(-4.21)***	-0.2(-3.6)***	-0.23(-4.42)***
_cons	-1.66(-18.11)***	-1.71(-18.52)***	-1.69(-18.28)***	-1.69(-18.33)***	-1.68(-18.29)***	-1.69(-18.33)***	-1.71(-18.44)***	-1.68(-18.26)***

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Appendix Table 4A continued

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxe1	i = indoborrow	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rhsi</b>								
bicloiss	0(1.96)**	0(1.98)**	0(1.93)**	0(1.94)**	0(2.03)**	0(1.95)**	0(1.96)**	0(1.93)**
rthkd	-0.38(-0.73)	-0.49(-0.93)	-0.45(-0.87)	-0.47(-0.89)	-0.44(-0.84)	-0.46(-0.89)	-0.49(-0.93)	-0.45(-0.86)
arch	0.08(4.64)***	0.09(4.89)	0.08(4.85)***	0.08(4.82)***	0.08(4.68)**	0.08(4.82)***	0.08(4.87)***	0.08(4.85)***
garch	0.05(0.68)	0.08(1.18)	0.08(1.13)	0.07(1.05)	0.05(0.76)	0.07(1.05)	0.08(1.17)	0.08(1.11)
vix	0.06(21.2)***	0.07(21.48)***	0.07(21.31)***	0.07(21.41)***	0.06(21.26)**	0.07(21.39)***	0.07(21.45)***	0.07(21.31)***
dummy(i)	-0.36(-6.32)***	-0.2(-3.05)**	-0.25(-3.97)***	-0.25(-3.99)**	-0.38(-6.45)***	-0.26(-4.12)**	-0.22(-3.36)**	-0.25(-3.98)***
_cons	-0.91(-6.61)***	-1.05(-7.42)***	-1.02(-7.26)***	-1.01(-7.27)***	-0.92(-6.73)***	-1.01(-7.26)***	-1.04(-7.41)***	-1.02(-7.25)***
<b>rsensex</b>								
bicloiss	0(2.21)**	0(2.32)**	0(2.21)**	0(2.22)**	0(2.25)**	0(2.23)**	0(2.3)**	0(2.21)**
rinr	0.08(1.59)	0.08(1.47)	0.08(1.5)	0.09(1.6)	0.08(1.52)	0.09(1.6)	0.08(1.51)	0.08(1.49)
arch	0.12(4.45)***	0.14(4.82)***	0.14(4.88)***	0.14(4.88)***	0.13(4.67)***	0.14(4.86)***	0.13(4.79)***	0.14(4.89)***
garch	-0.16(-2.18)**	-0.08(-0.96)**	-0.1(-1.18)**	-0.08(-0.94)**	-0.14(-1.91)**	-0.09(-1.02)**	-0.11(-1.29)**	-0.1(-2.22)**
vix	0.04(12.21)***	0.04(12.73)***	0.04(12.47)***	0.04(12.53)***	0.04(12.38)***	0.04(12.51)***	0.04(12.67)***	0.04(12.47)***
dummy(i)	-0.73(-11.59)***	-0.64(-8.44)***	-0.58(-8.27)***	-0.59(-8.12)***	-0.7(-10.71)***	-0.6(-8.37)***	-0.66(-8.91)***	-0.58(-8.26)***
_cons	0.09(0.79)	-0.12(-0.92)	-0.08(-0.6)	-0.11(-0.83)	0.03(0.24)	-0.1(-0.73)	-0.08(-0.62)	-0.08(-0.58)

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Appendix Table 4A continued

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxe1	i = indoborw	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rspx</b>								
bicloiss	0(4.59)***	0(4.46)***	0(4.51)***	0(4.49)***	0(4.56)***	0(4.5)***	0(4.48)***	0(4.52)***
arch	0.02(1.28)	0.02(1.6)	0.02(1.53)	0.02(1.53)	0.02(1.41)	0.02(1.52)	0.02(1.58)	0.02(1.53)
garch	-0.05(-1.67)*	-0.05(-1.51)*	-0.05(-1.59)*	-0.05(-1.56)*	-0.05(-1.63)*	-0.05(-1.56)*	-0.05(1.55)*	-0.05(-1.61)*
vix	0.09(30.24)***	0.09(30.09)***	0.09(30.08)***	0.09(30.01)***	0.09(30.29)***	0.09(30.03)***	0.09(30.09)***	0.09(30.06)***
dummy(i)	-0.27(-5.84)***	-0.18(-3.19)***	-0.22(-4.28)***	-0.2(-3.8)***	-0.23(-4.84)***	-0.21(-4.01)***	-0.19(-3.42)***	-0.22(-4.32)***
_cons	-1.75(-18.89)***	-1.8(-19.21)***	-1.77(-19.01)***	-1.78(-19.03)***	-1.77(-19.04)***	-1.78(-19.04)***	-1.8(-19.15)***	-1.77(18.98)***

## Notes:

1. krfxe1 means the Rep. of Korea measure (19 Nov 2009)—Capped the FX forward position for exporters to up to 125% of the underlying position and required banks to raise their long-term foreign currency borrowing from 80% to 90% of long-term lending.
2. krfxe3 means the Rep. of Korea measure (26 Nov 2012)—Cut the ceiling on FX derivative contracts owned by domestic banks from 40% to 30% of equity and by foreign bank branches from 200% to 150%, effective November 2012.
3. Phfxe1 means the Philippines measure (5 Nov 2010)—Starved the market of US dollars by “rolling-off” the FX forward book to stem peso appreciation.
4. Indoborw means the Indonesian measure (30 Dec 2010)—Re-imposed the limit on banks’ ST foreign borrowing to 30% of capital, effective March 2011.
5. Cnborrow means the PRC measure (31 Mar 2010)—SAFE cut the short-term debt quota by 1.5% to \$32.4 to prevent abnormal capital inflows, effective April 2010.
6. krborrow1 means the Rep. of Korea measure (19 Dec 2010)—Banks’ levy on non-deposit FC liabilities, effective 1 Aug 2011 (<1 year = 0.2%, 1–3 years = 0.1%, >3 years = 0.05%).
7. Indomin2 means the Indonesian measure (13 Apr 2011)—Increased the holding period to 6 months, effective 13 May.
8. Twlim2 means the Taipei, China measure (9 Nov 2010)—Restricted offshore funds from investing more than 30% of their portfolio in money market products and government debt with maturity of less than a year.

Source: Author’s calculations.

**Appendix Table 4B: Step 2: Calculation of Conditional Correlation Coefficients**

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phtfel	i = indoborw	i = cmborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rset</b>								
rfbmkici	0.38(17.56)***	0.39(17.15)***	0.39(17.42)***	0.39(17.22)***	0.39(17.66)***	0.39(17.29)***	0.39(17.19)***	0.39(17.41)***
rpcomp	0.25(10.62)***	0.25(10.36)***	0.25(10.54)***	0.25(10.45)***	0.25(10.63)***	0.25(10.49)***	0.25(10.41)***	0.25(10.54)***
rshcomp	0.17(6.73)***	0.16(6.44)***	0.17(6.61)***	0.17(6.54)***	0.17(6.66)***	0.17(6.54)***	0.16(6.48)***	0.17(6.6)***
rjci	0.45(22.03)***	0.45(21.61)***	0.45(21.82)***	0.45(21.71)***	0.45(22.01)***	0.45(21.77)***	0.45(21.69)***	0.45(21.81)***
rtwse	0.37(16.65)***	0.38(16.32)***	0.38(16.45)***	0.38(16.25)***	0.37(16.68)***	0.38(16.3)***	0.38(16.35)***	0.38(16.44)***
rkosp	0.4(18.17)***	0.4(17.66)***	0.4(17.96)***	0.4(17.64)***	0.4(18.25)***	0.4(17.72)***	0.4(17.74)***	0.4(17.94)***
rsgx	0.14(5.43)***	0.14(5.27)***	0.14(5.35)***	0.14(5.3)***	0.14(5.4)***	0.14(5.31)***	0.14(5.28)***	0.14(5.35)***
rhsi	0.48(24.58)***	0.49(24.08)***	0.49(24.31)***	0.49(24.06)***	0.48(24.65)***	0.49(24.13)***	0.49(24.13)***	0.49(24.3)***
rsensex	0.39(18.41)***	0.39(17.92)***	0.39(18.02)***	0.39(17.9)***	0.39(18.25)***	0.39(17.94)***	0.40(17.99)***	0.39(18.01)***
rspx	0.15(5.64)***	0.15(5.46)***	0.15(5.54)***	0.15(5.49)***	0.15(5.6)***	0.15(5.5)***	0.15(5.48)***	0.15(5.54)***
<b>rfbmkici</b>								
rpcomp	0.39(17.91)***	0.39(17.42)***	0.39(17.61)***	0.39(17.54)***	0.39(17.7)***	0.39(17.57)***	0.39(17.45)***	0.39(17.62)***
rshcomp	0.21(8.54)***	0.22(8.53)***	0.22(8.51)***	0.22(8.44)***	0.22(8.46)***	0.22(8.46)***	0.22(8.57)***	0.22(8.51)***
rjci	0.45(21.72)***	0.45(21.4)***	0.45(21.61)***	0.45(21.44)***	0.45(21.66)***	0.45(21.48)***	0.45(21.5)***	0.45(21.6)***
rtwse	0.44(20.86)***	0.45(20.8)***	0.45(20.84)***	0.45(20.79)***	0.44(20.83)***	0.45(20.81)***	0.45(20.8)***	0.45(20.83)***
rkosp	0.43(20.17)***	0.44(19.77)***	0.44(20.06)***	0.44(19.88)***	0.43(20.16)***	0.44(19.93)***	0.44(19.82)***	0.44(20.05)***
rsgx	0.06(2.26)**	0.06(2.14)**	0.06(2.17)**	0.06(2.13)**	0.06(2.2)**	0.06(2.13)**	0.06(2.12)**	0.06(2.17)**
rhsi	0.46(22.45)***	0.47(22.12)***	0.47(22.29)***	0.47(22.19)***	0.46(22.46)***	0.47(22.25)***	0.47(22.17)***	0.47(22.29)***
rsensex	0.32(13.6)***	0.32(13.23)***	0.32(13.6)***	0.32(13.6)***	0.32(13.6)***	0.32(13.6)***	0.32(13.6)***	0.32(13.6)***
rspx	0.07(2.52)**	0.07(2.39)**	0.07(2.41)**	0.07(2.37)**	0.07(2.46)**	0.07(2.38)**	0.07(2.36)**	0.07(2.42)**

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**Appendix Table 4B** *continued*

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxel	i = indoborw	i = cnborrow	i = krborrowl	i = indomin2	i = twlim2
<b>rpcomp</b>								
rshcomp	0.13(5.22)***	0.14(5.31)***	0.14(5.38)***	0.14(5.31)***	0.13(5.11)***	0.14(5.31)***	0.14(5.38)***	0.14(5.38)***
rjci	0.34(14.78)***	0.34(14.7)***	0.34(14.83)***	0.34(14.79)***	0.34(14.82)***	0.34(14.8)***	0.34(14.75)***	0.34(14.84)***
rtwse	0.35(15.59)***	0.36(15.53)***	0.36(15.57)***	0.36(15.53)***	0.35(15.54)***	0.36(15.56)***	0.36(15.56)***	0.36(15.57)***
rkospi	0.36(15.81)***	0.36(15.61)***	0.36(15.69)***	0.36(15.66)***	0.36(15.76)***	0.36(15.68)***	0.36(15.64)***	0.36(15.69)***
rsgx	0.03(0.96)	0.03(0.97)	0.03(0.97)	0.03(0.95)	0.03(0.97)	0.03(0.95)	0.03(0.96)	0.03(0.98)
rhsi	0.36(16.01)***	0.36(15.83)***	0.36(15.96)***	0.36(15.89)***	0.36(15.99)***	0.36(15.91)***	0.36(15.87)***	0.36(15.96)***
rsensex	0.24(10.01)***	0.24(9.81)***	0.24(9.84)***	0.24(9.8)***	0.24(9.94)***	0.24(9.82)***	0.24(9.84)***	0.24(9.84)***
rspx	0.03(1.13)	0.03(1.12)	0.03(1.13)	0.03(1.11)	0.03(1.13)	0.03(1.11)	0.03(1.12)	0.03(1.14)
<b>rshcomp</b>								
rjci	0.22(9.14)***	0.23(8.97)***	0.23(9.11)***	0.23(9.03)***	0.22(8.99)***	0.23(9.06)***	0.23(9.0)***	0.23(9.11)***
rtwse	0.26(10.73)***	0.27(10.36)***	0.26(10.43)***	0.27(10.45)***	0.26(10.56)***	0.27(10.48)***	0.27(10.38)***	0.26(10.44)***
rkospi	0.26(10.74)***	0.27(10.4)***	0.26(10.46)***	0.27(10.52)***	0.26(10.55)***	0.27(10.54)***	0.27(10.46)***	0.26(10.46)***
rsgx	0.07(2.56)***	0.07(2.39)***	0.07(2.5)***	0.07(2.39)***	0.07(2.54)***	0.07(2.39)***	0.07(2.37)***	0.07(2.5)***
rhsi	0.4(17.96)***	0.39(17.1)***	0.4(17.42)***	0.4(17.32)***	0.4(17.67)***	0.4(17.39)***	0.4(17.21)***	0.4(17.42)***
rsensex	0.21(8.38)***	0.21(8.14)***	0.21(8.24)***	0.21(8.11)***	0.21(8.25)***	0.21(8.15)***	0.21(8.21)***	0.21(8.24)***
rspx	0.06(2.28)**	0.06(2.14)**	0.06(2.24)**	0.06(2.14)**	0.06(2.26)**	0.06(2.14)**	0.06(2.12)**	0.06(2.24)**
<b>rjci</b>								
rtwse	0.44(20.63)***	0.44(20.51)***	0.44(20.57)***	0.44(20.45)***	0.44(20.6)***	0.44(20.5)***	0.44(20.57)***	0.44(20.56)***
rkospi	0.47(23.31)***	0.48(23.21)***	0.48(23.2)***	0.48(23.15)***	0.47(23.22)***	0.48(23.22)***	0.48(23.26)***	0.48(23.2)***

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Appendix Table 4B continued

Variables	Coefficient (z value)							
	i = krfxw1	i = krfxe3	i = phfxe1	i = indoborrow	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
rsgx	0.1(3.86)***	0.11(3.83)***	0.11(3.88)***	0.11(3.85)***	0.1(3.86)***	0.11(3.86)***	0.11(3.84)***	0.11(3.88)***
rhsi	0.54(29.51)***	0.55(29.45)***	0.54(29.51)***	0.55(29.47)***	0.54(29.52)***	0.55(29.54)***	0.55(29.53)***	0.54(29.52)***
rsensex	0.4(18.78)***	0.41(18.2)***	0.4(18.24)***	0.41(18.22)***	0.41(18.67)***	0.41(18.29)***	0.41(18.31)***	0.4(18.23)***
rspx	0.11(4.08)***	0.11(4.04)***	0.11(4.08)***	0.11(4.06)***	0.11(4.06)***	0.11(4.06)***	0.11(4.05)***	0.11(4.09)***
<b>rtwse</b>								
rkospi	0.66(45.76)***	0.67(44.65)***	0.67(44.86)***	0.67(44.85)***	0.66(45.31)***	0.67(44.93)***	0.67(44.71)***	0.67(44.87)***
rsgx	0.13(4.59)***	0.13(4.37)***	0.13(4.46)***	0.13(4.4)***	0.13(4.55)***	0.13(4.41)***	0.13(4.39)***	0.13(4.46)***
rhsi	0.58(33.2)***	0.58(33.01)***	0.58(33.03)***	0.58(32.97)***	0.58(33.13)***	0.58(33.02)***	0.58(33.08)***	0.58(33.04)***
rsensex	0.34(14.41)***	0.34(14.15)***	0.34(14.1)***	0.34(14.09)***	0.34(14.3)***	0.34(14.11)***	0.34(14.2)***	0.34(14.1)***
rspx	0.12(4.41)***	0.12(4.2)***	0.12(4.29)***	0.12(4.23)***	0.12(4.37)***	0.12(4.24)***	0.12(4.22)***	0.12(4.29)***
<b>rkospi</b>								
rsgx	0.17(6.08)***	0.16(5.72)***	0.17(5.86)***	0.17(5.77)***	0.17(5.98)***	0.16(5.78)***	0.16(5.71)***	0.17(5.86)***
rhsi	0.62(39.76)***	0.63(39.4)***	0.62(39.37)***	0.63(39.35)***	0.63(39.5)***	0.63(39.42)***	0.63(39.42)***	0.63(39.37)***
rsensex	0.39(17.55)***	0.4(17.38)***	0.4(17.31)***	0.4(17.24)***	0.39(17.49)***	0.4(17.28)***	0.4(17.47)***	0.4(17.29)***
rspx	0.16(6.02)***	0.16(5.69)***	0.16(5.82)***	0.16(5.74)***	0.16(5.95)***	0.16(5.75)***	0.16(5.68)***	0.16(5.83)***
<b>rsgx</b>								
rhsi	0.17(6.29)***	0.17(6.15)***	0.17(6.22)***	0.17(6.18)***	0.17(6.24)***	0.17(6.18)***	0.17(6.15)***	0.17(6.22)***
rsensex	0.16(5.95)***	0.16(5.76)***	0.16(5.77)***	0.16(5.72)***	0.16(5.88)***	0.16(5.72)***	0.16(5.77)***	0.16(5.77)***
rspx	0.99(119.2)***	0.99(117.6)***	0.99(119.0)***	0.99(118.1)***	0.99(119.5)***	0.99(118.3)***	0.99(118.1)***	0.99(119.0)***

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Appendix Table 4B continued

Variables	Coefficient (z value)							
	i = krfxe1	i = krfxe3	i = phfxe1	i = indoborrow	i = cnborrow	i = krborrow1	i = indomin2	i = twlim2
<b>rhsi</b>								
rsensex	0.49(24.31)***	0.49(23.71)***	0.49(23.78)***	0.49(23.64)***	0.49(24.16)***	0.49(23.73)***	0.49(23.85)***	0.49(23.78)***
rspx	0.17(6.2)***	0.17(6.06)***	0.17(6.13)***	0.17(6.09)***	0.17(6.16)***	0.17(6.09)***	0.17(6.07)***	0.17(6.13)***
<b>rsensex</b>								
rspx	0.17(6.36)***	0.17(6.17)***	0.17(6.16)***	0.17(6.12)***	0.17(6.29)***	0.17(6.12)***	0.17(6.18)***	0.17(6.17)***
<b>Adjustment</b>								
lambda1	0.01(5.85)***	0.01(5.42)***	0.01(5.8)***	0.01(5.44)***	0.01(6.03)***	0.01(5.51)***	0.01(5.48)***	0.01(5.78)***
lambda2	0.95(115.56)***	0.96(93.74)***	0.95(106.34)***	0.96(95.68)***	0.95(118.44)***	0.96(98.39)***	0.96(96.5)***	0.95(105.75)***

## Notes:

1. krfxe1 means the Rep. of Korea measure (19 Nov 2009)—Capped the FX forward position for exporters to up to 125% of the underlying position and required banks to raise their long-term foreign currency borrowing from 80% to 90% of long-term lending.
2. krfxe3 means the Rep. of Korea measure (26 Nov 2012)—Cut the ceiling on FX derivative contracts owned by domestic banks from 40% to 30% of equity and by foreign bank branches from 200% to 150%, effective November 2012.
3. Phfxe1 means the Philippines measure (5 Nov 2010)—Starved the market of US dollars by “rolling-off” the FX forward book to stem peso appreciation.
4. Indoborrow means the Indonesian measure (30 Dec 2010)—Re-imposed the limit on banks’ ST foreign borrowing to 30% of capital, effective March 2011.
5. Cnborrow means the PRC measure (31 Mar 2010)—SAFE cut the short-term debt quota by 1.5% to \$32.4 to prevent abnormal capital inflows, effective April 2010.
6. krborrow1 means the Rep. of Korea measure (19 Dec 2010)—Banks’ levy on non-deposit FC liabilities, effective 1 Aug 2011 (<1 year = 0.2%, 1–3 years = 0.1%, >3 years = 0.05%).
7. Indomin2 means the Indonesian measure (13 Apr 2011)—Increased the holding period to 6 months, effective 13 May.
8. Twlim2 means the Taipei, China measure (9 Nov 2010)—Restricted offshore funds from investing more than 30% of their portfolio in money market products and government debt with maturity of less than a year.

Source: Author’s calculations.



Appendix Table 5 continued

Date	Economy	Measure	Daily Flow of Foreign Purchases in the Equity Market						Daily Flow of Foreign Sales in the Equity Market						VIX Index			
			PHI	TAP	IDO	THA	IND	KOR	PHI	TAP	IDO	THA	IND	KOR				
	Indonesia	Raise RR on FC account and limit banks' ST foreign borrowing	★		★				★									
13 Apr 2011	Indonesia	Minimum holding period			★					★								H
19 May 2011	Rep. of Korea	Limit private FX exposure											★					L
29 Jul 2011	Rep. of Korea	Restrict external borrowing																H
28 Oct 2011	Philippines	Limit private FX exposure	★															H
17 Jul 2012	Philippines	Limit NR access to central bank instrument	★															L
26 Nov 2012	Rep. of Korea	Limit private FX exposure																L
26 Dec 2012	Philippines	Limit private FX exposure	★															L

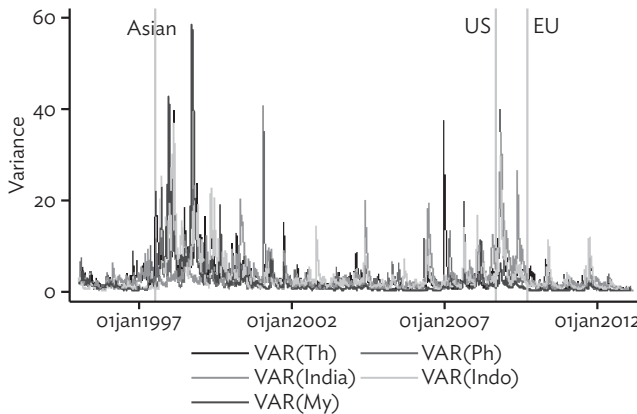
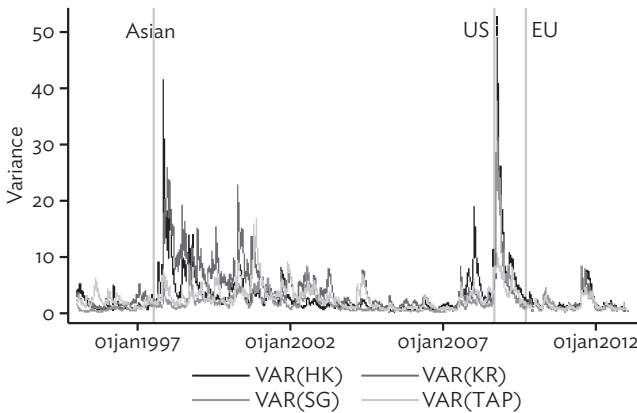
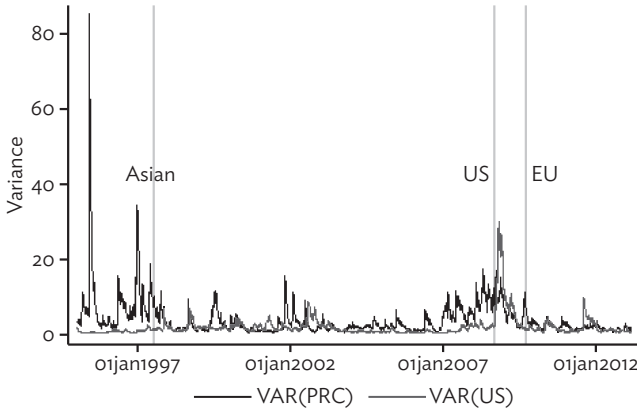
Legend: Increase > 2 SD Increase > 1SD Decrease > 2 SD Decrease > 1SD

IDO = Indonesia; IND = India; KOR = Republic of Korea; PHI = Philippines; PRC = People's Republic of China; TAP = Taipei; China; THA = Thailand.

Note: H stands for a value above its mean during 2009–2013; L stands for below the mean.

Source: Author's calculations.

**Appendix Figure 1: Time Series Plots of the Conditional Variance of the Equity Index (%)**

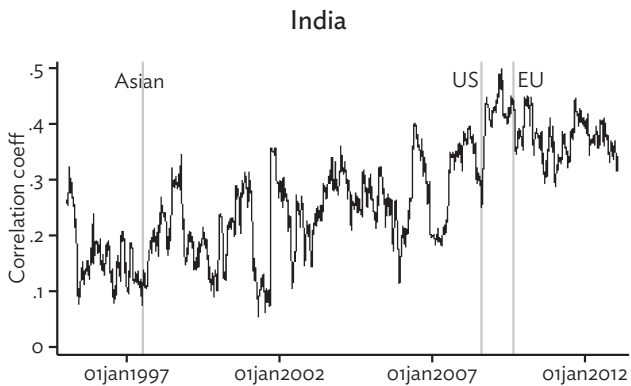
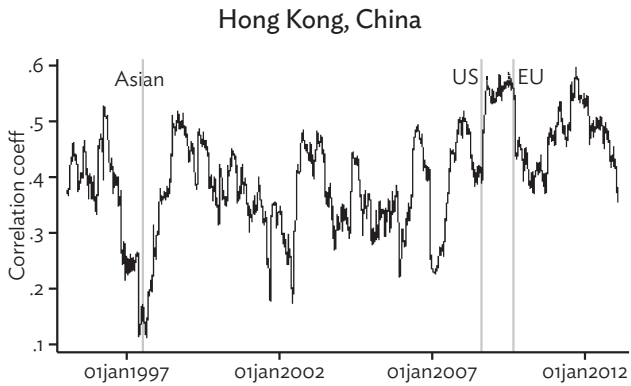
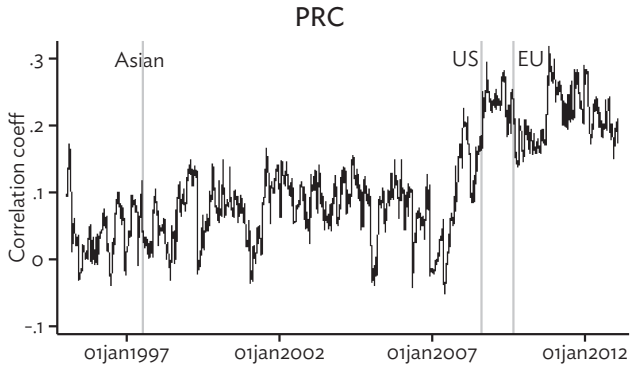


EU = Europe; HK = Hong Kong, China; KR = Republic of Korea; MY = Malaysia; PH = Philippines; PRC = People's Republic of China; SG = Singapore; TH = Thailand; TAP = Taipei, China; US = United States; VAR = vector autoregression.

Source: Author's calculations.

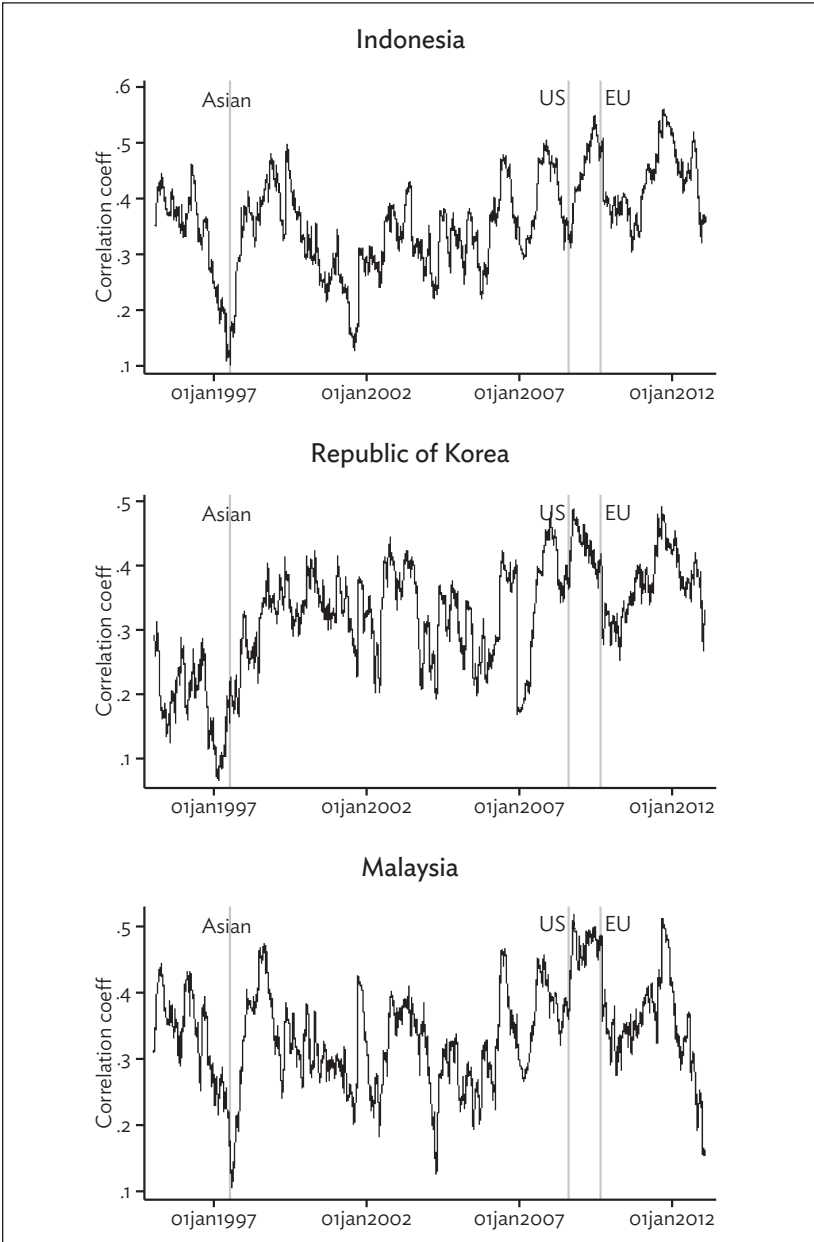


**Appendix Figure 2: Correlation Coefficients of Each Economy's Stock Return in Relation to the Thai Stock Return (Thailand Was the Crisis Originator in 1997)**



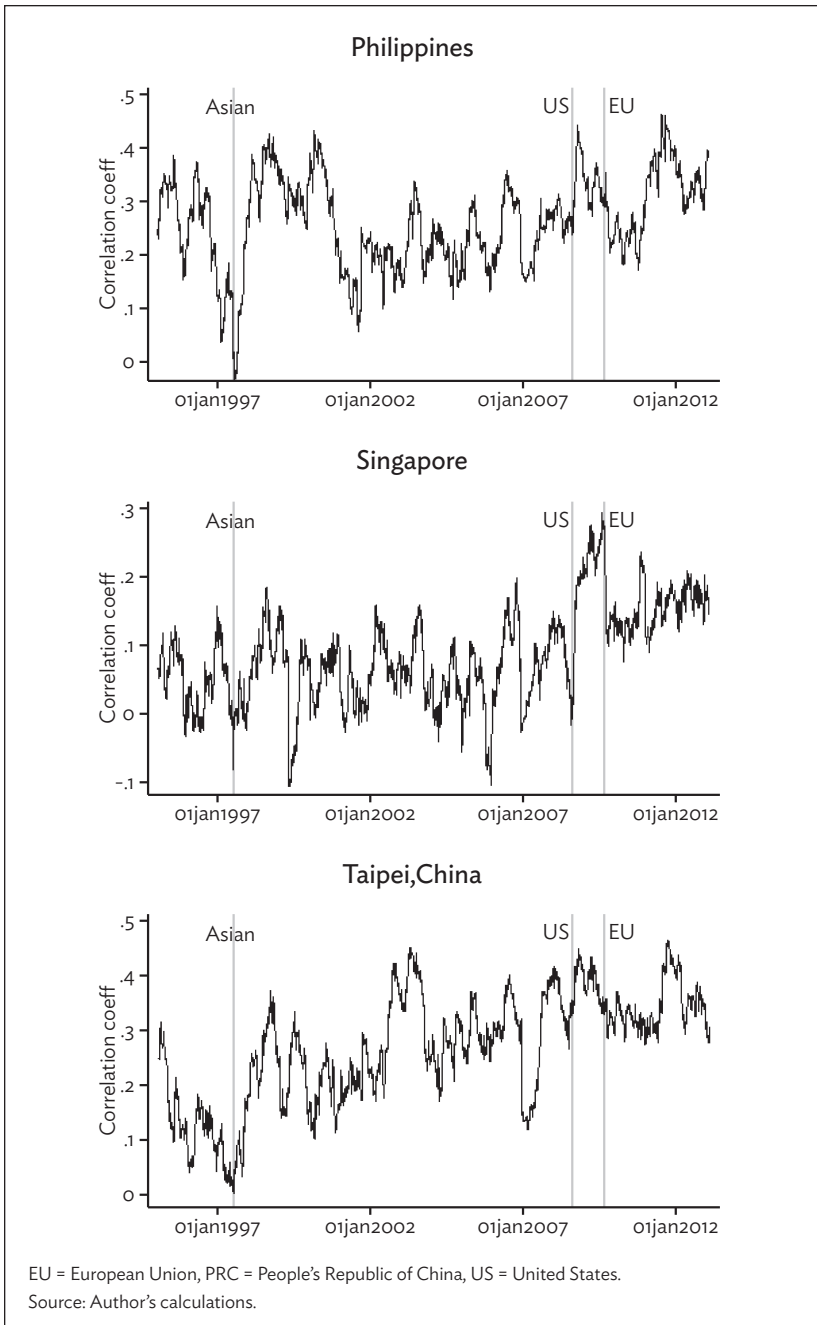
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**Appendix Figure 2** *continued*

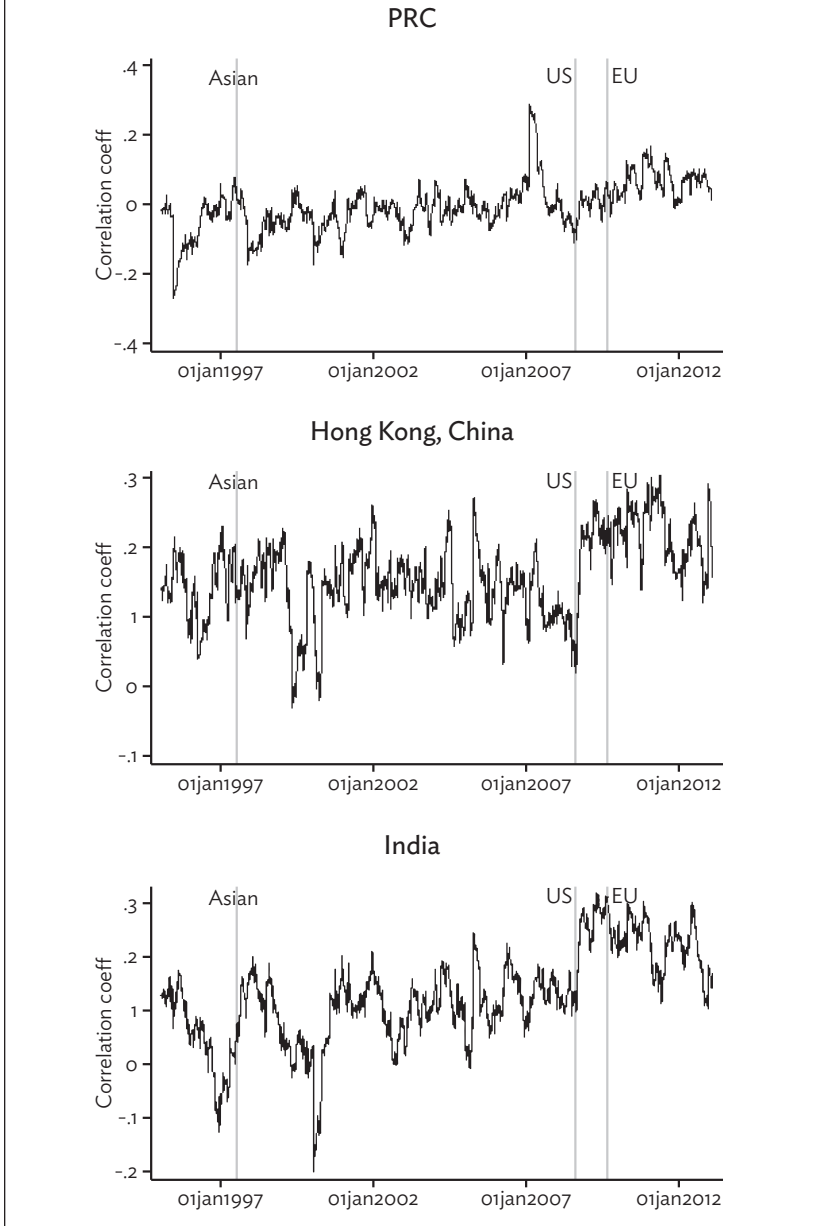


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**Appendix Figure 2** *continued*

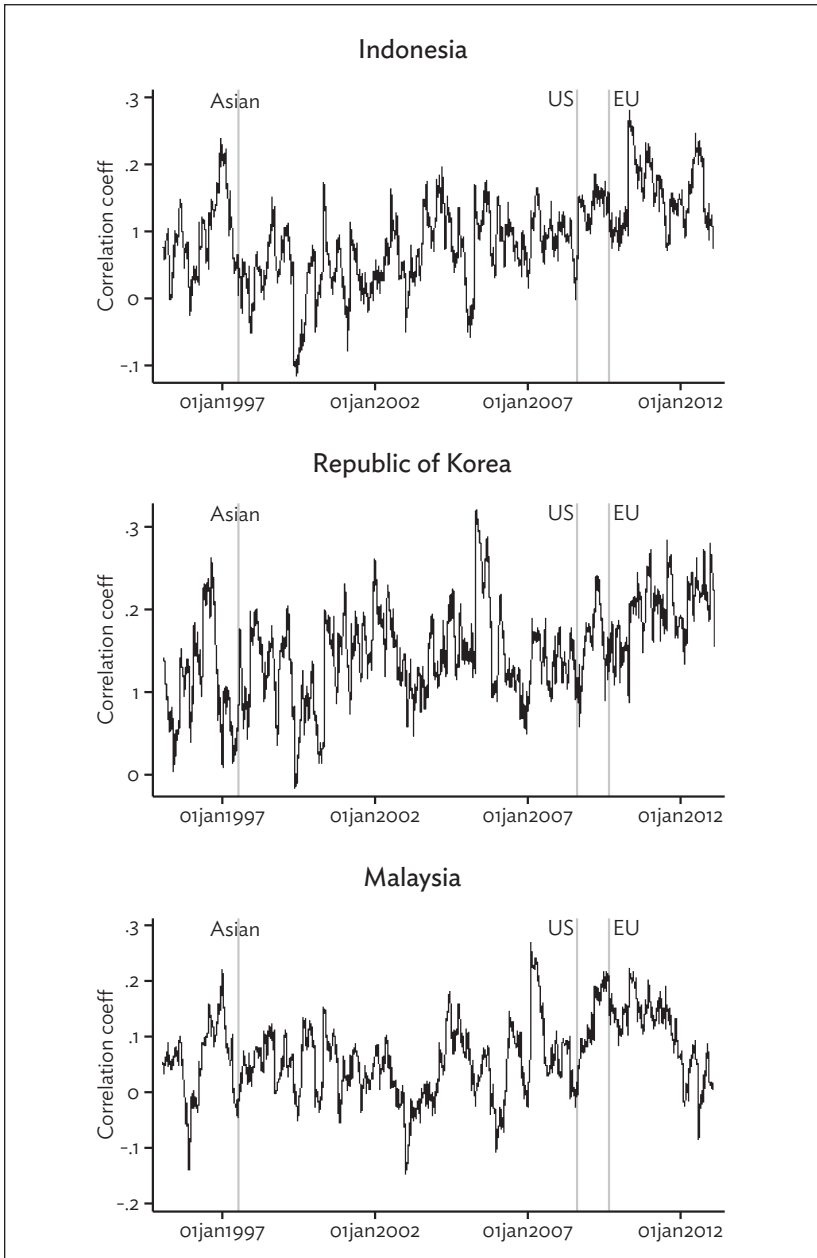


**Appendix Figure 3: Correlation Coefficients of Individual Economies' Stock Return in Relation to the US Stock Return (the US Was the Crisis Originator in 2008)**



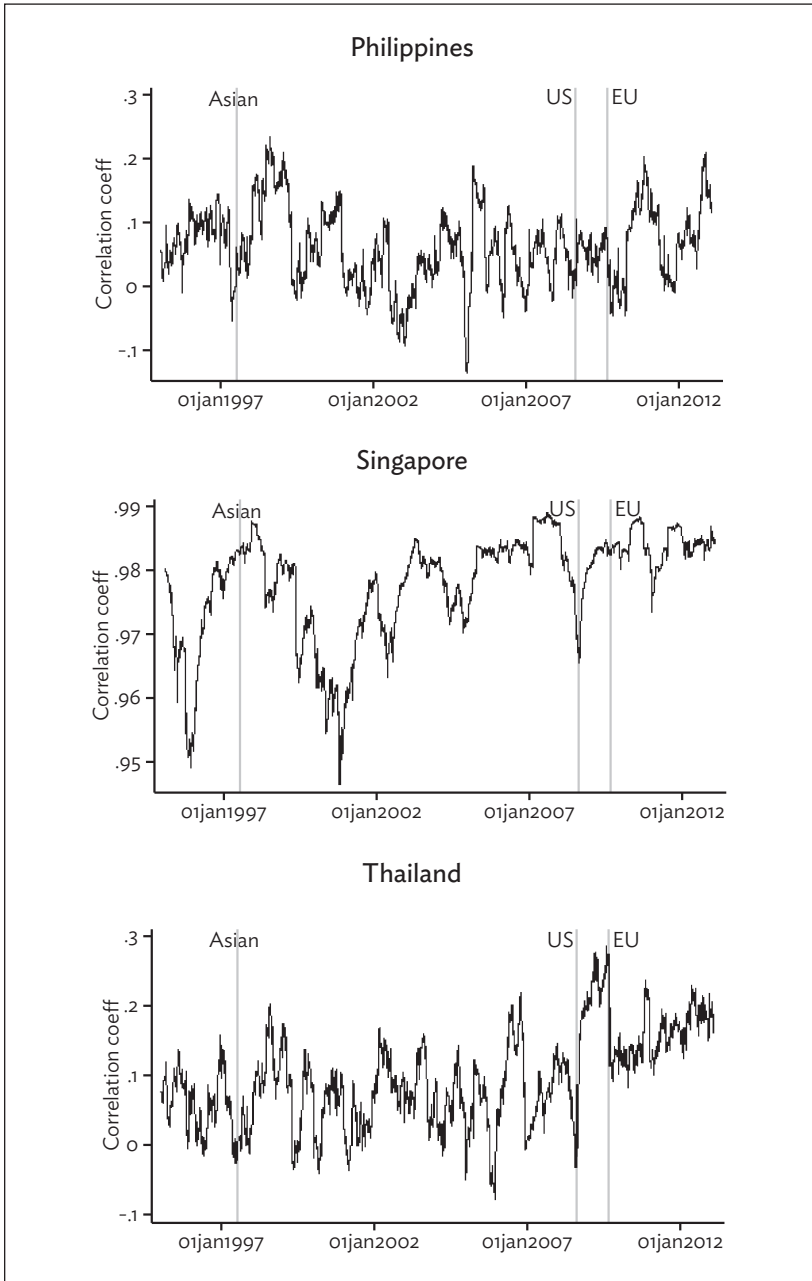
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**Appendix Figure 3** *continued*

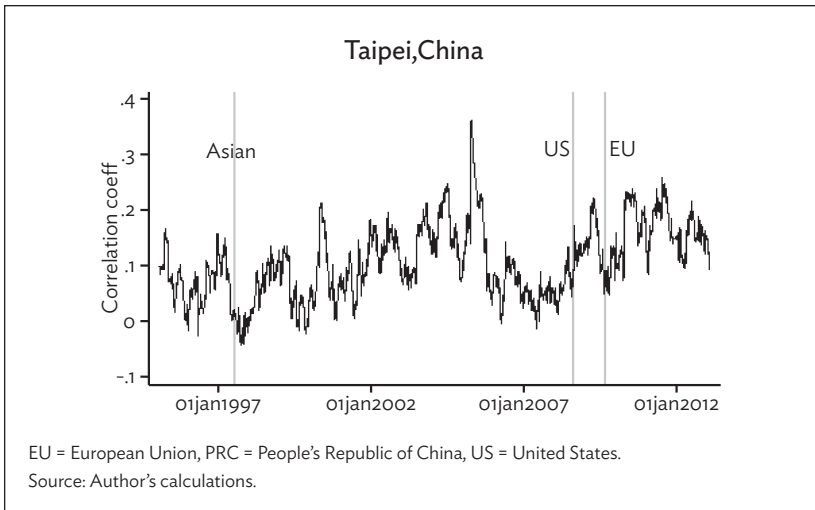


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**Appendix Figure 3** *continued*



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Appendix Figure 3 *continued*

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# 7

## External Debt Sustainability and Vulnerabilities: Evidence from a Panel of 24 Asian Countries and Prospective Analysis

*Matthieu Llorca*

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### 7.1 Introduction

Since the 1980s, most Asian countries have pursued processes for economic liberalization at the internal and external levels (openness to foreign trade and capital flows). The implementation of such programs implies that governments carry out a substantial stabilization of their external deficits. The main objective of these measures is for the external deficit to become sustainable in the long run in order to avoid the negative consequences of large external deficits and debt crises.

As the issue of public debt sustainability has gained in importance in Asia (as reflected in a book by Ferrarini, Ramayandi, and Jha [2012] on this topic), external debt sustainability has become important too, following the 1997 Asian financial crisis and the 2008–2009 global financial crisis. External debt sustainability is a relevant topic in the region for several reasons: (i) to maintain foreign investors' confidence in the economy; (ii) to address the adverse effects on the external debt position; (iii) to prevent a debt crisis; and (iv) because of the current high level of uncertainty in this period of a PRC “soft landing,” which

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<sup>1</sup> Such as a sudden currency depreciation, which increases the amount of external debt denominated in foreign currency, or an increase in interest rates on the external debt.

is inducing a decline in some commodity prices and a decline in international trade flows between Asian countries.

As a result, we explore the external debt sustainability issue by employing a panel approach on 24 Asian emerging and developing countries over the 1993–2014 period. A panel approach is appropriate given the strong economic, trade, and financial links among the economies of the region. The interests of this study are many and varied.

First, we consider a panel of 24 emerging and developing Asian countries,<sup>2</sup> which has never been used in academic literature, and divide this sample into four subpanels: Southeast Asia, Southwest Asia, Central Asia, and the Pacific (corresponding to the country classifications made for instance by the International Monetary Fund or the World Bank). Second, we take into account a recent period, 1993–2014, which includes the impact of the 1997 Asian financial crisis and the 2008–2009 global financial crisis on external debt sustainability over the four subpanels. Third, to test external sustainability, we employ both first and the second generation panel unit-root and cointegration tests to take into account cross-sectional dependence among countries.

We use the present-value methodology to determine whether the country satisfies its intertemporal external constraint, namely whether the external debt is sustainable in the long run. Such a methodology requires studying the panel stationarity of the external debt, the current account, imports, and exports, and the cointegration between the last two variables.

To our knowledge, no other paper has tackled the issue of external debt sustainability in these 24 emerging and developing Asian countries by applying recent econometric methods for panel data.

The outline of this article is as follows: Section 7.2 presents a brief survey of the external debt sustainability literature. Section 7.3 outlines the intertemporal approach to the current account. Section 7.4 provides a description of the data and reports the econometric findings. Section 7.5 analyzes the vulnerabilities, factors, and risks in the region by using different external debt indicators, such as debt service, the share of the short-term external debt in total external debt, the amount of total reserves, and the debt composition by currency. Finally, we conclude this study by establishing different prospective

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<sup>2</sup> The People's Republic of China and Mongolia; Southeast Asia (Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam); Southwest Asia (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka); Central Asia (Armenia, Azerbaijan, Georgia, Kazakhstan, the Kyrgyz Republic, and Tajikistan); the Pacific (Fiji, Papua New Guinea, Samoa, Solomon Islands, and Tonga). The case of developed Asian countries, such as Japan, Singapore, and the Republic of Korea, is not considered in this study.

scenarios for the Asian emerging and developing countries according to the degree of the PRC economic slowdown (a “soft” or “hard” landing).

## 7.2 Survey of the External Debt Sustainability Literature

The basic issue concerning the sustainability of external deficits has gained importance in developing countries as well as among political leaders, academic economists, and researchers in international institutions. Indeed, debt sustainability has become a very important topic for governments because it requires the adoption of responsible policies in order to engender macroeconomic stability.

As a result, extensive theoretical and empirical literature has emerged on this topic since the 1990s. In most cases, time-series methods have been employed to examine whether the external deficit of a nation is effectively consistent with its intertemporal external constraint in present-value terms. Moreover, most of the empirical studies have focused on the United States and other industrial countries: the United States (Trehan and Walsh 1991; Wickens and Uctum 1993; Ahmed and Rogers 1995; Fisher 1995; Hakkio 1995; Leachman and Francis 2000; Takeuchi 2010; Christopoulos and Leon-Ledesma 2010); the United States and Canada (Otto 1992; Wu, Fountas, and Chen 1996); and the G7 countries (Liu and Tanner 1996). The results of these studies generally reveal that external deficits are not sustainable for several major developed countries. However, relatively few papers (Sawada 1994; Coakley and Kulasi 1997; Fève and Henin 1998; Pattichis and Kanaan 2001; Jha 2003; Lau and Baharumshah 2003; Sun 2004; Berthomieu et al. 2004; Önel and Utkulu 2006; Mohammadi, Çak, and Çak 2007; Yilanci and Özcan 2008; Kim et al. 2009; Boengiu, Triandafil, and Triandafil 2011) have applied similar econometric tests to assess the sustainability of external deficits in developing countries. In short, the findings established by these studies suggest that external sustainability conditions are hard to meet in a number of developing countries.

Recently, some papers have investigated the issue of external sustainability by adopting unit-root and/or cointegration tests for panel data. We can quote the work of Wu (2000) and Wu, Chen, and Lee (2001) that have studied current account sustainability among industrial countries. In addition, applying an augmented Dickey–Fuller panel data unit-root test within a seemingly unrelated regression, Holmes (2006) finds that external debt is sustainable for at least 12 Latin American countries. Ehrhart and Llorca (2007) focus on a panel of seven South

Mediterranean countries and use first generation panel unit-root tests (Im, Pesaran, and Shin 2003; Maddala and Wu 1999; Choi 2001) and of cointegration tests (Pedroni 1999). Nasir and Noman (2012) apply a two-step nonlinear framework to investigate the stationary property of the debt-to-external earnings ratio for 36 countries and the current account-to-gross national income ratio for 55 countries. Another method was developed on a panel of 19 Asian countries from 1981 to 2010 by studying the mean-reverting behavior of the external debt (Lau, Baharumshah, and Soon 2013). Finally, Lin (2014) examines the sustainability of external debt for 21 member countries of the Organisation for Economic Co-operation and Development by using a quantile regression model.

### 7.3 Theoretical Framework: The Intertemporal Approach to the Current Account

Econometric tests of current account sustainability consist of investigating whether the country satisfies its intertemporal external constraint. In other words, empirical studies about this issue are based on the intertemporal approach to the current account.

Husted (1992) provides a simple small-economy framework in which a representative household is able to borrow and lend freely in international financial markets at a given global rate of interest.

The representative agent faces the following current period budget constraint:

$$C_0 = Y_0 + B_0 - I_0 - (1 + r_0)B_{-1} \quad (1)$$

where  $C_0$ ,  $Y_0$ ,  $B_0$ , and  $I_0$  represent current consumption, output, international borrowing, and investment;  $r_0$  is the one-period world interest rate; and  $(1 + r_0)B_{-1}$  is the initial debt of the representative agent, corresponding to the country's external debt.

Equation (1) must hold for every time period. Iterating (1) forward yields the economy's intertemporal budget constraint (see Husted [1992: 160]):

$$B_0 = \sum_{t=1}^{\infty} \delta^t TB_t + \lim_{n \rightarrow \infty} \delta^n B_n \quad (2)$$

where  $TB_t = X_t - M_t = Y_t - C_t - I_t$  represents the trade balance in period  $t$ ,  $X_t$  equals the exports,  $M_t$  is the imports, and  $\delta$  is the discount factor.

A necessary and sufficient condition for external sustainability is that as  $n \rightarrow \infty$ , the discounted value of the external debt converges asymptotically to zero. This transversality condition can be expressed as:

$$\lim_{n \rightarrow \infty} \delta_n B_n = 0 \quad (3)$$

Equation (3) implies that a country cannot borrow (lend) indefinitely in global capital markets to finance its trade account deficit (surplus). If this transversality condition holds, then the amount of country borrows (lends) in international financial markets equals the present value of the future trade surplus (deficits).

After several manipulations, we finally get a testable equation:

$$M_t - X_t = \sum_{j=0}^{\infty} \lambda^{j-1} [\Delta X_{t+j} - \Delta Z_{t+j}] \quad (4)$$

Given that the right-hand variables from equation (4) are first-difference stationary, the left-hand side of the equation must be stationary in order to satisfy the present-value external constraint. Thus,  $M_t$  and  $X_t$  must be examined for stationarity. If  $M_t$  and  $X_t$  are I(1), then they must be cointegrated so that the left-hand side of equation (7), i.e., the current account deficit, is stationary.

Thus, a test for the sustainability of the external debt can check for the cointegration of these two variables,  $M_t$  and  $X_t$ , if they are I(1). This cointegration regression takes the following form:

$$X_t = a + bM_t + u_t \quad (5)$$

Formally, if  $M_t$  and  $X_t$  are I(1), the null hypothesis is that  $M_t$  and  $X_t$  are cointegrated and  $\beta = 1$ . If the null hypothesis is not rejected, then the external debt is said to be sustainable.

## 7.4 Empirical Investigation

### 7.4.1 Sample and Data

The sustainability of external debt is assessed in a sample of 24 Asian emerging and developing countries.<sup>3</sup> We use annual data collected from the World Bank's World Development Indicators. The sample covers the period 1993–2014 for the current account, external debt, imports, and exports. The current account balance is the sum of the net exports of goods, services, net income, and net current transfers. External debt

<sup>3</sup> However, data for exports and imports in the cases of Papua New Guinea and Samoa are missing, so we do not include these two countries in the study of the cointegration relationship, and we cannot constitute the Pacific panel for this step.

is the debt owed to nonresidents, repayable in foreign currency, goods, or services. Our measure of exports includes the exports of goods and services. Our measure of imports only comprises the imports of goods and services since the data on net transfer payments and net interest payments are not available. All variables are measured in terms of their ratio to nominal GDP.

## 7.4.2 Features of the External Position of Asian Emerging and Developing Countries

First, we find that external debt has fallen slightly over the last 2 decades in the global panel of 24 emerging and developing Asian countries (Table 7.1 and Figure 7.1). However, we can see different paths according to the subpanel group: a strong reduction by more than half of the external debt in Southeast Asia, a decline of 10 percentage points of gross domestic product (GDP) in Southwest Asia, and a slight decline in the Pacific; meanwhile, the external debt-to-GDP ratio shows an increase by 20 percentage points in Central Asia.

Specifically, if we consider the evolution of external debt by country (Appendix, Table A.1, we find that four countries (the People's Republic of China [PRC], India, Azerbaijan, and Fiji) have a low level of external debt (less than 20% of GDP), whereas seven nations (Mongolia, Bhutan, Armenia, Georgia, Kazakhstan, the Kyrgyz Republic, and Papua New Guinea, namely four countries from Central Asia) have a high level of external debt (more than 60% of GDP). Thus, in the four countries from Central Asia, external debt grew sharply from 2000 to 2014, whereas all the other countries in the panel showed a reduction in their external indebtedness over these 2 decades, sometimes at a sustained pace (by

**Table 7.1: Evolution of External Debt in Asian Emerging and Developing Countries**  
(% of GDP)

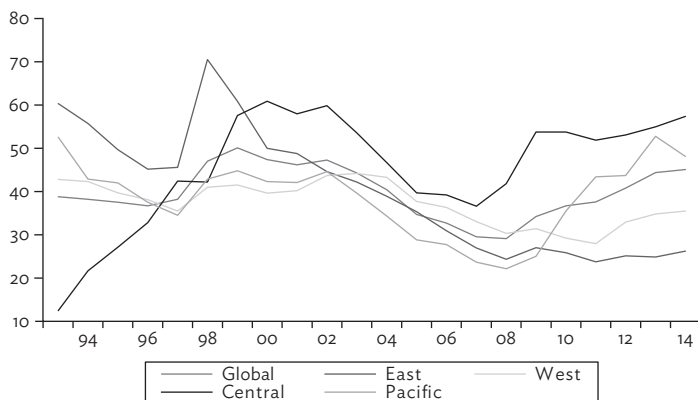
Panel	1993–1999	2000–2007	2008–2014	Average
Southeast Asia	55.5	39.8	25.3	40.2
Southwest Asia	40.2	39.8	31.7	37.3
Central Asia	33.7	49.3	52.4	45.3
Pacific	42.5	35.4	38.7	38.7
Global panel	41.0	40.3	38.3	39.9

GDP = gross domestic product.

Source: Author's calculations from the World Bank. World Development Indicators.



**Figure 7.1: Evolution of External Debt in Emerging and Developing Asian Countries**  
(% of GDP)



GDP = gross domestic product.

Source: World Bank. World Development Indicators.

more than 20 percentage points of GDP for the Philippines, Bangladesh, Tajikistan, Samoa, and Solomon Islands; by more than 30 percentage points of GDP for Indonesia, Thailand, and Nepal; and even by more than 70 points of GDP for Viet Nam).

Second, the current account position for the global panel improved during the second period between 2000 and 2007 to an average of  $-1.6\%$  of GDP, then deteriorated to an average of  $-3.7\%$  of GDP between 2008 and 2014 (Table 7.2 and Figure 7.2).

From the subpanels, we find the different current account positions: a significant surplus in Southeast Asia since the second period and a strong reduction of the current account deficit in Central Asia between 2000 and 2007, but a deterioration of the current account during the last period in Southwest Asia, and an even more critical deterioration in the Pacific.

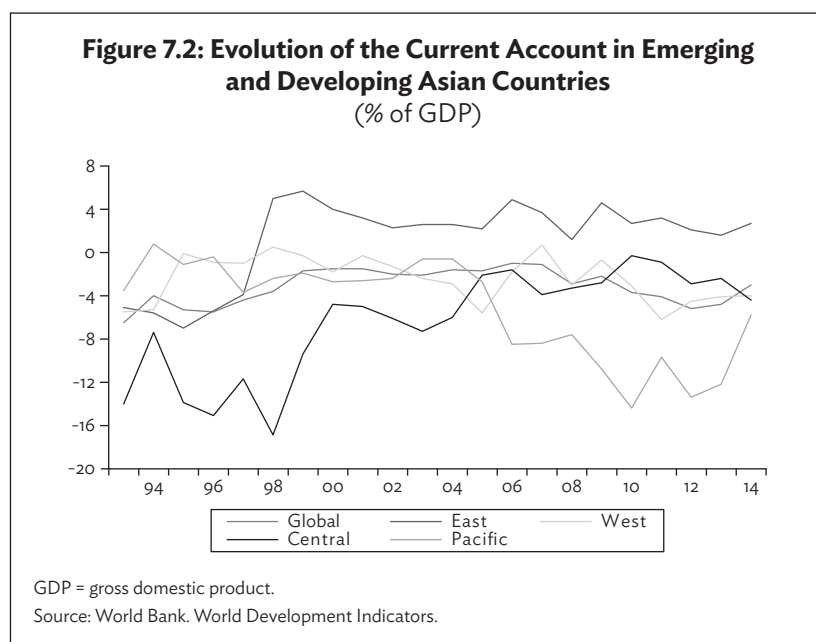
Pacific countries have a very high level of current account deficit during the last period, more than 10% of GDP for Solomon Islands and even more than 20% for Papua New Guinea. Similarly, some Central Asian countries (Georgia, the Kyrgyz Republic, and Armenia), and Bhutan and Mongolia have a current account deficit greater than 10% of GDP between 2008 and 2014. Meanwhile, among countries accumulating current account surpluses, we have Azerbaijan (with a

**Table 7.2: Evolution of the Current Account in Asian Emerging and Developing Countries**  
(% of GDP)

Panel	1993–1999	2000–2007	2008–2014	Average
Southeast Asia	-2.3	3.2	2.6	1.3
Southwest Asia	-1.8	-1.9	-3.7	-2.5
Central Asia	-12.8	-4.6	-2.5	-6.5
Pacific	-1.8	-3.6	-10.6	-5.2
Global panel	-4.5	-1.6	-3.7	-3.2

GDP = gross domestic product.

Source: Author's calculations from the World Bank. World Development Indicators.



surplus of more than 20% of GDP during the last period), Malaysia (with a surplus of around 10% of GDP on average since 2000), and the PRC, the Philippines, and Thailand with surpluses greater than 3% of GDP during the last period.

Finally, according to the global panel, exports and imports (Appendix have increased gradually, with a higher increase in Southeast Asia than in Southwest Asia and Central Asia (and even a slight decline in imports in the latter subpanel).

### 7.4.3 Empirical Results

Most empirical tests of external sustainability study whether the observed characteristics of the external debt-related variables satisfy the solvency condition in equation (3). As in time-series studies, in the case of panel data analysis, the econometric methodology employed to test this solvency condition consists mainly of two steps.

In the first step, the stationary properties of the current account, exports, imports, and the stock of external debt are studied using unit-root tests for panel data. External debt sustainability requires that these external variables be integrated of order zero.

If imports and exports are found to be integrated of order one (nonstationary), it is important to investigate in a second step whether there is a cointegration relationship between imports and exports. Cointegration among these variables is a necessary condition for external sustainability.

#### Unit-Root Results

The unit-root tests can be classified into two groups, depending on whether they account for cross-sectional dependence or not. The first generation panel unit-root tests (Im, Pesaran, and Shin 2003; Maddala and Wu 1999; Choi 2001) have been criticized because they assume cross-sectional independence. This hypothesis is rather restrictive and unrealistic since macroeconomic time series exhibit significant cross-sectional correlation among countries in a panel (Baltagi 2008), and co-movements of economies are often observed in the majority of macroeconomic applications of unit-root tests (Hurlin and Mignon 2005). The presence of cross-sectional correlation of errors in panel data applications in economics is likely to be the rule rather than the exception (Chudik and Pesaran 2015). Moreover, correlation across units in panels may have significant consequences on the first generation of tests assuming cross-sectional independence. When applied to cross-sectionally dependent panels, such panel unit-root tests can generate substantial size distortions (O'Connell 1998). As a result, alternative (second generation) panel unit-root tests (Bai and Ng 2004; Chang 2002, 2004; Choi 2002; Moon and Perron 2004; Phillips and Sul

2003; Pesaran 2007) have been proposed to take into account cross-sectional dependence.

The results of the Pesaran test of cross-sectional dependence are shown in Table 7.3.

As shown in Table 7.3, we obtain different results: first, the cross-sectional dependence (CD) test accepts the null hypothesis of cross-sectional independence in the Pacific, so we must employ the first generation panel unit-root test (Im, Pesaran, and Shin 2003; Maddala and Wu 1999; Choi 2001). Second, the CD test strongly rejects the null hypothesis of cross-sectional independence in Southeast Asia and Southwest Asia, suggesting the presence of cross-sectional dependence in these two subpanels. To study the issue of external sustainability, it

**Table 7.3: Pesaran (2004) Test for Cross-Sectional Dependence**

Panel	Variables (% of GDP)	CD-test	P-value
Global panel	Current account	4.83	0.000
	External debt	3.35	0.000
	Imports	0.89	0.372
	Exports	1.18	0.235
Southeast Asia	Current account	6.42	0.000
	External debt	6.75	0.000
	Imports	0.16	0.865
	Exports	3.69	0.000
Southwest Asia	Current account	16.22	0.000
	External debt	6.38	0.000
	Imports	2.87	0.004
	Exports	-2.69	0.006
Central Asia	Current account	14.64	0.000
	External debt	7.81	0.000
	Imports	-1.50	0.133
	Exports	-0.28	0.778
Pacific	Current account	0.76	0.444
	External debt	1.29	0.193

CD = cross-sectional dependence, GDP = gross domestic product.

Notes: CD reports the Pesaran (2004) cross-sectional dependence statistic. Under the null hypothesis of cross-sectional independence  $CD \sim N(0,1)$ .

Source: Author's calculations.

**Table 7.4: Summary of Panel Unit-Root Test for Asian Panels**

Panel	Variables (in % of GDP)	Panel Unit-Root Test	Results
Global panel	Current account	First and second generation	I(0)-I(0)
	External debt		I(0)-I(1)
	Imports		I(0)-I(1)
	Exports		I(0)-I(1)
Southeast Asia	Current account	Second generation	I(1)
	External debt		I(0)
	Imports		I(1)
	Exports		I(1)
Southwest Asia	Current account	Second generation	I(1)
	External debt		I(1)
	Imports		I(1)
	Exports		I(1)
Central Asia	Current account	First and second generation	I(0)-I(1)
	External debt		I(0)-I(0)
	Imports		I(1)-I(0)
	Exports		I(1)-I(0)
Pacific	Current account	First generation	I(1)
	External debt		I(1)

GDP = gross domestic product.

Note: I(0) and I(1) signify integration of order 0 and 1, respectively.

Source: Author's calculations.

is necessary to employ second generation panel unit-root tests (Pesaran 2007) allowing for this cross-country dependence in Southeast Asia and Southwest Asia. Finally, we propose using both first and second generation unit-root tests for the global panel and for Central Asia because the CD test reveals opposite results between the variables of external debt-current account and exports-imports.

As shown in Table 7.4 (see also Appendix, Tables A.5 and A.6), the panel unit-root tests indicate that for the global panel and Central Asia, the current account and external debt variables are stationary in level (or integrated of order 0), according to the first generation test, which is a condition necessary (but insufficient) for external debt sustainability.

However, for the subpanels, Southwest Asia and the Pacific,<sup>4</sup> the current account and external debt variables are stationary in first difference (integrated of order 1). In addition, imports and exports are integrated of the same order in the global panel and for Southeast Asia, Southwest Asia, and Central Asia, so we can proceed to the next step in the study of external sustainability, namely the panel cointegration tests.

## Panel Cointegration Tests

In the second step, provided that imports and exports are found to be nonstationary, it is relevant to investigate whether these two trade variables are cointegrated. Cointegration among the trade variables is a necessary condition for external debt sustainability.

Panel cointegration tests can be carried out using either tests proposed by Pedroni (1999, 2004) or error correction tests suggested by Westerlund (2007).

Pedroni's (1999, 2004) first generation panel unit-root test suggests seven test statistics for the null hypothesis of no cointegration, with four panel cointegration statistics and three group mean cointegration statistics (Table 7.5). Westerlund's test (2007) takes into account the presence of cross-sectional dependence.

Except for the panel variance test and the group and panel  $\rho$  tests, all the tests indicate a rejection of the null hypothesis of no cointegration between export and import ratios at the 1% significance level for the two panels. However, Monte Carlo simulations carried out by Pedroni (2004) show that in short samples ( $T=22$ , in our case), panel  $t$ -statistics and group  $t$ -statistics generally perform best, followed by panel  $\rho$  statistics. Panel- $v$  and group  $\rho$  statistics perform worst in this specific case. According to these results, we can conclude that the null hypothesis of no cointegration between export and import ratios is rejected. The findings imply that in a panel perspective, external debt is sustainable in the long run in the global panel and in the subpanel for Central Asia. Moreover, using the Westerlund panel cointegration tests (second generation panel unit-root tests) for the global panel, Central Asia, Southeast Asia, and Southwest Asia, all the panel tests reject the null hypothesis, so external debt is sustainable in these four panels, too.

Our findings imply that external debt in our panel of 24 Asian emerging and developing countries is sustainable in the long run.

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<sup>4</sup> However, we cannot say that external debt is not sustainable in this region because we cannot proceed to the cointegration tests between imports and exports due to missing data on these variables for Papua New Guinea and Samoa.

**Table 7.5: Pedroni Panel Cointegration Test for Export and Import Ratios**

## Global panel

Panel Variance Test	Panel $\rho$ Test	Panel t-test (Non-parametric)	Panel t-test (Parametric)	Group $\rho$ Test	Group t-test (Non-parametric)	Group t-test (Parametric)
0.58	-1.40*	-1.99***	-1.72***	-0.08	-1.88**	-2.97***

## Central Asia

Panel Variance Test	Panel $\rho$ Test	Panel t-test (Non-parametric)	Panel t-test (Parametric)	Group $\rho$ Test	Group t-test (Non-parametric)	Group t-test (Parametric)
-0.23	-1.24	-2.71***	-2.10***	-0,13	-4,51***	-2,38***

Note: \*\*\*, \*\*, and \* denote rejection of the null hypothesis of no cointegration at the 1%, 5%, and 10% levels, respectively.

Source: Author's calculations.

**Table 7.6: Westerlund Panel Cointegration Tests**

Statistics	Global Panel Value	Central Asia Panel Value	Southeast Asia Panel Value	Southwest Asia Panel Value
$G_{\tau}$	-3.040***	-3.081***	-3.729***	-2.208**
$G_{\alpha}$	-16.345***	-16.602**	-21.053***	-16.150**
$P_{\tau}$	-13.021***	-6.689**	-6.028**	-7.008***
$P_{\alpha}$	-13.943***	-12.897**	-17.878***	-11.476

Notes:  $G_{\tau}$  and  $G_{\alpha}$  are the group mean statistics.  $P_{\tau}$  and  $P_{\alpha}$  are the panel statistics. Westerlund's panel cointegration tests take no cointegration for all countries in the panel as the null hypothesis. \*\*\* and \*\* denote rejection of the null hypothesis of no cointegration at the 1%, and 5% levels, respectively.

Source: Author's calculations.

## 7.5 Vulnerability Factors and Risks in Asian Emerging and Developing Countries: A Prospective Analysis

Following this analysis of the external debt in Asian emerging and developing countries over the past 20 years, it is relevant, too, to consider the future path of the external debt. We propose analyzing the vulnerabilities, factors, and risks associated with the external debt of Asian countries.

Thus, four external debt criteria must be taken into account to assess the risk of future financial turmoil on the external debt of an

Asian country: debt composition by currency, the share of the short-term external debt to total external debt, debt service, and the amount of total reserves.

The first external vulnerability factor is the debt composition by currency. Indeed, given the appreciation of the US dollar against Asian currencies since May 2014, exchange rate movements have increased the external debt burden denominated in US dollars. This is notably the case for Central Asian countries (such as the Kyrgyz Republic and Tajikistan) or even India, Indonesia, Thailand, and the Philippines, which have high exposure to the appreciation of the US dollar against their local currencies. On the contrary, countries indebted in a foreign currency that depreciates against their local currencies can benefit from a decline in their external debt burden. This is the case for Kazakhstan and Georgia, which are massively indebted in pounds sterling (by 96% and 70% of their external debt, respectively). Indeed, they benefited from the depreciation of the pound sterling since the United Kingdom's Brexit decision on 23 June 2016.

The share of short-term external debt in total external debt can constitute a *sec* debt. However, all the emerging and developing Asian countries have low levels of short-term external debt as a percentage of their total external debt, except for Thailand and Malaysia with around 40%–50% of short-term external debt and the PRC with more than 70%.

The third criterion is the level of debt service, expressed as a percentage of export revenue. Indeed, we find that some Asian developing and emerging countries are constrained by their debt service, reaching more than 20% of exports in 2014 for Pakistan, Indonesia, and Georgia and even more than 30% in Armenia, Kazakhstan, and Tajikistan. On the other hand, countries such as the PRC, Viet Nam, Azerbaijan, Bangladesh, Thailand, Malaysia, and the Philippines have higher margins (or space) due to low debt servicing and their high levels of export revenues.

Finally, the last indicator to focus on is the amount of total reserves, expressed as a percentage of total external debt or in months of imports. On the one hand, some countries are well protected against adverse external events (such as financial crises in the region). These include the PRC, Azerbaijan, Thailand, the Philippines, Bhutan, Bangladesh, and India due to their high levels of reserves accumulated since 2000. On the other hand, Central Asian countries, with the exception of Azerbaijan, have a weak position. A notable example is Tajikistan, with a very low amount of reserves in months of imports.

According to these four external debt criteria (Appendix, Table A.7), we can expect an important threat to the future path of the external debt of Central Asian countries (except Azerbaijan), notably for Tajikistan,



the Kyrgyz Republic, and, to a lesser extent, Georgia. In addition, with the decline in the commodity prices over the current period, the Central Asian countries cannot accumulate enough reserves to face a future crisis. However, the external debt prospects are better in Southeast Asia and Southwest Asia, where countries have important reserves at their disposal to act as shock absorbers in case of a crisis.

As a result, in this time of uncertainty in the world and in the region, we must consider two alternative scenarios in Asia and their consequences on the external debt position of Asian countries.<sup>5</sup>

The first optimistic scenario is based on a PRC “soft landing” (a growth rate of around 6%–6.5%) with a stabilization of the Brent oil price at the current level (\$50 per barrel). In this context, countries that are most integrated with the PRC, through international trade channels, will register a decline in their exports to the PRC, and so will have lower export revenue to finance their external debt. Similarly, we can expect that the PRC will reduce its foreign direct investment flows to Asian countries, resulting in lower income to finance external deficits. In such a situation, Southeast Asian countries, such as Thailand, will be the most affected. However, because of their levels of reserves accumulated over the past years, there is no need to worry about the financing of their external position. Even in the case of a strong appreciation of the US dollar (induced by the future increases in the Fed Funds rate, for instance), the external debt burden denominated in US dollars will increase. Moreover, Asian countries that produce commodities, including Indonesia, Malaysia, and some Central Asian countries, will be negatively affected by the current commodity cycle and will be unable to accumulate enough reserves for the future. The situation for the Central Asian countries (except Azerbaijan) is even more troubling, particularly for Kazakhstan, because of their external debt situations and their trade and financial integration with the PRC through the new “Silk Road.” Indeed, the PRC slowdown could have an impact in the future on some projects or financing of this development strategy affecting Kazakhstan and its external account.

The second scenario is based on a “hard landing” for the PRC (a growth rate of less than 5%), resulting notably from the high level of PRC domestic private debt and the increase of nonperforming loans affecting the PRC’s banking and shadow banking sector. In this worst-case scenario, the entire region will be affected through international

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<sup>5</sup> These uncertainties include the PRC’s economic slowdown, movements in commodity prices, volatility of financial markets and exchange rates, the gradual increase of the Fed Funds rate, the appreciation of the US dollar, and other external events such as the Brexit decision or political risks.

trade and finance channels. In this period of financial stress, we can expect outflows of portfolio investment and foreign direct investment, so that the weakest countries in terms of reserves must use their reserves to face the external crisis. Moreover, a “hard landing” for the PRC would induce a slowdown in its use of raw materials, and so commodity prices would decline, affecting countries that produce natural resources more severely.

Amid a financing crunch, Asian countries can use their accumulated reserves from the last decade to face the economic and financial shocks. However, countries with insufficient levels of reserves—such as the Central Asian countries, Pakistan, Sri Lanka, or even Viet Nam—will be affected by a negative dynamic to finance their external deficits and debt.

## 8 Conclusion

In this study, we conducted a formal test of whether the external debt in 24 emerging and developing Asian countries is sustainable in the long run. We performed recent panel unit-root and cointegration tests for panel data for the period 1993–2014 to examine whether the external positions have been coherent with their intertemporal external constraints. Moreover, we divided our sample into four subpanels—Southeast Asia, Southwest Asia, Central Asia, and the Pacific—to identify specific external trade and debt trends.

We find that over the last 2 decades, external debt has been sustainable in the region and in the subpanels considered. The economic implication of this result is that imports and exports move together in the long run. Moreover, Southeast Asian and Southwest Asian countries benefited from their export revenues during the 2000s to accumulate reserves that can be used in the future to withstand strong external shocks.

As a result, by taking into account four criteria of external vulnerabilities (the debt composition by currency, share of short-term external debt in total external debt, debt service, and amount of reserves), the external debt position in emerging and developing Asian countries is not worrying, contrary to the current external positions of some African countries (Angola, Mozambique, Ghana, Congo) or Latin American countries (Venezuela, Brazil, Argentina). However, it is important to be vigilant and monitor the external situation of some Central Asian countries (Tajikistan, the Kyrgyz Republic, Kazakhstan) due to the deterioration of their external deficits in the recent period of declining oil prices and the appreciation of the US dollar against their local currencies.

Finally, with the current changing cycle of commodities prices, it is important for Asian countries that produce commodities to diversify their economic structure and avoid the Dutch disease prophecy.<sup>6</sup> Similarly, Asian countries that are closely integrated with the PRC must diversify their international trade relationships with other trading partners, such as India.

## Appendix

**Table 7A.1: External Debt Evolution in Asia and the Pacific**  
(% of GDP)

Country	1993–1999	2000–2007	2008–2014	Average
People’s Republic of China	12.5	7.3	3.2	7.6
Mongolia	37.5	50.7	91.5	59.5
Indonesia	54.6	44.0	23.8	41.0
Malaysia	32.3	36.6	32.0	33.8
Philippines	49.1	55.9	24.3	43.7
Thailand	40.3	31.0	17.2	29.5
Viet Nam	101.0	31.3	29.3	52.8
Bangladesh	37.8	30.8	19.4	29.4
Bhutan	40.3	69.2	69.1	60.0
India	24.2	17.4	15.4	18.9
Nepal	51.0	43.0	22.4	39.0
Pakistan	35.1	32.4	25.2	31.0
Sri Lanka	52.6	46.0	38.9	45.8
Armenia	24.5	36.8	51.7	37.6
Azerbaijan	6.6	13.7	10.3	10.4
Georgia	35.4	33.6	61.0	42.9
Kazakhstan	15.6	67.3	69.5	51.6
Kyrgyz Republic	54.8	87.1	77.4	73.8
Tajikistan	65.4	57.4	44.5	55.8
Fiji	8.2	8.5	13.5	10.0
Papua New Guinea	56.4	43.3	76.7	58.1
Samoa	76.2	46.6	44.2	55.2
Solomon Islands	42.0	44.4	21.6	36.4
Tonga	29.7	34.2	37.5	33.8
<b>Total average</b>	<b>41.0</b>	<b>40.3</b>	<b>38.3</b>	<b>39.9</b>

GDP = gross domestic product.

Source: Author’s calculations from the World Bank. World Development Indicators.

<sup>6</sup> Such mechanism was used to describe the economic situation of the Netherlands during the 1960s when they discovered gas fields in the North Sea. It is defined as the negative effects resulting from an increase in important commodities export in a country.

**Table 7A.2: Current Account Evolution in Asia and the Pacific**  
(% of GDP)

Country	1993–1999	2000–2007	2008–2014	Average
People's Republic of China	3.0	4.5	3.7	3.9
Mongolia	0.1	-1.7	-16.6	-5.8
Indonesia	-0.4	2.7	-0.9	0.6
Malaysia	-0.2	11.2	9.4	7.0
Philippines	-3.2	1.2	3.2	0.5
Thailand	-0.9	2.9	2.3	1.5
Viet Nam	-7.1	-1.8	-0.8	-3.2
Bangladesh	-1.1	0.0	0.7	-0.1
Bhutan	2.6	-12.1	-14.7	-8.3
India	-1.1	0.0	-2.8	-1.3
Nepal	-2.3	3.4	2.3	1.2
Pakistan	-3.6	0.2	-2.9	-2.0
Sri Lanka	-5.4	-3.1	-4.7	-4.3
Armenia	-13.7	-7.0	-11.6	-10.6
Azerbaijan	-17.8	-3.5	23.6	0.6
Georgia	-13.3	-10.2	-11.8	-11.5
Kazakhstan	-4.5	-2.6	1.5	-1.9
Kyrgyz Republic	-14.7	-1.2	-11.5	-8.8
Tajikistan	-12.7	-3.4	-4.9	-6.8
Fiji	-2.0	-8.2	-8.6	-6.3
Papua New Guinea	5.7	4.1	-20.2	-3.1
Samoa	-2.4	-7.2	-5.8	-5.3
Solomon Islands	-4.5	-3.4	-12.8	-6.8
Tonga	-5.5	-3.3	-5.6	-4.7
<b>Total average</b>	<b>-4.5</b>	<b>-1.6</b>	<b>-3.7</b>	<b>-3.2</b>

GDP = gross domestic product.

Source: Author's calculations from the World Bank. World Development Indicators.

**Table 7A.3: Evolution of Exports in Asian Emerging and Developing Countries**  
(% of GDP)

Panel	1993–1999	2000–2007	2008–2014	Average
Southeast Asia	50.8	63.0	57.3	57.3
Southwest Asia	21.4	22.0	21.5	22.0
Central Asia	36.3	42.1	37.4	39.0
Global panel	35.5	40.2	38.1	38.2

GDP = gross domestic product.

Source: Author's calculations from the World Bank. World Development Indicators.

**Table 7A.4: Evolution of Imports in Asian Emerging and Developing Countries**  
(% of GDP)

Panel	1993–1999	2000–2007	2008–2014	Average
Southeast Asia	52.0	59.1	54.7	55.4
Southwest Asia	28.2	30.1	33.9	31.0
Central Asia	53.2	52.2	51.2	52.2
Global panel	45.0	47.4	48.0	46.9

GDP = gross domestic product.

Source: Author's calculations from the World Bank, World Development Indicators.

**Table 7A.5: Summary of Pesaran (2007) CIPS Panel Unit-Root Test for Asian Panels**

Panel	Variables (% of GDP)	Variables in Level
Global panel	Current account	-3.554*** (0.000)
	External debt	1.943 (0.974)
	Imports	0.626 (0.734)
	Exports	-1.269 (0.102)
Southeast Asia	Current account	0.609 (0.729)
	External debt	-3.156*** (0.001)
	Imports	2.549 (0.995)
	Exports	2.267 (0.988)
Central Asia	Current account	-2.888*** (0.002)
	External debt	0.274 (0.608)
	Imports	-1.203 (0.115)
	Exports	-0.137 (0.446)
Southwest Asia	Current account	0.443 (0.671)
	External debt	3.666 (1.000)
	Imports	3.010 (0.999)
	Exports	-0.860 (0.195)

GDP = gross domestic product.

Notes: The null hypothesis of the Pesaran (2007) test is that all series are nonstationary. The alternative assumption is that only a fraction of the individual series in the panel is stationary. We report the standardized Z-tbar statistics, which are compared with the critical values provided by Pesaran (2007). P-value is in parentheses. \*\*\* indicates statistical significance at the 1% level.

Source: Author's calculations from the World Bank, World Development Indicators.

**Table 7A.6: Summary of IPS, MW, and Choi Unit-Root Tests for Asian Panels**

Panel	Variables (% of GDP)	Variables in Level		
		IPS	MW	Choi
Global panel	Current account	-4.412***	96.441***	83.683***
	External debt	-2.989***	97.84***	310.422***
	Imports	-3.105***	79.92***	72.918***
	Exports	-4.039***	82.81***	51.025
Central Asia	Current account	-3.370***	78.454***	81.614***
	External debt	-1.785***	20.331**	13.25
	Imports	-1.026	19.09	20.803*
	Exports	-1.267	16.588	19.933*
Pacific	Current account	-1.271	13.92	30.854***
	External debt	0.633	6.04	17.742**

GDP = gross domestic product, IPS = Im, Pesaran, and Shin, MW = Maddala and Wu.

Notes: IPS, MW, and Choi represent the Im, Pesaran, and Shin (2003); Maddala and Wu (1999); and Choi (2001) panel unit-root tests. All three tests examine the null hypothesis of nonstationarity. The alternative hypothesis is that at least one of the individual series in the panel is stationary. \*, \*\* and \*\*\* indicate statistical significance at 10%, 5%, and 1% levels, respectively.

Source: Author's calculations from the World Bank. World Development Indicators.

**Table 7A.7: External Debt Indicators of Asian Emerging and Developing Countries in 2014**

Country	External Debt Denominated in US Dollars (% of total external debt)	Short- Term Debt (% of total external debt)	Total Debt Service (% of exports of goods, services, and primary income)	Total Reserves (% of total external debt)	Total Reserves (months of imports)
Armenia	63.57	10.62	31.69	17.42	2.92
Azerbaijan	70.73	16.47	5.23	125.26	7.33
Georgia	15.91	15.91	23.33	19.40	2.93
Kazakhstan	6.34	6.34	35.12	13.66	3.25
Kyrgyz Republic	76.56	4.31	14.21	24.87	3.19
Tajikistan	79.38	0.56	38.25	4.19	0.37
Bangladesh	47.09	11.89	5.24	62.38	5.18
Bhutan	15.37	0.54	12.07	67.66	11.89
India	83.08	18.47	18.60	65.51	6.13

*continued on next page*

**Table 7A.7** *continued*

Country	External Debt Denominated in US Dollars (% of total external debt)	Short-Term Debt (% of total external debt)	Total Debt Service (% of exports of goods, services, and primary income)	Total Reserves (% of total external debt)	Total Reserves (months of imports)
Pakistan	55.35	8.91	19.14	18.99	2.55
Sri Lanka	73.99	16.99	14.75	16.78	3.49
Indonesia	74.61	15.88	23.07	37.09	5.59
Malaysia	38.05	49.25	5.85	54.35	5.65
Philippines	69.72	20.92	7.47	92.79	9.45
Thailand	87.26	41.70	5.22	111.38	6.43
Viet Nam	55.04	18.16	4.16	47.56	2.53
People's Republic of China	93.71	71.22	1.88	402.20	18.46
Mongolia	69.74	11.40	21.25	7.40	2.32

US = United States.

Source: World Bank. International Debt Statistics.

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# 8

## Effectiveness of Regional Mechanisms for Multilateral and Regional Governance

*Siriwan Chutikamoltham*

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### 8.1 Introduction

The Asian financial crisis of 1997–1998 revealed that Asia needs to have its own regional mechanism to mitigate systemic risk and contagion. After the crisis, a series of bilateral currency swap agreements, called the Chiang Mai Initiative, were set up in 2000 by the 10 member countries of the Association of Southeast Asian Nations (ASEAN) along with the People’s Republic of China (PRC), Japan, and the Republic of Korea (ASEAN+3). The idea was to establish a foreign exchange reserves pool that central banks of member countries could access in the event of a liquidity or balance of payment crisis. This pool of foreign exchange reserves would provide a backup to supplement the national resources and potential borrowing from international organizations such as the International Monetary Fund (IMF). The idea for, and size of, the reserves pool expanded and, in 2009, the collaboration became the Chiang Mai Initiative Multilateralization (CMIM). Currently, its swap arrangement totals \$240 billion.<sup>1</sup>

In 2009, in the process of making the Chiang Mai Initiative a multilateral effort, the members conceived the idea of setting up an independent surveillance unit to monitor regional economic situations and issue early warnings. The decision led to the creation of the ASEAN+3 Macroeconomic Research Office (AMRO), which opened its

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<sup>1</sup> ASEAN+3 Macroeconomic Research Office (AMRO). [www.amro-asia.org](http://www.amro-asia.org)

doors in Singapore in 2011 and became an international organization in February 2016.

## 8.2 ASEAN+3 Macroeconomic Research Office

### 8.2.1 Mandates of the ASEAN+3 Macroeconomic Research Office

The mandate of AMRO is set out on its website:<sup>2</sup>

AMRO's objective is to contribute to securing the economic and financial stability of the region by conducting regional economic surveillance and supporting the implementation of the CMIM. To fulfill its purpose, AMRO's functions are to

- (i) monitor, assess, and report to members on their macroeconomic status and financial soundness;
- (ii) identify macroeconomic and financial risks and vulnerabilities in the region for members and assist them, if requested, in the timely formulation of policy recommendations to mitigate such risks;
- (iii) support members in the implementation of the regional financial arrangement; and
- (iv) conduct other activities necessary for achieving the purpose of AMRO as may be determined by the Executive Committee.

### 8.2.2 The Organization of AMRO

AMRO's strategy and policy for managing operations is set by its executive committee (Appendix 8.1). The committee members are deputy or vice ministers of finance and deputy central bank governors from the member countries. The executive committee also has the responsibility of appointing the advisory panel and the director.<sup>3</sup>

The advisory panel comprises up to six professionals who form an independent body, reporting directly to the executive committee. The panel is responsible for providing the director with inputs and recommendations—either strategic or technical—for AMRO's work on macro assessments. Members of the advisory panel, three from ASEAN

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<sup>2</sup> ASEAN+3 Macroeconomic Research Office (AMRO). [www.amro-asia.org](http://www.amro-asia.org)

<sup>3</sup> ASEAN+3 Macroeconomic Research Office (AMRO). [www.amro-asia.org](http://www.amro-asia.org)

countries and one each from the ASEAN+3 countries, are respected economists who hold the appointment for a period of 2 years.

AMRO's director is responsible for staff and operations. He or she reports directly to the executive committee. The term for the director's appointment is 3 years (AMRO 2016a). Reporting to the director is a team of economists who keep track of the macroeconomic and financial conditions of the ASEAN+3 countries, with the objective of giving timely recommendations to ensure macroeconomic stability and soundness.

### 8.2.3 The Operations of AMRO

The nature of AMRO's work can be divided into two main categories: crisis prevention and crisis resolution assistance.

#### Crisis Prevention

Toward this end, AMRO produces three kinds of reports. The first contains overall macroeconomic assessment of all members on an individual basis. The second kind of report is the ASEAN+3 Regional Monitoring (AREM) report, which is multilateral surveillance of the global economic and financial developments that may impact the members (Siregar and Chabchitrchaidol 2014). In between the executive committee meetings, it also produces monthly AREM reports, which may be discussed with the advisory panel. The third set of reports contains periodic thematic studies on issues relating to macroprudential measures such as banking supervision.<sup>4</sup>

Based on the agreement to establish AMRO (AMRO 2016b), the members of ASEAN+3 agree to provide the information that AMRO requires to carry out its duties. Along with consultation visits with members to investigate relevant issues, AMRO prepares its reports independently. It communicates the findings and recommendations to the member in an informal and confidential manner.

Analyses done by AMRO provide a basis for member countries to qualify for the crisis-prevention facility of the CMIM, according to the five qualification criteria: (i) external position and market access, (ii) fiscal policy, (iii) monetary policy, (iv) financial sector soundness and supervision, and (v) data adequacy.<sup>5</sup>

<sup>4</sup> ASEAN+3 Macroeconomic Research Office (AMRO). [www.amro-asia.org/publications](http://www.amro-asia.org/publications)

<sup>5</sup> AMRO. The Relationship Between AMRO and CMIM. <http://www.amro-asia.org/about-amro/>

The country reports and AREM reports are presented at the executive committee meetings, held semiannually.

### **Crisis Resolution Assistance**

If, and when, a member experiences difficulties with its liquidity and/or balance of payments, AMRO will assist it to utilize the swap line of CMIM, according to the conditions set forth.

When a member country requests the use of the swap line, AMRO provides an assessment of its economic and financial conditions to the executive committee to aid the committee's decision. If swap line usage is granted, AMRO assists the member country to disburse the funds, monitor the usage, and comply with the terms of the CMIM Agreement (West 2014). Thus far, CMIM does not have an official secretariat body that coordinates the disbursement of the swap line, and AMRO is not legally appointed to be its secretariat. But, by default, the crisis-resolution assistance tasked to AMRO gives it at least part of the role of a secretariat body.

AMRO is also tasked to "provide the macroeconomic policy recommendations that are needed for the CMIM to operate successfully" (Junhong 2016).

### **Resources and Their Utilization**

AMRO's annual budget for operations is provided by its member countries, with the PRC and Japan being the largest contributors.

Currently, the analytical team of AMRO consists of about 25 economists and area experts who monitor member countries' economic and financial development, along with the regional and global conditions to produce the reports noted earlier.

In addition to the analytical staff, there are staff for other aspects of the operation, such as human resources, legal aspects, and coordination with CMIM.<sup>6</sup>

## **8.2.4 Strengths of AMRO in Providing Macprudential Surveillance**

- (i) The agreement establishing AMRO ensures its independent operation. Its property and assets are exempt from search,

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<sup>6</sup> AMRO. [www.amro-asia.org](http://www.amro-asia.org)

confiscation, and restriction. In addition, its work is exempt from censorship and its archived records are untouchable (AMRO 2016: Article 18). This is a good protection against potential exertion of undue influence or actions that could alter the neutrality of its work.

- (ii) AMRO's budget is funded by its members (AMRO 2016: Article 13), thus there is no pressure for it to generate revenue. This financial arrangement affords AMRO staff more freedom to frankly express opinions they derive from their analyses, without being concerned about pleasing the "customers." In this regard, the opinions of AMRO should be more credible than those of research departments of organizations that need to generate profits and may hold back opinions that may not be popular with their customers.
- (iii) AMRO became an international organization in February 2016. Its international status, and the fact that it does not belong legally to one single country, gives it a better corporate standing, a better image of neutrality, and legal protection under international law.
- (iv) The international compensation for its personnel, especially for its expatriate staff who "shall be exempted from taxation on salaries and emoluments paid to them by AMRO" (AMRO 2016: Article 19) is an advantage in attracting high-caliber staff. This should enable AMRO to achieve its criteria of hiring staff, which stress "the paramount importance of securing the highest standards of efficiency and of technical competency" (AMRO 2016: Article 11).
- (v) A surveillance unit like AMRO, dedicated to a particular region, is a major asset in enhancing a regional safety net. AMRO's focus is on its member countries in Asia, and its head office is situated in the region. Thus, its geographic location and scope of work create closer ties and a deeper understanding of Asian affairs. Its staff, although international, is expected to be recruited on a "regional geographical basis" (AMRO 2016: Article 11) which may result in recruiting staff with intimate knowledge of the region.
- (vi) Being regional, AMRO has better access to information about, and a deeper cultural understanding of, the issues in Asia and how people in the region operate. The organization's proximity and cultural sensitivity are advantageous since the nature of the surveillance requires timeliness and an ability to convince policy makers to take action to prevent or improve a situation that could lead to a major crisis.

- (vii) AMRO presents its surveillance reports directly to high-level officials of each country member's ministry of finance and central bank. The private process of presenting the reports allows a faster and more open policy dialogue than those from published reports. The private nature of the dialogue, which takes place behind closed doors, is also more amenable to the Asian culture where face saving is of critical importance.
- (viii) The small staff size, although a limitation for work of such importance, scope, and speed, has a plus side. The small office creates a good flow of information and exchange of knowledge, increasing the depth of individual analysis and levels of integration.
- (ix) ASEAN+3 has shown a strong commitment to regional financial cooperation. If it keeps up its efforts to support AMRO, it should be able to expand the scope and significance of AMRO's work.
- (x) Given that the CMIM does not have a permanent secretariat, AMRO, by default, "has already assumed a substantial secretariat role for the CMIM thus far" (Junhong 2016). One role of the permanent secretariat is to implement the usage of swap lines when a member country needs it. To prepare for this important task, AMRO "conducted a number of test runs to test its operational readiness" (Junhong 2016). It expressed a desire to do more for this function and become a "crisis manager" (Junhong 2016).
- (xi) Nevertheless, it seems that AMRO is only filling in, until (and if) a permanent secretariat is created.
- (xii) In the past, some research papers have criticized AMRO for its lack of a conditionality framework for members to utilize CMIM (West 2014). However, the initial motivation of the members in setting up CMIM and AMRO was a desire to have an Asian alternative to international organizations such as the IMF to deal with crisis financing. Based on the region's experiences of financial crisis management in 1997–1998, setting conditionality may make members more reluctant to use the facility. Of equal importance, Asian culture generally prefers a gentler and more flexible approach to problem solving than having rigid, legal conditionality imposed upon it.



## 8.2.5 Strengthening the Effectiveness of AMRO

AMRO was set up and has expanded in only a few short years to take on the critical responsibility of timely macroeconomic surveillance for various countries in Asia. There are additional areas it can explore to further strengthen its effectiveness.

- (i) If decisions made by the executive committee cannot be reached by consensus, then they will be sought through “no less than two-thirds of the voting power” (AMRO 2016: Article 9). The weight of the voting power is allocated based on the percentage of resource contribution to the CMIM Swap Line (Appendix 2). Countries that contribute more have larger voting power. This structure may dilute the intention of making AMRO an “independent surveillance unit” (AMRO 2016: Article 5) whose operation can be carried out “independently and without undue influence of any member” (AMRO 2016: Article 5).

The nature of surveillance work is to keep track of—or detect—potential problems, send early warnings, and offer recommendations. It is unavoidable that surveillance work sometimes requires bearing bad news and warnings. No one likes to receive such news, especially if they are responsible for the causes, or if they must make changes to rectify the bad situation. Thus, the nature of surveillance requires any organization in this line of work to maintain a delicate balance between being upfront about the analysis and being culturally and politically sensitive. Being perceived as timely and independent is, therefore, critical for AMRO’s effectiveness. A “one man one vote” principle is more conducive to achieving the goal of independence and neutrality. Under such an approach, the amount that a member country provides will not influence the outcome through the weight of its vote.

- (ii) The ASEAN+3 countries contribute to AMRO’s budget. Although this enables AMRO to work without the need to generate its own revenue, the reliance on contributions may have its own complexity. The amount each country is willing to give each year, for example, may depend on its own economic or fiscal health. AMRO needs to make member countries aware of its significance to keep their commitment and support, regardless of their economic conditions or the health of their annual fiscal budget.

- (iii) AMRO does not have the authority to force members to heed its analyses or advice. This makes AMRO essentially a research institution that provides analyses and advice to members in an informal manner. It is possible that members may ignore AMRO's work, at the expense of raising systemic risk over time, especially if the advice is politically unpopular.
- (iv) For member countries to value AMRO, the quality and timeliness of its work are of critical importance. Currently, AMRO has about 25 analytical staff to cover 14 member countries as well as regional and global conditions. This number is very small compared with other international organizations that carry out similar work (West 2014). This point has been mentioned in several other studies, and AMRO has been gradually expanding. But, given the complex linkages, and the rapid speed at which contagion can transmit, ensuring that there are sufficient resources to carry out the work is a top priority.
- (v) One past study (Siregar and Chabchitrchaidol 2014) pointed out that AMRO's "bilateral surveillance work...tends to focus too narrowly on the domestic economy and less on external factors." Without reading AMRO's actual country reports, which are not available to the public, it is hard to know if this critique is applicable to the organization's current work. But, given the increasing connectedness among countries, especially the ongoing economic integration among ASEAN nations under the ASEAN Economic Community plan, it is important to keep track of external factors that are important to systemic risk for the entire region.
- (vi) Since the subprime crisis of 2007–2008, it is apparent that the financial sector plays several vital roles, including being a potential cause of major crises, an important crisis contagion carrier, and a monetary policy transmission device for crisis resolution. It is important that surveillance work should include a constant assessment of developments in the financial sector of a country and its linkages with global banking. There is evidence that AMRO recognizes this point and some of its work has focused on attempting to address issues in this area (Siregar and Chabchitrchaidol 2014). This line of work should continue, with a comprehensive coverage of the financial sector—both the official and the shadow-banking systems—as an integral part of macroeconomic surveillance.

- (vii) Another past study indicated that AMRO's surveillance work focused more on potential risks for the short term, and less on those for the longer term (West 2014). Given the small number of analytical staff, this is a pragmatic decision for the time being. However, history teaches us that a financial crisis may take a long time to develop. Some structural flaws or poor business practices may not pose a risk in the short term, but can accumulate to become systemic risks, over time. The subprime crisis of 2007–2008 is a good example of excessive mortgage lending, coupled with derivative products based on those loans, which accumulated over several years before the actual crisis became apparent. Thus, if it is not already doing so, the scope of AMRO's work should include a comprehensive assessment of all the factors that can affect systemic risk across various time horizons.
- (viii) While AMRO is gradually building up its research capability, it may consider a few options to prioritize its use of available resources.

One possibility is for AMRO to go “niche”—to focus on areas that are most crucial for regional economic and financial stability, which are its main tasks. It can cooperate with existing research institutions, universities, and international organizations such as the IMF and the Asian Development Bank (ADB) for other parts of the analyses when producing its reports.

AMRO has recently acknowledged the importance of “cooperation between the different layers of the global financial safety net, i.e., foreign reserves, bilateral swap agreements, regional financial arrangements (such as CMIM), and IMF resources which may also help address issues such as facility shopping or duplications of functions” (Junhong 2016). It further envisioned that the future role of “CMIM and AMRO may go beyond their regional mandate” (Junhong 2016). In my view, this acknowledgment is a step in the right direction and should be pursued to make it a reality as soon as possible.

This kind of cooperation, which can potentially reduce work duplication, is pragmatic, especially in an increasingly connected global economy. It can increase the effectiveness of collaborating organizations while saving resources. However, a few prerequisites are important to make collaboration possible. First, more established institutions

will have to find AMRO's work to be of sufficiently high quality, and to add value to their own. Second, there should be a clear division of labor and scope of work, to avoid potential overlaps and conflict. Third, there must be a mechanism for timely exchange of data and information. This means that AMRO and the collaborating organizations must work out their levels of confidentiality, clearance, and reciprocity.

The article that established AMRO also allows cooperation with relevant international financial institutions (such as ADB, the European Stability Mechanism, the IMF, the World Bank, and the Organisation for Economic Co-operation and Development [OECD]) by allowing AMRO to "enter into agreements with them" (AMRO 2016: Article 5) to carry out the desired cooperation, especially on a formal basis, and beyond its regional mandates. However, there seems to be some inconsistency that may prevent the effectiveness of cooperation because the same article also stipulates that "No member shall be liable, by reason of its status or participation in AMRO, for acts, omissions or obligations of AMRO arising out of such agreements." The required cooperation by members is only to "cooperate with AMRO in good faith in AMRO's surveillance and other activities." AMRO should consider a legal arrangement that makes the cooperation acceptable to its members.

Another possibility for AMRO to leverage its limited staff is to prioritize member countries that are more vulnerable, and focus its resources, for the time being, on these countries, with less emphasis on those that are deemed solid. The priority list should be reassessed periodically to make sure that AMRO does not neglect members that may be accumulating latent problems that may erupt into a crisis.

- (ix) The limited resources under CMIM are a serious barrier to financial stability in the region. CMIM has a multilateral swap line of \$240 billion, with a stipulation for the maximum swap amount that each ASEAN+3 member country can use at a time (Appendix 2). Each member can use up to 30% of its quota without being subject to conditionality set by the IMF (the IMF delinked portion). The usage of any amount above the delinked portion is subject to conditions that the IMF sets for its support program (Hill and Menon 2014). For example, Singapore's maximum swap amount is \$22.76 billion (Appendix 2). The delinked portion of the swap line

covers less than 10 days worth of imports, and the total quota can cover only 29 days worth of its imports.<sup>7</sup>

In other words, as it is currently set up, AMRO can be more effective in delivering an early warning than in resolving a crisis. Once there is a full-blown crisis, resources available for stabilization under the CMIM are still small and can only give its members a little more time to seek assistance from other sources, but are not likely to pull a country out of a major crisis. Coupled with the absence of conditionality in utilizing the swap line, even if AMRO became the crisis manager, it would have less enforcing power for crisis resolution than when conditionality is required.

Given its direct role in crisis prevention, it is critical that AMRO ensures that its surveillance work is timely, of high quality, and that its messages are taken seriously by member countries to prevent a potential crisis.

Besides CMIM and AMRO, there are various other organizations within the Asia and Pacific region whose work is supportive of macroprudential objectives. They include the Southeast Asian Central Banks Research and Training Centre (SEACEN), the Executives' Meeting of East Asia–Pacific Central Banks (EMEAP), and a few other high-level policy dialogues that take place on a regular basis.

### 8.3 Southeast Asian Central Banks Research and Training Centre

SEACEN was established in 1982 as a private company, under Malaysian law. Its stated objectives are “to promote the understanding of financial, monetary, banking, and economic development matters which are of interest to central banks and monetary authorities of countries in Southeast Asia and to facilitate cooperation among central banks and monetary authorities in the area of research and training” (SEACEN 1982).

SEACEN's mission is to build capacity and promote best practices within central banks and foster networking and collaboration among member central banks. Toward this end, its main activities

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<sup>7</sup> Author's calculation based on 2015 balance of payments data from Department of Statistics Singapore. ([www.singstat.gov.sg](http://www.singstat.gov.sg)) and the average exchange rate S\$–\$ for 2015 (Monetary Authority of Singapore. [www.MAS.gov.sg](http://www.MAS.gov.sg)).

are conducting training and seminars, collaborative research of the disciplines mentioned, and publishing and distributing the research. It also organizes meetings, including annual meetings of the Board of Directors, to promote collaborations among central bankers.

Since July 2016, SEACEN has undertaken a new strategic direction by strengthening its research capability with the goal of being a thought leader in central banking matters. In addition, it wants to be recognized as the top regional provider of training for central bankers.

The SEACEN Centre has 20 regular members that are central banks and monetary authorities (Appendix 3). In addition, it has seven associate members.<sup>8</sup> They are invited, along with the regular members, to attend the annual SEACEN Governors' Conference and High-Level Seminar to exchange views on the main areas of research and topics of interests. These two types of members are also invited on a regular basis to SEACEN's learning programs. SEACEN also has eight observers,<sup>9</sup> which are central banks that are invited to take part in its learning programs.

The organization of SEACEN comprises the board of governors, the executive committee, and staff. The board sets its strategies, admits new members and observers, appoints directors of the executive committee, and approves its annual budget. Directors of the board are governors of members' central banks and monetary authorities. The executive committee, on the other hand, is staffed with their deputies to take charge of SEACEN's operations and recommendations for the board's approval.

The operations of SEACEN are carried out by the SEACEN Team, which consists of about 25 staff members<sup>10</sup> and is headed by an executive director.<sup>11</sup> The majority of the staff works on designing and organizing training courses and administrative duties, while there are 11 positions for economists and area experts who are responsible for research and learning content.

There is also a SEACEN Expert Group (SEG) on capital flows that deals specifically with this issue. SEG develops frameworks and proposals for management of capital flows. SEACEN staff members

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<sup>8</sup> Associate member central banks and monetary authorities of Australia; Bangladesh; Bhutan; Macau, China; Pakistan; Tonga; and Vanuatu (The SEACEN Centre. [www.seacen.org](http://www.seacen.org)).

<sup>9</sup> Observer member banks and monetary authorities are Afghanistan, Iran, Japan, the Maldives, New Zealand, Samoa, Solomon Islands, Timor-Leste, and other economies as approved by the SEACEN BOG.

<sup>10</sup> Interview with Hans Genberg, SEACEN executive director, 12 July 2016.

<sup>11</sup> The SEACEN Centre. [www.seacen.org](http://www.seacen.org)

assist SEG in implementation through providing, processing, and analyzing data on capital flows as well as facilitating communication among SEG members.<sup>12</sup>

Currently, SEACEN collaborates with 26 strategic partners, including the Bank for International Settlements.<sup>13</sup> Appendix 4 shows areas of collaboration with some partners. In addition, it also uses content experts from the financial community such as academics, or from the public or private sector. These collaborations help increase SEACEN's coverage and quality beyond the capacity of its small-sized organization.

SEACEN publishes reports related to economic and financial issues and central banking practices. Until 2013, it produced few research studies. In 2014, it streamlined its publication to working papers.<sup>14</sup> Each year, it produces about 5–7 working papers on various economic and financial topics. Since October 2014, it has also published the SEACEN Financial Stability Journal, which focuses on “practical implementation of issues related to promoting financial stability and systemic risk management from a central bank/monetary authority perspective.”<sup>15</sup> In addition, it publishes conference proceedings from major conferences that it organizes.

### 8.3.1 SEACEN Centre's Strengths in its Contribution to Macroprudential Policy

- (i) SEACEN promotes better central banking practices through training and communication among members—which are primarily ASEAN members—and a few other Asian countries. Although SEACEN's mandate is not directly regarding macroprudential issues, its work benefits the region and improves its ability to handle these issues in the long term. Central banks play a crucial role in managing macroprudential policies and measures, and SEACEN helps to upgrade their ability. Thus far, SEACEN is the only regional organization in Asia that focuses on central banking.
- (ii) In addition, the training programs and meetings that SEACEN organizes provide opportunities for central bankers from member, associate member, and observer countries to meet

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<sup>12</sup> The SEACEN Centre. [www.seacen.org](http://www.seacen.org)

<sup>13</sup> The SEACEN Centre. [www.seacen.org](http://www.seacen.org)

<sup>14</sup> The SEACEN Centre. [www.seacen.org](http://www.seacen.org)

<sup>15</sup> The SEACEN Centre. [www.seacen.org](http://www.seacen.org)

and to work together. Alumni of SEACEN forums may get to know each other over a period of time and build personal rapport and relationships that benefit their professional interactions and lead to better regional integration.

- (iii) The structure of SEACEN's board consists entirely of governors of members' central banks and monetary authorities. In general, they are bureaucrats who hold their positions for some time, not politicians whose tenure is unpredictable. This structure provides stability and continuity in SEACEN's strategic direction. In addition, central banks are assumed to be independent of political influences. One would expect that SEACEN's outputs—whether they are publications, training programs, or meetings—are based on professional frameworks, not political pressure.
- (iv) Following the same logic as above, members of SEACEN are central banks, not countries. Central banks are a part of the bureaucracy, not political parties, and often have independence regarding their operations. As a result, this setup should allow SEACEN to be independent of international politics.
- (v) SEACEN's budget is funded by its members, so it does not have commercial pressure to generate profits. It can focus on its organizational missions. The contribution from each member is relatively small and, thus far, SEACEN's budget requests over the years have not been affected by the economic conditions in member countries.<sup>16</sup>

### 8.3.2 Strengthening the SEACEN Centre's Effectiveness<sup>17</sup>

- (i) With the organization's mandate already specified by the nature of its work, SEACEN plays a supporting role, not a direct one, in macroprudential regulation. The bulk of its activities are training and conferences on issues that are of interest to central bankers. Although some of its publications are directly related to economic and financial stability in the Asia and Pacific region, SEACEN does not have the mandate to communicate them directly to the members' policy makers, nor does it have any policy advisory role. Thus, it is harder for

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<sup>16</sup> Interview with Hans Genberg, executive director, SEACEN Centre.

<sup>17</sup> The information provided in this subsection is from an interview with Hans Genberg, executive director, SEACEN Centre.



SEACEN to have a direct impact on regional macroprudential policy. Its contribution is indirect, through disseminating knowledge and upgrading the skills of central bank officials who work on macroprudential issues.

- (ii) SEACEN has a small number of staff: about 25 personnel, of which only 11 are economists or experts in areas such as financial stability or central bank supervision. The rest, which is the majority of the staff, are involved in organizing training programs, meetings, and administrative duties. Currently, SEACEN has no expansion plans. It is hard to expect that the research outputs of such a small staff could make a significant change to the macroprudential landscape of the region. One way to achieve the most meaningful output is to focus on research areas that fit its agenda, but are not yet covered by other institutions. There is some evidence that SEACEN has plans to move in the direction of “niche” research such as its work on the payment system. If it continues in this direction, it may become more prominent in certain fields of research.
- (iii) SEACEN is not an international organization, but a Malaysian corporation. Its new strategic direction of becoming more of a research institution requires increased specialized expertise. Professionals who are of top quality are in short supply in the Asia and Pacific region; thus, their compensation would have to be internationally competitive. This is a consideration that needs to be kept in mind if SEACEN is to achieve its goal of focusing more on generating knowledge.
- (iv) SEACEN’s research scope has some overlap with AMRO. Recently, there have been efforts to explore potential collaboration but, thus far, there is no formal plan of collaboration. Given that both AMRO and SEACEN have a small number of staff, both could potentially benefit from collaborating.

In summary, SEACEN plays a supporting role in building the capacity for macroprudential regulations in the Asia and Pacific region through training of central bank personnel, with some research and publications to generate and disseminate knowledge related to economic and financial stability. The benefits derived from SEACEN’s work, namely upgrading and expanding members’ ability to handle macroprudential issues, are more medium to long term. It is not an organization that directly creates policy impact in the short term.

## 8.4 The Executives' Meeting of East Asia–Pacific Central Banks

The Executives' Meeting of East Asia–Pacific Central Banks (EMEAP) was established in 1996 as a joint effort of the central banks and monetary authorities of 11 nations in the Asia and Pacific region to strengthen the relationships and cooperation among members. Their members are central banks of Australia; the PRC; Hong Kong, China; Indonesia; Japan; Malaysia; New Zealand; the Philippines; the Republic of Korea; Singapore; and Thailand.<sup>18</sup>

The governors of the member central banks hold annual meetings to exchange ideas on economic and financial conditions. They also set policies of the organization's activities and receive updates from the working groups, which collaborate on issues important to central banking such as bank supervision, payment and settlement systems, financial markets, etc.

Since 2004, they have also held annual meetings with officials of the Euro system on policies and issues that are of mutual interests and/or mutual impact. When necessary, EMEAP communicates with other regional central banks on issues that are of mutual significance, such as with the Federal Reserve System about the impact of the Volcker Rule on EMEAP members (EMEAP 2014).

Between the annual meeting of the central bank governors, their deputies meet twice a year for continuity of the agenda. They also monitor the activities of the working groups, which consist of experts on different issues.

Currently, there are three working groups: (i) payment and<sup>19</sup> settlement systems, (ii) banking supervision, and (iii) financial markets. They conduct studies on their respective areas, report the findings to the governors and deputies, and produce publications. There is also a group that studies applications of information technology in banking and communicates to members at the meeting of the directors of Information Technology.<sup>20</sup>

One concrete outcome of the working groups is the creation of the two Asian Bond Funds (ABF). ABF 1 was created in 2003 as a US dollar-denominated bond fund that invests in sovereign and quasi-sovereign bonds issued by Asian EMEAP members. ABF 2 was created

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<sup>18</sup> EMEAP. [www.ememap.org](http://www.ememap.org)

<sup>19</sup> Executives' Meeting of EMEAP.

<sup>20</sup> Executives' Meeting of EMEAP.

in 2004 with the same concept, but the bonds were denominated in local currencies of the issuers. The main objective of this collaboration is “to further broaden and deepen the domestic and regional bond markets and hence contribute to more efficient financial intermediation in Asia” (EMEAP 2005).

Working groups conduct research that is mainly of interest to central banks. Members may be able to use the research findings to improve their central banking operations and to enhance macroeconomic surveillance. Toward this end, EMEAP essentially carries out dialogues among members and financial institutions, both private and international, to promote financial stability in the region. The committee members also hold meetings at the same time as the deputies’ meetings.

#### **8.4.1 Strengths of EMEAP in Contributing to Macroprudential Policy**

- (i) It provides another forum for regular communication among the governors and deputy governors of the region. Presumably, the more frequently the top decision makers of members’ central banks meet, the better the exchange of information and collaboration. This should help with timely regional coordination required for macroprudential policy.
- (ii) It extends the coverage to central banks outside the region, enabling them to communicate major factors that may impact the Asia and Pacific region. Given global interconnectedness, these activities may help promote coordination, especially when there is a major threat to the global financial system.
- (iii) Its working groups carry out research that is mainly of interest to central banks. Members may be able to use the research findings to improve their central banking operations. Since central banks are crucial organizations for macroeconomic stability, EMEAP plays an indirect role in strengthening the macroprudential capabilities of its members.

#### **8.4.2 Strengthening the Effectiveness of EMEAP**

- (i) The scope of EMEAP’s work overlaps with those of AMRO and SEACEN. Its working groups conduct studies on topics that are similar to those of the other two organizations. For example, SEACEN also works on the payment settlement systems, and AMRO has worked on banking supervision. Its

working groups also deal with macroeconomic surveillance and promote dialogues among members on financial stability issues. Again, this seems to overlap with the direct mission of AMRO. It is not clear if EMEAP's work is substantially different in content from that of other institutions.

- (ii) Thus far, there is no evidence that EMEAP's working groups collaborate with other institutions in their research. Given the similarity in the agendas of EMEAP and other institutions related to macroprudential policy, financial stability, and surveillance, it seems logical that EMEAP should collaborate with the others, or set its own agenda that is clearly distinct from the work of the other organizations.
- (iii) Public information about the work and accomplishments of EMEAP is limited. Besides its concrete successes, such as the two ABFs, which were set up more than a decade ago, there is not much information about EMEAP's more recent achievements. The publications on its website are also limited. It is not clear whether it produces many more publications that are simply not posted. EMEAP would perhaps gain more significance if it made its work more transparent.

In summary, EMEAP provides another avenue for the governors and deputy governors of the members' central banks to dialogue and exchange ideas. This agenda promotes more frequent interactions among them, although they also have other opportunities to exchange ideas. There seem to be few studies by its working groups and it is unclear if they overlap with the works of other institutions. Its works are given to its member central banks, but EMEAP's mission is not to be a policy advisory body. It is up to the members to utilize EMEAP's work. Thus, the benefits of EMEAP's work are indirect and long term in nature. It is hoped that EMEAP's studies, and the interaction between the members, improves the exchange of ideas, which may lead to better and faster macroprudential policy outcomes. To accomplish its mission, EMEAP should be more transparent regarding its work and plans.

## 8.5 Other High-Level Policy Dialogues

In an effort to promote cooperation and surveillance processes, high-level officials from the ASEAN+3 countries hold meetings on various occasions.

### 8.5.1 The Economic Review and Policy Dialogue

One of them is the Economic Review and Policy Dialogue, which is an annual meeting among the ASEAN+3 finance ministers. Since 2012, it has also included the governors of the members' central banks. Hence, the name of the meeting was changed to the ASEAN+3 Finance Ministers and Central Bank Governors' Meeting.

The main purpose of the meeting is to discuss macroeconomic and financial issues, with inputs from ADB. Besides the meeting of the finance ministers, their deputies also meet twice a year for the same purpose.

### 8.5.2 Asia-Pacific Economic Cooperation

Another forum where leaders from countries in Asia and the Pacific meet and collaborate is the Asia–Pacific Economic Cooperation (APEC). The primary goal of this 21-member organization<sup>21</sup> is to support sustainable economic growth and prosperity in the Asia and Pacific region.

APEC's main areas of focus include the promotion of free trade and investment, regional economic integration, economic and technical cooperation, human security, and sustainable business environments. Its activities seek to forge agreements among members that yield tangible policy benefits.<sup>22</sup>

Although the mission of APEC extends beyond economic and financial surveillance, it provides a forum for more regional collaboration and policy dialogues, which can help strengthen macroeconomic resiliency. Leaders of member countries, which also include several ASEAN+3 members, meet at various APEC meetings such as the annual ministerial meetings, the sectoral ministerial meetings, and other workshops.

### 8.5.3 Asia–Europe Meeting

A similar forum that allows more policy discussion and collaboration, but is less formal, is the Asia–Europe Meeting (ASEM) which was created in 1996 to provide “an informal process of dialogue and cooperation”<sup>23</sup> among the 53 member states of Europe and Asia, which includes

<sup>21</sup> See Appendix 5 for the list of APEC members.

<sup>22</sup> Asia-Pacific Economic Cooperation. [www.apec.org](http://www.apec.org)

<sup>23</sup> ASEM InfoBoard. [www.aseminfoboard.org](http://www.aseminfoboard.org)

members of ASEAN+3 and the ASEAN Secretariat. ASEM holds summit meetings for heads of member states, ministerial meetings, and other high-level official meetings on various related issues. In addition, the forum involves regular consultation before international meetings.

In summary, these meetings enhance collaboration and extend it beyond macroprudential issues. Although they may not have a direct impact on regional surveillance and crisis prevention, they provide more opportunities for members to dialogue and interact. The exchanges at these forums can help align and coordinate members' policies which promote regional cooperation

## 8.6 Conclusion

This chapter reviews regional organizations within the Asia and Pacific region whose work promotes the region's macroprudential ability. It describes their operations and organizational structures to assess their role in improving the region's ability to resolve and prevent future financial crises. The chapter also suggests areas where these organizations can become stronger, to increase their effectiveness

The review of AMRO, which is tasked with macroprudential surveillance and providing assistance in crisis resolution, shows that it plays an important role and offers several unique features that can contribute to better and more timely macroprudential policy in the region. Given its small size, its lack of authority to enforce its policy recommendations, and the limited budget of CMIM, AMRO is not in a position to replace the dominance of international organizations with large resources such as the IMF when there is a need to resolve a financial crisis. In its current state, AMRO is more effective in raising alarm at the early warning stages than in crisis resolution at a later stage. The work of AMRO should be supported and expanded; its coordination with other international organizations could strengthen its work as well as the macroprudential ability of the Asia and Pacific region.

SEACEN produces research on central banking and gives training to central bankers. Its work is not directly on macroeconomic surveillance, but it plays an indirect role in promoting financial stability in the region through improving the capabilities of central banking staff, and creating forums to strengthen the relationships among members' central bankers. The works of SEACEN indirectly helps improve the management of the central banking of its members in the medium to long term, which benefits macroprudential policy, of which a core

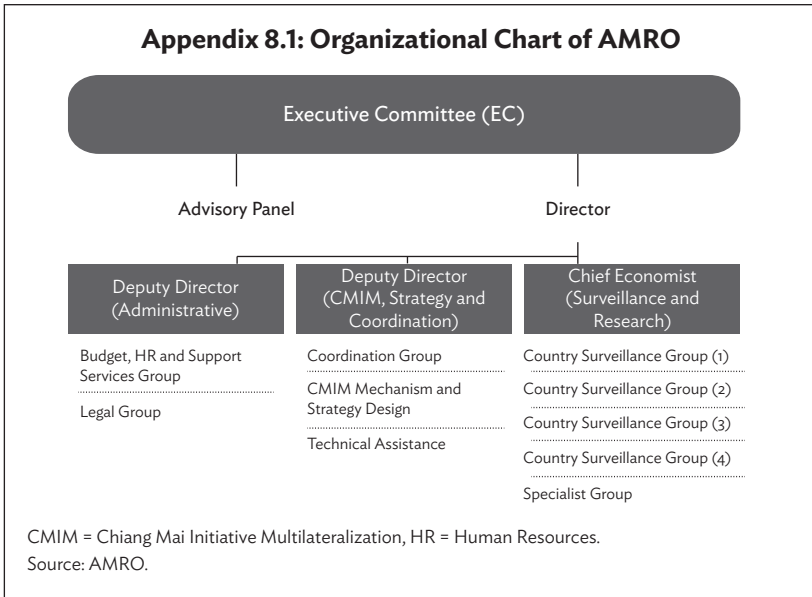
element is central banking. SEACEN could become more effective if it streamlines its focus and collaborates with other organizations whose works are complementary to its own.

EMEAP organizes meetings to enable the governors and deputy governors of its members' central banks to dialogue and exchange ideas. The benefits of EMEAP's work on macroprudential policy is indirect and long term through fostering relationships and interactions among the top decision makers at members' central banks, which may enable better and faster macroprudential policy outcomes. EMEAP also offers some studies to its members, but given that EMEAP's mission is not to be a policy advisory body, it is up to the members to utilize EMEAP's work. There is no public information about if, and how, the members have made use of the work, however.

There are also other high-level policy dialogues that take place regularly in the Asia and Pacific region such as APEC, whose focus is to enable members to achieve agreements and policies on the promotion of free trade and investment, regional economic integration, economic and technical cooperation, human security, and sustainable business environment. The scope of APEC goes beyond direct macroprudential schemes, but it provides another forum for more regional collaboration and policy dialogue, which can help strengthen macroeconomic resiliency.

Similarly, ASEM enables informal policy dialogue among its members in Asia and Europe, which are additional avenues of interaction among top policy makers that can indirectly strengthen regional integration.

The regional organizations reviewed in this chapter contribute directly and indirectly to macroprudential schemes in the Asia and Pacific region. But, due to the nature of their work objectives and/or relatively small sizes, they should be viewed as useful supplements to the existing international organizations rather than their replacements.



## Executive Committee

- Comprises deputy finance ministers and deputy central bank governors of the ASEAN+3 countries.
- Functions: To maintain strategic oversight of AMRO, including providing guidance and setting broad policy direction for the management of AMRO; and appointing AMRO's director and advisory panel members.

## Advisory Panel

- Comprises six members for a 2-year term (three from ASEAN, one from the PRC, one from Japan, and one from the Republic of Korea) appointed by the Executive Committee.
- It is independent from the director and staff of AMRO, and is accountable to the Executive Committee. The term is 2 years.

Source: ASEAN+3 Macroeconomic Research Office. [www.amro-asia.org](http://www.amro-asia.org) (accessed 9 October 2016).



## Appendix 8.2: Chiang Mai Initiative Multilateralization Contributions, Purchasing Multiples, and Maximum Swap Amounts

Economies	Financial Contribution (\$ billion)		Share (%)		Purchasing Multiple	Maximum Swap Amount	
+3	192.000		80.000			117.30	
Japan					0.5	34.20	
PRC	PRC (Excluding Hong Kong, China)	76.800	68.400	32.000	28.500	0.5	34.20
	Hong Kong, China	8.400		3.500		2.5	6.30
Republic of Korea	38.400		16.000		1.0	38.40	
<b>ASEAN</b>	<b>48.000</b>		<b>20.000</b>			<b>126.20</b>	
Indonesia	9.104		3.793		2.5	22.76	
Thailand	9.104		3.793		2.5	22.76	
Malaysia	9.104		3.793		2.5	22.76	
Singapore	9.104		3.793		2.5	22.76	
Philippines	9.104		3.793		2.5	22.76	
Viet Nam	2.000		0.833		5.0	10.00	
Cambodia	0.240		0.100		5.0	1.20	
Myanmar	0.120		0.050		5.0	0.60	
Brunei Darussalam	0.060		0.025		5.0	0.30	
Lao PDR	0.060		0.025		5.0	0.30	
<b>Total</b>	<b>240.000</b>		<b>100.00</b>			<b>243.50</b>	

Economies	Basic Votes	Votes Based on Contribution	Total Voting Power		
				%	
+3	9.600	192.000	201.60	71.59	
Japan	3.200	76.800	80.00	28.41	
PRC	PRC (Excluding Hong Kong, China)	3.200	68.400	71.60	25.43
	Hong Kong, China	0.000	8.400	8.40	2.98
Republic of Korea	3.200	38.400	41.60	14.77	
<b>ASEAN</b>	<b>32.000</b>	<b>48.000</b>	<b>80.00</b>	<b>28.41</b>	
Indonesia	3.200	9.104	12.304	4.369	
Thailand	3.200	9.104	12.304	4.369	
Malaysia	3.200	9.104	12.304	4.369	
Singapore	3.200	9.104	12.304	4.369	
Philippines	3.200	9.104	12.304	4.369	

continued on next page

**Appendix 8.2** *continued*

Economies	Basic Votes	Votes Based on Contribution	Total Voting Power	
				%
Cambodia	3.200	0.240	3.44	1.222
Myanmar	3.200	0.120	3.32	1.179
Brunei Darussalam	3.200	0.060	3.26	1.158
Lao PDR	3.200	0.060	3.26	1.158
<b>Total</b>	<b>41.600</b>	<b>240.000</b>	<b>281.60</b>	<b>100.00</b>

ASEAN = Association of Southeast Asian Nations; +3 = ASEAN + People's Republic of China, Japan, and Republic of Korea; Lao PDR = Lao People's Democratic Republic; PRC = People's Republic of China.

Source: ASEAN+3 Macroeconomic Research Office. [www.amro-asia.org](http://www.amro-asia.org) (accessed 9 October 2016).

**Appendix 3: Membership of the SEACEN Centre**

Autoriti Monetari Brunei Darussalam  
National Bank of Cambodia  
People's Bank of China  
Reserve Bank of Fiji  
Hong Kong Monetary Authority  
Reserve Bank of India  
Bank Indonesia  
The Bank of Korea  
Bank of the Lao PDR  
Bank Negara Malaysia  
The Bank of Mongolia  
Central Bank of Myanmar  
Nepal Rastra Bank  
Bank of Papua New Guinea  
Bangko Sentral Ng Pilipinas  
Monetary Authority of Singapore  
Central Bank of Sri Lanka  
Central Bank of Taipei, China  
Bank of Thailand  
State Bank of Vietnam

Source: The SEACEN Centre. [www.seacen.org](http://www.seacen.org) (accessed 9 October 2016).

## Associate Members

SEACEN has seven associate member central banks/monetary authorities that are regularly invited to participate in all SEACEN learning programs as well as the annual SEACEN Governors' Conference/High-Level Seminar. The associate members are listed below:

### SEACEN Associate Members

1. Reserve Bank of Australia
2. Bangladesh Bank
3. Royal Monetary Authority of Bhutan
4. Monetary Authority of Macao
5. State Bank of Pakistan
6. National Reserve Bank of Tonga
7. Reserve Bank of Vanuatu

## Observers

SEACEN also has eight observer central banks/monetary authorities that are regularly invited to participate in all SEACEN learning programs. The list of observers is given below:

### SEACEN Observers

1. The Afghanistan Bank
2. The Central Bank of the Islamic Republic of Iran
3. Bank of Japan
4. Maldives Monetary Authority
5. Reserve Bank of New Zealand
6. Central Bank of Samoa
7. Central Bank of Solomon Islands
8. Central Bank of Timor-Leste

Source: The SEACEN Centre. [www.seacen.org](http://www.seacen.org) (accessed 9 October 2016).

### Appendix 8.4: Strategic Partners of the SEACEN Centre

Institute and Areas of Collaboration in Learning Programs				
Institutions	Monetary Policy/ Macroeconomic Management	Financial Stability/ Banking Supervision	Payment and Settlement Systems	Central Bank Governance/ Others
Asia-Pacific Economic Cooperation (APEC) Business Advisory Council		●		
Asian Development Bank (ADB)	●	●		
ADB Institute		●		●
APEC Training Initiative		●		
Bank for International Settlements (BIS)	●	●		● (Legal; IT)
Centre for Central Banking Studies, Bank of England	●			
Center for Latin American Monetary Studies	●			
Bank of Japan	●		●	
Committee for Payment and Market Infrastructure/BIS			●	
Deutsche Bundesbank		●		
Federal Reserve System, US	●	●		
Financial Stability Institute/ BIS		●		
International Centre for Leadership in Finance				● (Leadership)
International Monetary Fund (IMF)	●			
IMF Institute	●	●		
Irving Fisher Committee on Central Bank Statistics	●			
Islamic Development Bank		●		
Office of Comptroller of the Currency, US		●		
Office of the Superintendent of Financial Institutions, Canada		●		
Toronto International Leadership Centre		● (Leadership)		

continued on next page

**Appendix 8.4** *continued*

Institute and Areas of Collaboration in Learning Programs				
Institutions	Monetary Policy/ Macroeconomic Management	Financial Stability/ Banking Supervision	Payment and Settlement Systems	Central Bank Governance/ Others
World Bank	●	●		
World Bank Institute	●	●		
World Bank Treasury				● (Reserve Management)
Harvard Club of Malaysia and Charles River Centre				● (Leadership)
International Association of Deposit Insurers		● (Deposit Insurance)		
Consultative Group to Assist the Poor		● (Microfinance, Access to Finance)		

IT = information technology, SEACEN = Southeast Asian Central Banks Research and Training Centre, US = the United States.

Source: The SEACEN Centre. [www.seacen.org](http://www.seacen.org) (accessed 9 October 2016).

### Appendix 8.5: Members of Asia-Pacific Economic Cooperation

APEC Members	Date of Joining
Australia	6–7 Nov 1989
Brunei Darussalam	6–7 Nov 1989
Canada	6–7 Nov 1989
Chile	11–12 Nov 1994
PRC	12–14 Nov 1991
Hong Kong, China	12–14 Nov 1991
Indonesia	6–7 Nov 1989
Japan	6–7 Nov 1989
Republic of Korea	6–7 Nov 1989
Malaysia	6–7 Nov 1989
Mexico	17–19 Nov 1993

*continued on next page*

**Appendix 8.5** *continued*

APEC Members	Date of Joining
New Zealand	6–7 Nov 1989
Papua New Guinea	17–19 Nov 1993
Peru	14–15 Nov 1998
Philippines	6–7 Nov 1989
Russian Federation	14–15 Nov 1998
Singapore	6–7 Nov 1989
Taipei, China	12–14 Nov 1991
Thailand	6–7 Nov 1989
United States	6–7 Nov 1989
Viet Nam	14–15 Nov 1998

APEC = Asia-Pacific Economic Cooperation, PRC = People's Republic of China.

Source: Asia-Pacific Economic Cooperation. [www.apec.org](http://www.apec.org)

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# 9

## The Evolving Multilayered Global Financial Safety Net: The Case of the Association of Southeast Asian Nations +3 (ASEAN+3) Regional Financial Safety Net and the International Monetary Fund

*Pradumna B. Rana*

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### 9.1 Introduction

The international monetary architecture or the global financial safety net (GFSN)<sup>1</sup> set up at Bretton Woods in 1944 was centralized with the International Monetary Fund (IMF) being the sole multilateral institution to promote macroeconomic and financial stability by providing short-term financial support to countries facing a temporary balance of payments problem. Subsequently, the G7 was established in the mid-1970s to oversee the process of provision of public goods by various international economic institutions including the IMF. In the aftermath of the global financial crisis of 2008–2009, this relatively centralized GFSN has evolved into a more decentralized multilayered system comprising (i) the G20 at the apex as an overarching institution,

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<sup>1</sup> The GFSN refers to a set of crisis prevention and resolution instruments encompassing self-insurance (reserves), bilateral arrangements (swap lines between central banks), regional arrangements, and multilateral arrangements with the IMF in the center.



(ii) multilateral financial safety nets (MFSNs) established under the auspices of the IMF, (iii) bilateral financial safety nets (BFSNs) among central banks, (iv) regional financial safety nets (RFSNs) established in various regions of the world, and (v) national financial safety nets (NFSNs) or reserve accumulation by individual countries. The most significant factor explaining this evolution is financial globalization and the increased incidence of capital account crises—associated with large inflows and sudden reversals of capital flows, and the bursting of asset bubbles. As Kawai and Rana (2009) have argued, preventing and managing such crises requires actions at the global, regional, and national levels.

The multilayered GFSN is still evolving and needs to be strengthened further to prevent a systemic crisis and protect innocent bystanders in the future. The relationship between institutions at different layers also needs to be spelled out. In particular, should RFSNs complement or compete with global institutions? This topic was introduced as a new agenda item at the Seoul G20 Summit in November 2010, where global leaders agreed that “strengthened GFSNs can help countries to cope with financial volatility, reducing economic disruptions from sudden swings in capital flows, and the perceived need for excessive reserves accumulation.” They also agreed to explore “ways to improve collaboration between regional financing arrangements and the IMF, acknowledging the potential synergies from such collaboration” (The G20 Seoul Summit Leaders Declaration 11–12 November 2010). The following year, in November 2011, the G20 leaders endorsed six broad principles for cooperation between RFSNs and the IMF (G20 2011).

The objectives of this chapter are threefold: (i) to briefly review trends in the GFSN and the factors responsible for the developments; (ii) to outline the progress in the ASEAN+3 RFSN (namely, the Chiang Mai Initiative Multilateralization [CMIM] and ASEAN+3 Macroeconomic Research Office [AMRO]) and its relationship with the IMF; and (iii) to provide recommendations to strengthen the ASEAN+3 RFSN and its complementarity with the IMF. It is hoped that these recommendations, together with the recent upgrade of AMRO to an international organization, will ensure that the ASEAN+3 RFSN will be utilized the next time a financial crisis hits the region.

While several authors (e.g., Henning [2011a] and Volz [2012]) have argued that the relationship between the ASEAN+3 RFSN and the IMF should be cooperative and complementary, some others (e.g., Ocampo and Titelman 2012) have argued that RFSNs should be stand-alone and independent. The main hypothesis of this chapter is that beyond

a certain amount of “healthy” competition,<sup>2</sup> RFSNs should cooperate with and complement global institutions. This is for a number of reasons. First, both global and regional institutions have relative comparative advantages in different areas—cross-regional expertise and experience plus institutional memory in the case of the former, region-specific knowledge and proximity in the latter. Second, the demand for international public goods is sufficient for both to coexist. Third, managing financial globalization needs global, regional, and even national institutions (Kawai and Rana 2009). The chapter, however, argues that the present ad hoc method of promoting complementarity between the ASEAN+3 RFSN and the IMF is not good enough. The small size of funds available and possible delays in disbursement are also constraints. Based on the experience of Europe, we make the case for a more structured form of RFSN and IMF complementarity and argue that this modality of cooperation will enhance the effectiveness of the ASEAN+3 RFSN, so that it can be utilized when the next financial crisis hits the region. Our proposal is mutually beneficial to both the ASEAN+3 RFSN and the IMF. The recently acquired international organization status by AMRO strengthens the case for our proposal because it gives AMRO the mandate to deepen its surveillance over the ASEAN+3 countries, either individually or collectively. AMRO should now be able to access confidential data about countries. It should also be able to field joint missions with the IMF,<sup>3</sup> and its surveillance should be able to go beyond “peer review and peer pressure” to “due diligence.”<sup>4</sup>

A more structured form of cooperation with the IMF seems to be in the minds of the ASEAN+3 leaders as well. Their recent joint statement states: “We noted the completion of the CMIM studies on ‘Troika’s Financial Assistance Programs in the Euro Area for CMIM’s Future Reference’” (ASEAN 2016). The statement also adds: “...we tasked the Deputies to carefully study how the CMIM can be better integrated into the global financial safety net. To this end, we welcomed a “test run” to be conducted this year on the crisis resolution facility linked to the IMF program.”

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<sup>2</sup> “Healthy” competition refers to competition that leads to reforms of institutions and increases in the supply of public goods, while “unhealthy” competition means a race to the bottom and implementation of “beggar thy neighbor” policies. The establishment of AMRO has led the IMF to produce regional outlook reports for Asia, for example.

<sup>3</sup> The author has been informed that the IMF does not welcome AMRO staff to its surveillance missions. AMRO staff are, however, selectively welcome in the IMF’s routine economic review missions.

<sup>4</sup> “Due diligence” involves a rigorous scrutiny of a potential debtor’s economy and policies from a potential creditor’s perspective (Kawai and Houser 2008).

The chapter is organized as follows: Section 2 outlines the move from a centralized GFSN set up at Bretton Woods to a multilayered GFSN. Section 3 discusses the reasons for the change. It argues that among the various components of the GFSN, RFSNs show the most promise and potential. But as noted by the G20, RFSNs should complement MFSNs and not try to supplant them. Section 4 focuses on the development of the ASEAN+3 RFSN and explains why it was not utilized when the global financial crisis affected the region in 2008. Section 5 examines the relationship between the European RFSN and the IMF and argues that, for various reasons, the ASEAN+3 RFSN should establish a more structured form of cooperation with the IMF in order to enhance their effectiveness. Section 6 provides our conclusions.

## 9.2 From a Centralized to a Decentralized Global Financial Safety Net

The GFSN that prevailed in the 1970s and 1980s is depicted in Figure 9.1. It comprised the IMF, with the G7 as the oversight body. This architecture worked fairly well in promoting macroeconomic and financial stability aside from the Latin American debt crisis of the 1980s and the problems with the European Monetary System in the early 1990s.

In the aftermath of the global financial crisis, however, the centralized GFSN of the 1970s and 1980s is moving toward a more decentralized one comprising (i) the G20 as an apex body, (ii) multilateral financial safety nets (MFSNs) established under the auspices of the IMF, (iii) bilateral

**Figure 9.1: Centralized Global Financial Safety Net of the 1970s and the 1980s**



G7 = Group of Seven, IMF = International Monetary Fund.

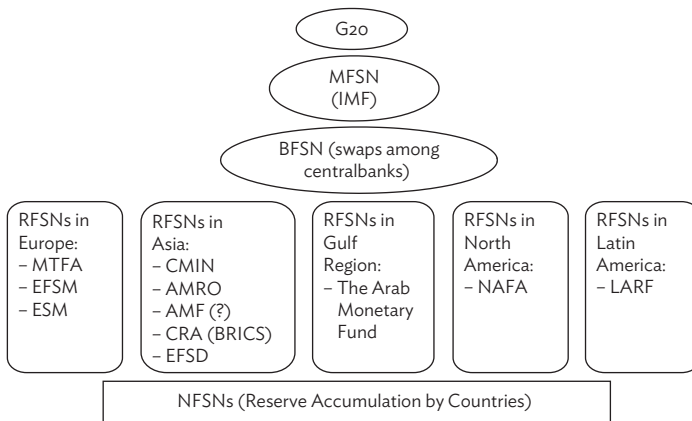
Source: Author.

financial safety nets among central banks (BFSNs), (iv) regional financial safety nets (RFSNs) established in various regions of the world, and (v) national financial safety nets (NFSNs) or reserve accumulation by individual countries. The present GFSN is depicted in Figure 9.2.

The G20 is at the apex of the multilayered GFSN. The G20 Summit was established after the global financial crisis by upgrading the G20 finance and central bank officials' forum, which started in 1999 but was kept under the shadow of the G7. The leaders have self-appointed the forum as the "premier forum for international economic cooperation" including monetary cooperation. As already mentioned, since the Seoul Summit, the G20 has adopted the topic of strengthening the GFSN as one of its agenda items.

Following the London G20 Summit and the eurozone sovereign debt crisis, IMF resources have been substantially increased. Also, in an attempt to prevent and more effectively manage a capital account crisis, the IMF has revamped its lending policies. These include the various contingent financing facilities or MFSNs that have been established. In 2009, the IMF introduced a new flexible credit line (FCL) designed to

**Figure 9.2: Multilayered Global Financial Safety Net**



AMRO = ASEAN+3 Macroeconomic Research Office, BFSN = bilateral financial safety net, CMIM = Chiang Mai Initiative Multilateralization, CRA = BRICS Contingent Reserve Arrangement, EFSF = Eurasian Fund for Stabilization and Development, EFSM = European Financial Stability Facility, EFSN = European Financial Stabilization Mechanism, ESM = European Stability Mechanism, IMF = International Monetary Fund, LARF = Latin American Reserve Fund, MFSN = multilateral financial safety net, MTFA = Medium-Term Financial Assistance, NAFA = North American Framework Agreement, NFSN = national financial safety net, RFSN = regional financial safety net.

Source: Author.

meet the increased demand for crisis prevention and crisis mitigation lending from countries with robust policy frameworks and very strong track records in economic performance. A year later it also introduced the precautionary credit line (PCL) for countries with a sound policy track record and fundamentals that may not meet the FCL requirement. Proposals for a Global Stabilization Mechanism, where the IMF would finance a number of countries simultaneously, have also been launched, although they have not received enough support from member countries.

Despite these innovations, the IMF's capacity to prevent a crisis in the future is in doubt. The IMF's FCL, which provides large-scale access to finance without conditionality to protect countries against contagion, has been taken up by only three countries (Colombia, Mexico, and Poland). Similarly, the PCL has been taken up by only one country (Macedonia). Stigma is a major problem—countries fear that applying for these facilities would be seen by the capital markets as a sign of underlying weakness and as an indication that the countries were facing difficulties. There is now talk of the IMF unilaterally prequalifying countries and of countries applying as a group so that no one country is singled out as a weak country.

In 2008, when countries faced a severe credit crunch because of the crisis in the United States (US), the Federal Reserve extended \$30 billion in the form of bilateral swaps to Brazil, Mexico, Singapore, and the Republic of Korea. The Republic of Korea also obtained such funding from the Bank of Japan and the People's Bank of China. Although some countries wish to establish BFSNs by regularizing these bilateral dollar swap arrangements entered into with various central banks in times of crisis, it may not be possible. For example, the swaps were criticized by the US Congress as giveaways to countries, which could lead to moral hazard.

Efforts have also been made to establish or expand existing regional financial safety nets (RFSNs).<sup>5</sup> Europe has the medium-term financial assistance program established in 1971 to support European Union members facing payment difficulties. In 1999, this program was narrowed to cover only the non-eurozone members. Subsequently, fears that the contagion from Greece could affect other countries in Europe led to the establishment in May 2010 of the European Financial Stability Facility (EFSF) for eurozone members and the European Financial Stabilization Mechanism (EFSM) for all European Union (EU) members. In 2012, the European leaders agreed to a permanent replacement of the EFSF by the

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<sup>5</sup> See McKay, Volz, and Wolfinger (2010) and Eichengreen (2010) for a comparative analysis of various RFSNs.

European Stability Mechanism (ESM). The ESM is in effect a European monetary fund (Henning 2011a).

In 1994, the North American Framework Agreement (NAFA) was established as a parallel financing agreement to the North American Free Trade Agreement. Also, the Arab Monetary Fund was established in 1976, and the Latin American Reserve Fund in 1978.

In Asia, we have the CMIM and AMRO (discussed in section 9.4). More recently, a few other RFSNs have been established. These include the Contingent Reserve Arrangement (CRA) set up by the BRICS, and the Eurasian Fund for Stabilization and Development (EFSD) set up by the Russian Federation and the Central Asian Republics.

Data in Table 9.1 show that European RFSNs are the strongest in terms of financing capacity, speed of decision making, impartiality, and the ability to work with the IMF. The Arab Monetary Fund and the Latin American Reserve Fund are older but have limited resources; their surveillance capacity is fairly strong, but they have no links with the IMF. The CMIM is in the middle, with \$240 billion in funds and linkages with the IMF. The CMIM's surveillance capacity is also being built at the AMRO.

Many developing countries have built up foreign exchange reserves as first lines of defense. Pretty much every country that has been able to do so has accumulated ever-growing amounts of reserves intended to serve as self-insurance and thus prevent the need to resort to the IMF. While there is evidence that countries with more reserves have done better during crises, self-insurance has its costs (Eichengreen 2010). Yields on reserve assets are low and there could be accounting losses if the country's currency appreciates versus the US dollar and euro. Further, reserve accumulation could aggravate the global imbalance problem.

### **9.3 Factors Responsible for the Multilayered Global Financial Safety Net**

The first and foremost factor responsible for the move toward a multilayered GFSN is the financial globalization of the post-1990 period. While policy makers had been wary of uncontrolled financial flows during the Bretton Woods era and in fact permitted capital controls, in the 1980s and 1990s, under the Washington Consensus, they embraced financial liberalization and deregulation, thereby ushering in an age of highly integrated financial markets and capital flows that have dwarfed the operation of the IMF. As early as the 1960s, the British had been promoting financial globalization through their support of deregulated Euromarkets for London. But the momentum accelerated when Thatcher

**Table 9.1: Details of Regional Financial Safety Nets**

	Europe	CMIM	The Arab Monetary Fund	The Latin American Reserve Fund
Brief Description	<p>1. Medium-Term Financial Assistance (MTFA) established in 1971 to provide financial support to all European Union (EU) members facing payment difficulties: since 1999, it covers only non-eurozone members.</p> <p>2. The European Financial Stability Mechanism (EFSM) was established in May 2010 with similar mandate to MTFA, but covers all European Union (EU) members.</p> <p>3. The European Financial Stabilization Facility (EFSF) was established in May 2010 and covers only eurozone countries. In 2012, the EFSF evolved into the European Stability Mechanism (ESM).</p>	<p>The CMI of May 2000 became the CMIM (Chiang Mai Initiative Multilateralization) or a “self-managed” reserve pool of \$120 billion in March 2010. Two years later the size of the pool was doubled to \$240 billion.</p>	<p>The Arab Monetary Fund started operations in 1977. It has 22 member countries and has provided 146 loans benefiting 14 countries.</p>	<p>It was established in 1978. Membership comprises 5 Andean countries and Uruguay. Originally it focused on providing balance of payments support. Now it also helps with debt restructuring and harmonizing macroeconomic policies of members.</p>
Adequacy of finance	<p>MTFA: Max. capacity: €50 billion                      EFSM: €60 billion                      ESM: €500 billion</p>	<p>\$240 billion</p>	<p>Its paid-up capital is small, only \$3 billion.</p>	<p>It has roughly \$2 billion of paid-up capital. The Latin American Reserve Fund (FLAR) can borrow specified amounts.</p>

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Table 9.1 continued

	Europe	CMIM	The Arab Monetary Fund	The Latin American Reserve Fund
Surveillance capacity	Decisions are taken by the Economic and Financial Affairs Council based on the recommendations of the Commission or request of a member. Its surveillance capacity is strong.	The ASEAN+3 Macroeconomic Research Office (AMRO) was established in May 2011 in Singapore as an independent surveillance unit. AMRO's objectives are to (i) monitor and analyze regional economies, and (ii) contribute to (a) an early detection of risks, (b) policy advice for remedial actions, and (c) effective decision making at the CMIM. AMRO became an international organization on 9 February 2016.	It has a technical staff of 50 and conducts regular country reviews.	FLAR has an Economic Studies Department and is quite effective.
Speed of decision making	Relatively fast	Procedures have been established, but could be slow	Relatively fast	Relatively fast
Impartiality in lending decisions	Impartial	Impartial	Impartial	Impartial
Ability to work with the IMF	Working closely with the IMF in resolving the present eurozone crisis	Withdrawal beyond the delinked portion linked to an IMF program	No provision for working with the IMF	No provision for working with the IMF

Sources: Data from McKay, Volz, and Wolfinger 2010; Eichengreen 2010; Park 2011; and others.



in 1979 and Reagan in 1980 took political office. IMF management even launched an initiative in 1995 to overturn the commitment to capital controls by amending their articles of agreement in order to gain a liberalization mandate with respect to capital movement. It was only recently that this initiative was withdrawn.

With financial globalization, not only has the incidence of financial crisis increased,<sup>6</sup> its nature has also changed. The crises of the past were currency crises or debt crises due mainly to governments borrowing excessively in international capital markets to finance their current account deficits. Speculative attacks occurred as the international reserves of the country fell below a critical level. These were the standard currency crisis or the “generation one”-type crisis first discussed by Krugman in the 1970s.

With financial globalization, a new type of crisis called “capital account crisis” or “generation three” crisis (Dornbusch 2001)—associated with large inflows and sudden reversals of capital flows and the bursting of asset bubbles and a banking crisis—has started to hit emerging markets.<sup>7</sup> Such crises tend to affect the balance sheets of countries and their solvency. The costs of balance sheet recessions tend to be higher and recovery from such crises also takes longer. They also tend to be systemic, affecting most or all sectors of the economy with strong contagion to neighboring countries (which may be innocent bystanders).

Based on the experience with the Asian financial crisis, Kawai and Rana (2009) had argued that efforts to prevent and manage a capital account crisis required actions at the global, regional, and national levels. Last year, the G20 came up with a similar message with respect to the global financial crisis: “Current volatility of capital flows is reflecting the differing speed of recovery between advanced and emerging market economies. National, regional, and multilateral responses are required” (G20 Seoul Summit Leaders Statement). The IMF had until recently not appreciated the value of RFSNs. But now that view is changing and the IMF is working closely with various FSFNs (especially those in Europe) in attempting to resolve the eurozone crisis. In 2010, the IMF organized a high-level seminar to create stronger links with RFSNs (Goretti, Lanau, and Ramakrishnan 2010). There is, therefore, a consensus now that we need a multilayered GSFN and global and regional policy

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<sup>6</sup> Kawai and Rana (2009) noted that 10 such crises had hit countries all over the world since the Asian financial crisis of 1997–1998. Chamon, Ghosh, and Kim (2010) identified more episodes of such crises.

<sup>7</sup> “Generation two” crises are the self-fulfilling type of crisis that hit the European Monetary System in 1992–1993.

coordination. Regional policy coordination could add value in two ways. First, policy makers tend to be more frank when discussing policies with neighboring countries than at the global level. Second, a regional policy agenda also tends to be more focused on the common issues affecting a set of countries rather than those at the global level.

Second, the governance system of the international monetary architecture in the 1970s and the 1980s reflected the dominance of the US and this system lacked legitimacy and needed to be changed in an environment where the economic and political power of emerging markets, particularly those in Asia (the People's Republic of China [PRC] and India), was rising rapidly. Emerging markets, whose footprint in the global economy is increasing rapidly, must also participate in global governance.

According to the long-term projections made by Goldman Sachs, emerging markets will continue to grow rapidly over the next 40 years. In 2003, Wilson and Purushothaman (2003) projected that the three largest economies in the world by 2050 would be the PRC, the US, and India. Poddar and Yi (2007) later revised this ranking to the PRC, India, and the US. More recently, the Kohli and Sood (2010) projected that the above ranking could be obtained even earlier, within the next 30 years. However, despite their economic dynamism, the PRC and India will be very much behind the US in terms of per capita income, poverty alleviation, and military might.

Third, the IMF is a club in the sense that it produces a benefit that is partially nonrivalrous (more than one user can consume) and at least partially excludable (users can be denied access). Kawai, Petri, and Sisli-Ciamarra (2009) applied the theory of clubs to explain that the IMF, like other clubs, is an inflexible institution designed to maintain firm control in the hands of the founding members and not be open to allowing new members into its governance system. The charter, quotas, and voting rights of the IMF were designed in the interest of like-minded original core members in 1944 and placed strict limits on change as membership expanded. That is why even though the G20 has pledged to allocate higher quotas and voting power to emerging markets, governance reform of the IMF can only proceed at a glacial pace.<sup>8</sup> In comparison with the 44 countries that participated at the Bretton Woods conference, the membership of the IMF now stands at 187.

Kawai, Petri, and Sisli-Ciamarra (2009) examined the evolution of the shares of developing and emerging markets in IMF quotas, and in

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<sup>8</sup> The 2010 IMF Governance Reform Bill was finally approved by the US Congress in December 2015. But it is regarded as “too little, too late” and “two steps forward, one step back” by many analysts.

global trade and global domestic product (GDP) (in terms of purchasing power), two rough indicators of their importance in the world economy. They found that the trade shares of developing and emerging economies have risen more rapidly than their share in IMF quotas. This contrast is even clearer for their share of world GDP. Quotas, which also determine voting power at the IMF, are especially low for the rapidly growing emerging market countries, such as Brazil, the PRC, and India. Kelkar et al. (2005) found that these three countries had 19% fewer votes than Belgium, Italy, and the Netherlands collectively, although they had 21% more nominal GDP, 400% more purchasing power GDP, and 2,800% more population. On the other hand, Europe controls, directly or indirectly, 10 chairs out of 24 on the IMF Board even though it has a common monetary policy and 30% of quota and voting rights.

Fourth, another reason why Asian countries have adopted national and regional self-help measures is to protect themselves from the policy mistakes made by the IMF in managing the Asian financial crisis. The IMF saw the Asian financial crisis as a standard current account crisis and recommended its standard prescription to manage it, comprising tighter monetary and fiscal policies and a currency devaluation. These policies aggravated the impact of the capital account crisis. A more appropriate response would have been to pump liquidity into the system through expansionary monetary and fiscal policies—just the opposite of the policies the IMF had prescribed. The IMF also prescribed too many structural conditions that extended beyond its core competencies.<sup>9</sup>

The fifth is an argument for competition, particularly in the supply of services to small and medium-sized countries. Owing to their small size, the power of these countries to negotiate with large organizations is limited, and their most important defense is therefore competition in the provision of financial services to them (Ocampo 2010).

The final argument relates to the fact that regional and subregional institutions enjoy a greater sense of ownership because member states, particularly small ones, feel that they have a strong voice in these organizations. The “preferred creditor status” that results from this reduces the risks that regional reserve funds face, further encouraging the virtues of risk pooling (Ocampo 2010). Large regional countries may be willing to take a leading role in regional bodies before global bodies.

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<sup>9</sup> The IMF’s Independent Evaluation Office (2003) report accepts many but not all of these criticisms. More recently, Ostrey, Lougani, and Furceri (2016) concluded that “instead of delivering growth, neoliberal policies have increased inequality, in turn jeopardizing durable expansion.” The policies called into question are unfettered flows of hot money, and excessively rapid efforts to reduce public debt.

## 9.4 ASEAN+3 Regional Financial Safety Net and Complementarity with the International Monetary Fund

Before the Asian financial crisis of 1997–1998, the only RFSN in Southeast Asia was the ASEAN swap arrangement (ASA), which was established in August 1997 when the original members of ASEAN—Indonesia, Malaysia, the Philippines, Singapore, and Thailand—agreed to a reciprocal currency swap arrangement among themselves. The idea was to provide liquidity support to members experiencing balance of payments difficulties. The maximum amount of liquidity available under the ASA was \$100 million, with each member providing \$20 million. Subsequently, the maximum amount was doubled to \$200 million. The size of the ASA was too small to be of use in helping countries manage the Asian financial crisis and so it was not used.

The Asian financial crisis led countries to revisit the issue of an RFSN mainly because of the way in which the IMF managed the crisis. Four of the crisis-affected countries—Indonesia, the Republic of Korea, the Philippines, and Thailand—had accepted an IMF program, while Malaysia went alone. The IMF misdiagnosed the problem and prescribed the wrong medicine—a fact that it acknowledged later (Sussangkarn 2010). It was also believed at the time that the IMF might not have adequate resources to help countries manage a “capital account” crisis associated with large inflows and sudden reversals of private capital flows (Kawai and Rana 2009).

There were calls to establish the Asian Monetary Fund, which did not materialize because of insufficient support within the region and predictable opposition from the US. Nevertheless, there was a strong feeling among policy makers that a regional financing facility in the region could act as the first line of defense by providing short-term liquidity and thereby preventing a crisis when speculative attacks occur (Sussangkarn 2010). Therefore, at their May 2000 meeting in Chiang Mai, the ASEAN+3 finance ministers agreed to launch the Chiang Mai Initiative (CMI) as a regional “self-help and support mechanism” to provide “sufficient and timely financial support to ensure financial stability in the East Asia region” (AMRO 2000). The CMI expanded the ASA to all ASEAN members and set up a network of bilateral swaps among the ASEAN+3 countries. The ASA was subsequently expanded to \$100 billion and then to \$200 billion in April 2005. The ASEAN+3 countries also signed bilateral swaps and by 2008 there were 16 such bilateral swaps amounting to \$84 billion.

Pursuit of complementarity has been the key focus of the ASEAN+3 RFSN. In their May 2000 Joint Statement, the ASEAN+3 finance ministers had stipulated that the RFSN in East Asia should “supplement the existing international facilities,” and the way that complementarity was promoted in the CMIM (and its predecessor, the CMI) was by requiring the existence of an IMF-supported program to provide assistance in excess of a certain percentage of maximum access. Initially, only 10% of the maximum access was readily available, with 90% being linked to an IMF program. The size of the delinked portion was subsequently increased. The link to the IMF was also intended to address the moral hazard problem in lending and the lack of independent surveillance capacity in the CMI. By 2008, the ASEAN+3 countries had signed 16 bilateral swaps amounting to a total of \$84 billion.

In the aftermath of the severe credit crunch that the region experienced because of the 2008 global financial crisis, the CMI bilateral swaps were not used. This was because of the small size of the swaps (including the delinked portions)<sup>10</sup> and the absence of a rapid response mechanism to trigger the swaps (each bilateral swap had to be triggered one at a time).

Since then, the ASEAN+3 countries have taken a number of steps to increase the financial resources available from the RFSN and to clarify the disbursement procedures. These include doubling the size of the CMIM, increasing the delinked portion to 30% with a view to increasing it further to 40% subject to review, and agreeing to the decision-making process and operational guidelines (Box 9.1). AMRO also now has the status of an international organization. This means that AMRO is no longer a business entity subject to rules and regulations of Singapore, where it is housed, but an ASEAN+3 institution with a mandate for surveillance of the member countries either individually or collectively. Are these actions sufficient to ensure that the CMIM will be utilized when the region faces the next crisis? Probably not.

Under the new agreement, the five ASEAN members (Indonesia, Malaysia, the Philippines, Singapore, and Thailand) can borrow a maximum amount of approximately \$23 billion each from the CMIM with an IMF program in place—one-third of which will be the delinked portion—under a single contract at one go (Hill and Menon 2014).<sup>11</sup>

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<sup>10</sup> For example, the Philippines and Thailand had two swaps each with Japan and the Republic of Korea for \$2.5 billion and \$4 billion, respectively.

<sup>11</sup> The Republic of Korea and Japan are entitled to borrow a maximum of \$38.4 billion for the CMIM with an IMF program in place. The PRC can borrow about \$35 billion, Viet Nam \$10 billion, and Cambodia, the Lao People's Democratic Republic, and Myanmar about \$1 billion each.

### **Box 9.1: Steps Taken to Strengthen the ASEAN+3 Regional Financial Safety Net since the Global Financial Crisis**

**(i) The CMI has been multilateralized into the CMIM.**

In March 2010, the bilateral swaps were combined and expanded to become the Chiang Mai Initiative Multilateralization (CMIM) or a \$120 billion “self-managed reserve pool” governed by a single contract. As a self-managed reserve pool, the contributions remain in the central banks of the member countries and are not actually paid into a centralized reserve pool. Two years later the size of the pool was doubled to \$240 billion.

**(ii) Contributions, borrowing rights, and operational guidelines of the CMIM have been fixed.**

All ASEAN+3 member countries (plus Hong Kong, China) have contributed to the CMIM and are eligible to borrow from it using a multiplier (so that the smaller countries can borrow more) in case they face a payment problem. To access the CMIM, a member country must submit a request to the Coordinating Countries (the co-chairs of the ASEAN+3), which then deliver the request to a nonresident Executive-Level Decision-Making Body. This body then has to convene and make a decision based on a two-thirds majority within 2 weeks of the swap request.

**(iii) AMRO has been established and its capacity is being enhanced.**

With the multilateralization of the CMI, there was a need for an independent surveillance unit to conduct due diligence so that the borrowing countries’ capacity to repay the loan could be assessed. In May 2011, the ASEAN+3 Macroeconomic Research Office (AMRO) was established as a limited company in Singapore. AMRO’s activities are divided into functions during so-called peace time and crisis time. During peace or noncrisis periods, AMRO’s main responsibility is to prepare quarterly consolidated reports on the overall macroeconomic assessment of the ASEAN+3 region as well as on individual ASEAN+3 countries. Should a crisis occur, however, its role and responsibilities multiply. During crisis time, AMRO is tasked to

1. provide an analysis of the economic and financial situation of the CMIM Swap Requesting Country;
2. monitor the use and impact of the funds disbursed under the CMIM Agreement;
3. monitor the compliance by the CMIM Swap Requesting Country with any lending covenants to the CMIM Agreement.

AMRO is governed by an executive committee comprising the deputy finance ministers and deputy central bank governors of the ASEAN+3 countries. At present, AMRO is being run by a small staff of about a dozen led by the AMRO director.

*continued on next page*

**Box 9.1** *continued*

- (iv) Several other decisions were taken at the May 2012 meeting of the ASEAN+3 Finance Ministers:
1. The delinked portion was increased to 30% with a view to increasing to 40% subject to review.
  2. The ASEAN+3 Finance Ministers Meeting was upgraded to the ASEAN+3 Finance Ministers and Central Bank Governors Meeting. For the first time, the central bank governors of the 13 countries plus the head of the Hong Kong Monetary Authority were invited to participate in the forum. This was a significant move as it brought together officials handling tax and expenditure policies with those handling monetary and exchange rate policies.
  3. A crisis preventive facility, the CMIM Precautionary Line (CMIM-PL), which is similar to the various contingent credit lines offered by the IMF, was introduced.
- (v) Decisions taken at the May 2016 ASEAN+3 Finance Ministers and Central Bank Governors Meeting:
1. Welcomed the establishment of AMRO as an international organization on 9 February 2016.
  2. Instructed deputies to carefully study how the CMIM can be better integrated into the global financial safety net.
  3. A task force was established to give its recommendation on increasing the IMF delinked portion by November 2016.
  4. AMRO is to further develop the qualification indicators for the CMIM Precautionary Line based on the Economic Review and Policy Dialogue (ERPD) matrix.

These amounts are large compared with the old CMI swaps, but still inadequate to prevent and manage the newer types of capital account crisis associated with large inflows and a sudden withdrawal of short-term financial capital.<sup>12</sup> It is unlikely that the ASEAN+3 countries will increase their commitments to the CMIM and increase the percentage of the delinked portion without the capacity of AMRO being strengthened significantly for regional surveillance and for designing conditions under which funds can be disbursed (otherwise there could be moral hazard). Although AMRO has come a long way, as a relatively new institution it still lacks the research capacity, human resources, and experience to serve as an “independent surveillance unit” for the CMIM.

<sup>12</sup> The economic and social costs and the contagion effects of a capital account crisis tend to be high. During the recent eurozone crisis, two separate packages of \$142 billion and \$130 billion (in today's dollars) were put together for Greece and \$100 billion for Portugal.

More important is the speed and efficiency with which requests for assistance can be disbursed (Hill and Menon 2014). The operational guidelines for the CMIM require that a decision based on a two-thirds majority is to be made within 2 weeks of the swap request. This is unlikely to happen as the CMIM is not a centralized fund, but a “self-managed” arrangement where contributions are held by individual central banks and monetary authorities. Also, the decision rests with a nonresident body and there is uncertainty regarding the nature of the information and analysis required to facilitate the decision making. In contrast, bilateral swaps with the advanced countries are fast-disbursing and come without explicit conditionalities as they are well collateralized.

## 9.5 A Proposal for Structured Cooperation between the ASEAN+3 Regional Financial Safety Net and the International Monetary Fund

ASEAN+3 and the IMF, therefore, need to move beyond ad hoc collaboration to develop a more structured form of cooperation by pooling financial, human, and technical resources. An example worth considering is the IMF’s cooperation with various European RFSNs<sup>13</sup> to resolve the eurozone crisis. In Europe, countries that are members of both the EU and the IMF request financial assistance simultaneously from the two institutions. In the case of assistance to EU members outside the eurozone, discussions are conducted jointly with the government authorities, the European Commission (EC), and the IMF (Table 9.2). In addition, the European Central Bank (ECB) participates in the discussions when the borrowing country is in the eurozone, forming the “Troika” framework between the IMF, EC, and ECB. In designing policies and conditionalities, there is a clear division of labor, with the IMF focusing on the macroeconomic framework, the EC ensuring that the conditionality is consistent with EU-wide rules and institutions particularly regarding the fiscal targets, and the ECB ensuring that the financial sector strategy is sufficiently robust. The “Troika” members discuss the program among themselves before presenting it to the authorities. Two separate program documents are prepared, one for the

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<sup>13</sup> These are the European Financial Stabilization Mechanism (which provides balance of payments support to all EU members) and the European Stability Mechanism (which safeguards against financial crisis in the eurozone countries).



**Table 9.2: International Monetary Fund's Engagement with its European Partners**

	EU member	Overall Financial Literacy Index
Partners	Authorities + EC + IMF	Authorities + Troika (ECB + EC + IMF)
Program Document	Memorandum of Economic and Financial Policies for IMF Board and Memorandum of Understanding for EC	Memorandum of Economic and Financial Policies for IMF Board and Memorandum of Understanding for EC
European RFSN	European Financial Stabilization Mechanism (EFSM) for balance of payments assistance	European Financial Stabilization Mechanism (EFSM) for balance of payments assistance  European Stability Mechanism for financial stability
Designing of Policies	IMF: macroeconomic framework  EC: ensuring consistency with EU-wide rules particularly on fiscal targets	IMF: macroeconomic framework  EC: ensuring consistency with EU-wide rules particularly on fiscal targets  ECB: financial sector strategy
Cofinancing between the IMF and European RFSNs	Programs are cofinanced between the two with no single rule for burden sharing	Programs are cofinanced between the two with no single rule for burden sharing

EC = European Commission, ECB = European Central Bank, EU = European Union, IMF = International Monetary Fund, RFSN = regional financial safety net.

Source: IMF. 2013. *Stocktaking of the Fund's Engagement with Regional Financing Arrangements*. 11 April. Washington, DC.

IMF board and another for the EC. Programs are cofinanced with no single rule for burden sharing between the IMF and European RFSNs. In Latvia in 2008 and Greece in 2012, the IMF provided about 20% of the total financing while European RFSNs provided the balance. On the other hand, in Hungary in 2008 and Romania in 2009–2011, the IMF provided over 60% of the financing.

The IMF's assessment of this cooperation is that although the difference of views among institutions continues to pose a challenge, "On the ground, the Troika structure has enabled effective information sharing, more streamlined program discussions and reviews, and helped ensure that external communications are well coordinated" (IMF 2013). The recent IMF Independent Evaluation Office (IEO) report highlighting the IMF's lending to Greece and Ireland in 2010 and Portugal

in 2011 also finds that the Troika arrangement proved to be an efficient mechanism in most instances, “but the IMF lost its characteristic agility as a crisis manager” (IEO 2016). This happened “because the European Commission negotiated on behalf of the Eurogroup” and “subjected the IMF’s technical judgement to political pressure from an early stage.” The report mentions that the “IMF treated Europe differently” and that “it was easily swayed by European officials.” The report mentions that the Fund failed to “play its customary sole and lead role” that it adopts when lending to developing countries. Instead the IEO argues that the IMF’s Troika partners had “veto power” over the IMF.

Since the present modality of cooperation between the ASEAN+3 RFSN and the IMF is unlikely to be successful, a more structured form of cooperation between the two institutions should be considered. This framework would involve pooling of financial, human, and technical resources between the ASEAN+3 RFSN and the IMF in three cooperative activities (Table 9.3). Details of this cooperative arrangement should consider the lessons from Europe.

First, as in Europe, the ASEAN+3 countries seeking financial resources should be required to apply simultaneously to both the IMF and CMIM, and the IMF and AMRO should jointly analyze and evaluate the applications. Currently, the analysis and evaluation by the two institutions are separate, with AMRO responsible for CMIM funds.

**Table 9.3: Structured ASEAN+3 Regional Financial Safety Net and International Monetary Fund Collaboration**

Our Proposal	Advantages
<b>Crisis Management</b>	
1. Simultaneous request for financial assistance from CMIM and IMF and joint analysis and evaluation	<ul style="list-style-type: none"> <li>- Bring in expertise from outside East Asia to supplement AMRO resources</li> <li>- IMF staff, in theory, would be more dispassionate to regional countries</li> <li>- Overcome IMF “stigma”</li> </ul>
2. Joint monitoring and surveillance, joint AMRO–IMF missions, and jointly developed conditionality	<ul style="list-style-type: none"> <li>- Focus on relative comparative advantages (IMF, macro and macro financial and cross-regional experience: AMRO, regional financial and capital market developments, and structural reforms)</li> </ul>
3. Cofinancing (with amounts depending on country-specific basis) and joint supervision	<ul style="list-style-type: none"> <li>- Would leverage CMIM funds as IMF funds would also come in</li> </ul>
<b>Crisis Prevention</b>	
4. Joint assessment (of eligibility) and cofinancing	<ul style="list-style-type: none"> <li>- Focus on relative comparative advantages</li> <li>- Would leverage CMIM funds as IMF funds would also come in</li> </ul>

Source: Author.

But AMRO's capacity is limited and will take a long time to strengthen. Involving both the IMF and AMRO in the analysis and evaluation process would increase its robustness in two ways. First, experts from outside East Asia would support an understaffed AMRO, which would arguably be less politicized than any CMIM members meeting. Decisions on applications could therefore be made more rapidly and involving IMF staff who, at least in theory, should feel more dispassionate about the country requesting a CMIM package. A crisis triggering an application for CMIM funds would need a decision to be taken in the shortest period of time and with the smallest moral hazard possible. IMF and AMRO intervention in the decision-making process would help both.

In addition, a joint application to both the IMF and CMIM would help address the IMF stigma concern in East Asia. Given the experience of Indonesia, the Republic of Korea, and Thailand during the 1997 Asian financial crisis, politically it would be very difficult to sell an IMF program anywhere in East Asia. Having a joint process together with an ASEAN+3 institution (AMRO) would eliminate such a stigma.

The second area of cooperation between ASEAN+3 and the IMF would be in the area of joint monitoring and surveillance, joint missions, and joint conditionality. Given that the IMF and AMRO analyses have the common goal of ensuring that signs of financial vulnerability are discovered well in time to prevent a possible crisis, it would make sense for the two institutions to pool their capabilities. The two bodies should focus on their relative comparative advantages—the IMF on macro and micro financial and cross-regional experience and AMRO on regional financial and capital market developments and structural reforms.

AMRO staff members are from the ASEAN+3 countries, giving them familiarity with one or more countries in the region—including relevant language skills and cultural understanding. For its part, the IMF is better resourced and has staff with knowledge of macro and financial systems in different parts of the world. Pooling their resources together through joint IMF–AMRO missions and analysis including joint conditionality would strengthen the surveillance mechanism.

The third area of cooperation would be cofinancing and joint supervision of liquidity provision programs. Currently, financing would only come from the CMIM pool, which, as explained above, would probably be insufficient to avert the financial crisis. Cofinancing with the IMF would substantially increase the resources available for ASEAN+3 to deal with a financial crisis. As the experience of joint EU–IMF programs shows, the percentage of a total rescue package coming from the RFSN and the IMF can be negotiated on a case-by-case basis. Also, joint supervision of any approved liquidity provision program would be the natural consequence of joint approval and financing.

## 9.6 Conclusions

In the future, the decentralization of the GFSN is expected to continue. The incidence of capital account crisis is also expected to increase. The existing ASEAN+3 RFSN is, however, unlikely to be successful in crisis prevention and management. This is because of the present ad hoc modality of cooperation between the ASEAN+3 RFSN and the IMF, the relatively small size of funding available, and the cumbersome disbursement procedures. Therefore, a more structured form of cooperation between the two institutions should be considered, as in Europe. This framework should involve pooling of financial and technical resources between the ASEAN+3 RFSN and the IMF in three cooperative areas: (i) joint AMRO–IMF analysis and evaluation of all applications for CMIM liquidity; (ii) joint surveillance, joint AMRO–IMF missions, and jointly developed conditionality; and (iii) cofinancing of programs by the ASEAN+3 RFSN and the IMF, with the amounts determined on a country-specific basis, and joint supervision. Our proposal for a more structured cooperation between the ASEAN+3 RFSN and the IMF, which takes into account the European experience, together with the recently upgraded status of AMRO, which strengthens its surveillance capacity, should lead to an effective regional safety net in Asia.

The timing is also appropriate for a more structured form of complementarity between the ASEAN+3 RFSN and the IMF for two reasons. First, after the Asian financial crisis, countries in the region bore the IMF stigma that originated from the feeling of being unfairly treated and being forced to accept inappropriate conditions. This is now changing and the IMF is invited to the surveillance meetings of the ASEAN+3 ministers together with AMRO. The IMF has also engaged in dialogues with AMRO as part of its outreach activities, although it does not have a formal technical assistance program with it. This engagement should be deepened further to a more structured form of ASEAN+3–IMF cooperation as outlined above. Second, AMRO is now an international organization that has a mandate from the ASEAN+3 countries to conduct policy dialogues and surveillance of member countries either individually or collectively. The IMF should, therefore, invite AMRO staff to join its crisis management missions and seek their views and inputs in designing conditionality.

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# 10

## Regional and Global Financial Safety Nets: The Recent European Experience and its Implications for Regional Cooperation in Asia

*Zsolt Darvas*

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### 10.1 Introduction

The recent global financial and economic crisis, which started to develop in the summer of 2007 in the United States (US), shocked Europe. After the September 2008 collapse of Lehman Brothers, one of the top five US investment banks, several European Union (EU) countries had to ask for financial assistance one after the other.

Three non-euro area countries, Hungary, Latvia, and Romania, were the first victims of the crisis in the EU, and requested financial assistance shortly after the collapse of Lehman Brothers. Assistance to these countries was provided jointly by the EU medium-term financial assistance facility for non-euro area EU countries and the International Monetary Fund (IMF), in partnership with the World Bank (for all three countries); European Bank for Reconstruction and Development (for Latvia and Romania); and European Investment Bank for Romania and several countries (Czech Republic, Denmark, Estonia, Finland, Norway, Poland, and Sweden for Latvia).<sup>1</sup> The total volume of lending was not extraordinarily large, given the relatively small size of the public debt of these countries.

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<sup>1</sup> See Table 1 in Darvas (2009) for the contribution of the different lenders to these three financial assistance programs.



Shortly after the collapse of Lehman Brothers, euro-area member states seemed to be shielded from the crisis. In fact, in Denmark, a European Union country, which is not a member of the euro area but keeps a fixed exchange rate to the euro, the central bank had to raise interest rates to support the peg, while the European Central Bank cut interest rates. Based on this development, many commentators applauded the wisdom of euro-area members with weaker fundamentals of joining the euro earlier, which seemed to protect them from the global financial crisis.

However, in the second half of 2009 tensions started to increase, initially concerning Greece, while later concerning other peripheral euro-area countries too. There were general elections in Greece in 2009 and shortly thereafter more information became available indicating that the budget deficit of the country will be considerably higher than the 3.6% of the gross domestic product (GDP) figure initially planned. Actually, the Greek budget deficit rose to 15.1% of GDP in 2009. In early 2010, there were intense discussions whether a euro-area country could ask for financial assistance, and in particular, whether the IMF could participate in the bailout of a euro-area country (Pisani-Ferry and Sapir 2010). Moreover, the EU did not have a crisis management framework or an appropriate fund to help out a euro-area country. The EU Medium-Term Financial Assistance Facility (which supported Hungary, Latvia, and Romania in 2008–2009) was especially dedicated to non-euro area countries.

However, the shock of the financial crisis made it necessary to develop European financial assistance facilities for euro-area member states. Four euro area countries requested full financial assistance programs: Greece, Ireland, Portugal, and Cyprus. In addition, Spain requested a special banking program from the EU. After the 2010 Greek financial assistance program tragically failed, the country negotiated a second assistance program in 2012, and subsequently a third one in 2015.

The full-fledged financial assistance programs of Greece (in 2010 and 2012), Ireland, Portugal, and Cyprus were under the auspices of the so-called “Troika”: the IMF, the European Commission, and the European Central Bank (ECB). These three institutions cooperated in the design, monitoring, and financing of the financial assistance programs.

At the time of writing this chapter, the IMF had not yet decided whether to participate in the third financial assistance program for Greece, due to the major disagreement between the IMF and the European institutions on the sustainability of Greek public debt.

What were the special aspects of euro-area and non-euro area EU programs? Were these programs successful? What major tensions

emerged between the IMF and European institutions? And what are the implications of the European experiences with cooperation with the IMF for regional financial assistance facilities in Asia? These questions are answered in this chapter by comparing the four euro-area and three non-euro area EU financial assistance countries and Germany, the largest EU country, which acts as an anchor in many respects.

## 10.2. The Distinctive Aspects of Euro-Area Programs

The financial assistance programs for euro-area countries had several distinctive features compared with other financial assistance programs (Pisani-Ferry et al. 2013). We highlight six specific characteristics. Only a few of these features characterize non-euro EU countries that received financial assistance.

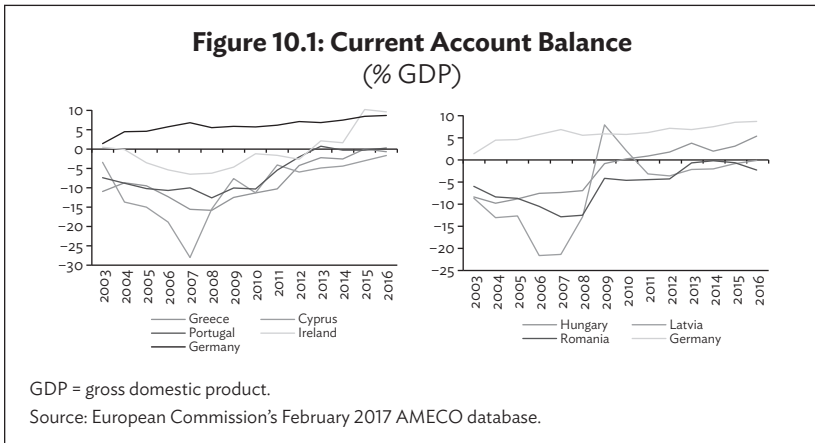
### 10.2.1 Large Imbalances

Very large imbalances were accumulated in the precrisis years. The current account deficit of several southern euro-area member states exceeded 10% of GDP (Figure 10.1). Similarly, high current account deficits were observed in a number of (non-euro area) Central and Eastern European (CEE) EU countries. These large deficits made these countries vulnerable to a sudden halt in private capital inflows. The consequences of persistently large current account deficits was the accumulation of very large negative net foreign asset positions, which increased to about 100% of GDP in peripheral euro-area countries, and to a slightly lower value in CEE countries. In the peripheral euro-area countries, the net negative foreign asset position consisted mostly of debt liabilities,<sup>2</sup> while in CEE countries foreign direct investment (a more stable funding source) also had a significant role.

Divergence within a monetary union, such as that in current account balances, is not necessarily a detrimental development. Capital flows across regions and the ensuing current account deficits and surpluses may reflect the improved utilization of resources when capital moves to fast-growing regions to the benefit of the entire monetary union. However, the booms and busts in the Irish and Spanish housing sectors (Ahearne, Delgado, and von Weizsäcker 2008) exemplify capital

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<sup>2</sup> See Table 1 of Darvas (2012b).



misallocation. Moreover, the accumulation of “excessive” regional debt is undesirable, and there are good reasons to conclude that the external debt of Greece, Portugal, and Spain became excessive (Darvas 2012d).

## 10.2.2 Lack of a Crisis-Resolution Mechanism for Euro-Area Countries

There was no crisis-resolution mechanism for euro-area countries when the crisis erupted. We note that the same is true for stand-alone countries. For example, the US and Canada do not have a financial facility to bail out states and provinces in trouble. And when studying the conditions required for a fiscal union to function smoothly and successfully, Bordo, Markiewicz, and Jonung (2011) concluded: “*the first and probably the most important condition is a credible commitment to a no-bailout rule.*”

Still, the fear from cross-country contagion and negative spillovers across the euro area led to the design of various euro-area financial assistance facilities to help member states in trouble. The first Greek financial assistance program, which started in May 2010, was financed by bilateral loans from other euro-area member states (coordinated by the European Commission), while two financing mechanisms were created, the temporary European Financial Stability Facility<sup>3</sup> and the European

<sup>3</sup> <https://www.esm.europa.eu/efsf-overview>

Financial Stability Mechanism,<sup>4</sup> with a combined lending capacity of €500 billion. Later, the European Financial Stability Facility was replaced by a permanent institution, the European Stability Mechanism.<sup>5</sup>

### 10.2.3 Large Financial Support

Exceptionally large loans were granted to governments (by the various EU funds and the IMF) and huge amount of liquidity was provided to banks (by the ECB). Figure 10.2 shows the committed financing of the assistance programs to governments both in nominal terms and as a share of GDP, for the seven EU countries that received full assistance programs. Ireland and Portugal were granted about 40% of their GDP (not counting Ireland's own contribution to the total volume of financing), Cyprus was granted about 50% of GDP, and the three Greek programs (which have some overlaps) committed to more than 150% of Greek GDP. Regarding only the loans granted by the IMF, Figure 7 of Pisani-Ferry et al. (2013) compares all IMF programs in 1993–2012 and shows that loans to euro-area countries (as a share of the receiving country's GDP) were larger than loans to emerging economies. In addition, IMF loans comprise only a small share of total financing: as Figure 10.2 indicates, the share of IMF funding in total funding was about one-third in Ireland and Portugal and one-tenth in Greece and Cyprus.

Bank financing via ECB liquidity support was also huge. The ECB, or more correctly, the Eurosystem (which consists of the ECB and the national central banks of countries that have adopted the euro)<sup>6</sup> provided massive amounts of liquidity to banks throughout the euro area during the crisis, but especially to those peripheral countries that suffered from the triple problem of weak banks, difficulties in financing public debt, and low levels of competitiveness.

Figure 10.3 shows that financing via regular Eurosystem operations exceeded €100 billion in the case of Irish and Greek banks and about €60 billion in Portugal. In Cyprus, the peak was at €8 billion, which is almost half the Cypriot GDP.

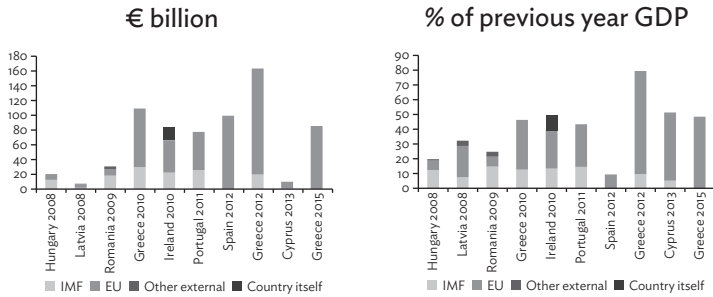
However, regular Eurosystem operations can be accessed only against suitable collateral. Even though the ECB has relaxed its collateral standards several times (Darvas and Merler 2013), a number of banks in hard-hit countries run out of enough (or sufficiently high quality) collateral to access normal Eurosystem operations. Under such cases,

<sup>4</sup> [http://ec.europa.eu/economy\\_finance/eu\\_borrower/efsm/index\\_en.htm](http://ec.europa.eu/economy_finance/eu_borrower/efsm/index_en.htm)

<sup>5</sup> <https://www.esm.europa.eu/>

<sup>6</sup> See <https://www.ecb.europa.eu/ecb/orga/escb/html/index.en.html>

**Figure 10.2: Size and Composition of Financial Assistance Programs of European Union Countries**

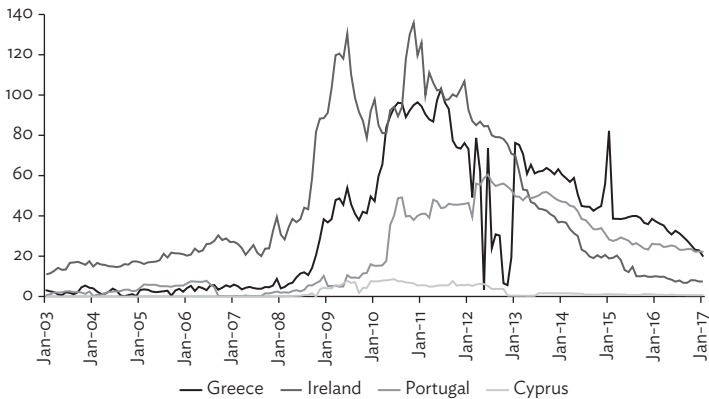


EU = European Union, GDP = gross domestic product, IMF = International Monetary Fund.

Note: The data represent the committed amounts, in billion euros (left panel) and as a % of previous year GDP (right panel). There is overlap between the first and second Greek programs, since the first program was terminated when the second program was agreed upon and some of the unused funds of the first program were reallocated to the second program. EU includes all kinds of European Union facilities (including bilateral loans). “Other external” includes the World Bank and the European Bank for Reconstruction and Development.

Source: European Commission and European Stability Mechanism program documents.

**Figure 10.3: Use of the Eurosystem’s Main and Longer-Term Refinancing Operations by Banks, January 2003–November 2016 (€ billion)**



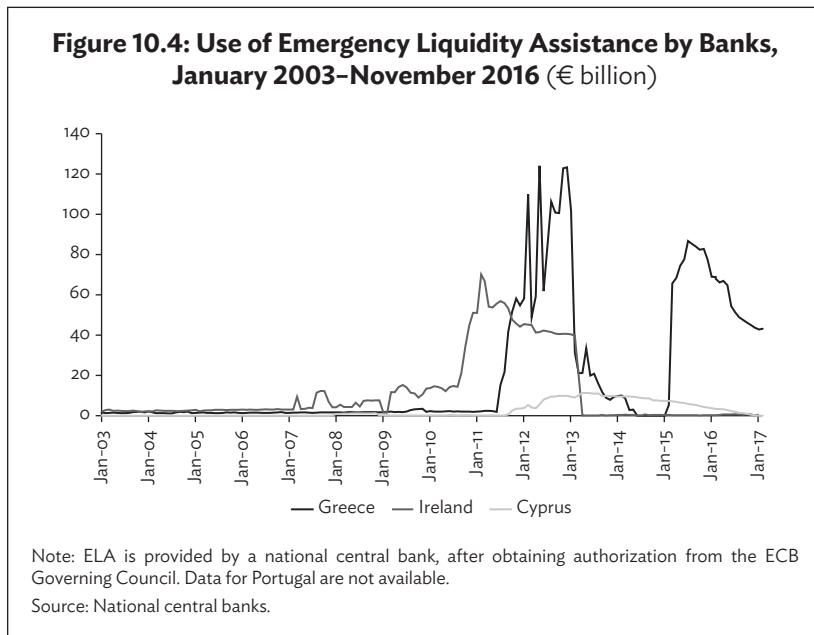
Source: Bruegel database of Eurosystem lending operations developed in Pisani-Ferry and Wolff (2012).

national central banks provided emergency liquidity assistance (ELA) to banks that were considered solvent, but exceptionally and temporarily running out of eligible collateral. The ELA operations are under the sole risk of the national central bank concerned, yet the ECB's Governing Council has to agree to it in advance, can set the limit for the total ELA funding, and can order an ELA program to be stopped at any time. While the ELA statistics are opaque, certain items in central bank balance sheets likely indicate ELA.

Figure 10.4 shows available data for Greece, Ireland, and Cyprus, but unfortunately we could not collect data for Portugal. In Greece, ELA exceeded €100 billion and fluctuated widely—it typically increased when standard Eurosystem refinancing fell (Figure 10.3), suggesting a persistently high funding gap of banks, which was filled by a combination of standard and emergency financing. In Cyprus, ELA increased to €11 billion, well above the level of standard financing, and thereby total central bank liquidity assistance amounted to more than 100% of Cypriot GDP.

### 10.2.4 Low Inflation Contributed to the Real Exchange Rate Adjustment in the Euro Area

Within the euro area there is no possibility of currency devaluation to quickly regain competitiveness and there is no stand-alone central



bank to align monetary conditions to the special needs of the country. A key problem of euro-area periphery countries is that in the precrisis period wages and prices rose much faster than productivity, which led to an overvaluation of the real exchange rate. These developments also reflected in the huge widening of current account deficits and the consequent increase in external debt, as we have discussed above. At the same time, wages in Germany and some other core euro-area countries rose at a smaller pace than productivity, improving wage competitiveness in these countries. The euro crisis made it clear that large macroeconomic adjustment was needed: the misaligned real exchange rates of euro-periphery countries had to depreciate, while current account deficits needed to turn to surpluses. However, given euro-area membership, the role played by nominal depreciation of the exchange rate is limited, for two reasons.

On the one hand, euro exchange rate changes depend on the developments in the euro area as a whole. Arguably, if euro periphery countries had their own currencies, depreciation of those currencies would have been much larger than the magnitude of the actual depreciation of the euro. Hungary and Romania adopted a floating exchange rate system and the depreciation of the Hungarian forint and the Romania leu was much larger than the depreciation of the euro.

On the other hand, euro depreciation can address the real exchange rate relative to non-euro countries. However, about half the foreign trade of most euro countries is with other euro-area countries, and as we argued above, the real exchange rate of euro periphery countries became overvalued relative to core euro area countries. This necessitates an intra-euro real exchange rate adjustment. The adjustment of the real exchange rate between euro members is possible only through prices and wages, that is, prices and wages of periphery countries have to fall relative to those in the core countries. The same applies to Latvia too, which maintained a fixed exchange rate against the euro until the country eventually joined the euro area on 1 January 2014.

Figure 10.5 shows that considering the monthly consumer-price based real effective exchange rate calculated relative to 138 trading partners, all financial assistance program countries, except Latvia, experienced depreciation. Among the euro countries, only Ireland achieved a much larger real depreciation than Germany. The two countries with floating exchange rate regimes, Hungary and Romania, experienced a sudden depreciation in the aftermath of the collapse of Lehman Brothers in late-2008, yet the overall depreciation in December 2007–January 2017 was rather similar to that of Germany.

Table 10.1 decomposes the change in the real effective exchange rate to nominal effective exchange rate changes and changes in relative prices. We use annual data between 2007 and 2016, in order to focus on

**Figure 10.5: Real Effective Exchange Rates Based on Consumer Prices (December 2007 = 100), January 1995–January 2017**

Note: The monthly real effective exchange rate is calculated against 138 trading partners, using country-specific trade weights.

Source: Updated data set of Darvas (2012a), available at: <http://bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database/>

**Table 10.1: Change in the Real Effective Exchange Rate, 2007–2016 (%)**

	Greece	Ireland	Portugal	Cyprus	Germany	Hungary	Latvia	Romania
Real effective exchange rate	-8.1	-15.1	-5.4	-8.1	-9.0	-12.3	8.0	-14.8
of which:								
Nominal effective exchange rate	1.6	-3.2	0.2	3.2	-1.6	-19.7	12.3	-23.5
Relative prices	-9.5	-12.3	-5.6	-10.9	-7.5	9.2	-3.8	11.3

Note: The annual real effective exchange rate is calculated against 172 trading partners, using country-specific trade weights.

Sources: Updated data set of Darvas (2012a). <http://bruegel.org/publications/datasets/real-effective-exchange-rates-for-178-countries-a-new-database/>

the broader trends and minimize the noise inherent in monthly data due to the short-term volatility of nominal exchange rates.

The two countries with floating exchange rate regimes show a rather different pattern from euro-area countries and Latvia (which maintained a pegged rate and joined the euro in 2015): in Hungary and Romania the nominal effective exchange rate fell by about 20% from 2007 to 2016, while there was higher inflation in these countries compared with their trading partners.

In euro-area countries, prices fell relative to their trading partners and nominal depreciation was much smaller, or there was even a nominal appreciation. The same applies to Latvia, a country that maintained a



fixed exchange rate until it joined the euro in 2015. Therefore, the real exchange rate adjustment largely fell on the relative price adjustment in euro-area countries, including Germany, reflecting the generally low inflation in the euro area in recent years. On the contrary, countries with floating exchange rates relied on nominal exchange rate adjustment, which is a faster way of adjustment, and also easier, since prices and wages tend to be sticky downward. However, when a country has large foreign debt, and domestic credit creation predominantly relies on foreign currency lending (as in many central European countries), nominal depreciation can create balance sheet problems.

Beyond these overall trends, there are some differences between the euro countries. Prices relative to trading partners fell in Germany by 7.5%, even more than in Portugal. The largest relative price fall was observed in Ireland (12.3%), suggesting that the Irish economy was more flexible than other euro-area countries. The overall nominal exchange rate change ranged between minus 3.2% in Ireland and plus 3.2% in Cyprus, reflecting the different composition of their foreign trade. One reason for the larger nominal depreciation of Ireland was the rather high share (19.5%) of the US in Ireland's trade basket, while the share of the US in the trade basket of Greece, Cyprus, and Portugal is between 4.2% and 6.6%, and 12.2% in Germany. Therefore, the depreciation of the euro against the US dollar had a much larger effect on the nominal effective exchange rate of Ireland than of other euro countries. In Latvia, there was a rather large (12.3%) nominal effective appreciation, partly reflecting the larger share of the Russian Federation in Latvia's foreign trade, since the Russian currency depreciated enormously in 2007–2016.

The overall real effective depreciation from 2007 to 2016 was the largest in Ireland (15.1%), followed by Romania (14.8%) and Hungary (12.3%). Germany had a larger depreciation (9.0%) than Greece, Cyprus, and Portugal, which leads us to the next issue, the lack of a symmetric adjustment.

### 10.2.5 Asymmetric Intra-Euro Adjustment

Intra-euro adjustment was largely asymmetric: while wages in the peripheral euro countries started to adjust (a decline in wages or at least a halt in the rate of increase), wage growth hardly accelerated in core euro-area countries. This made the adjustment of the peripheral countries more difficult. A symmetric adjustment, whereby wage growth decelerates in periphery countries and accelerates in core countries, would facilitate the intra-euro adjustment.

Furthermore, lack of sufficiently fast wage growth in the core countries necessitates even larger wage and price reductions in the peripheral countries, which makes the sustainability of both public and

private debt more difficult. In contrast to a stand-alone country, where low inflation is typically followed by reduction in nominal interest rates, in a heterogeneous monetary union, like the euro area, low inflation in a particular (peripheral) country is unlikely to lead to lower interest rates there. Such a divergence between inflation and interest rates was also observed in the precrisis period, when interest rates converged between euro-area countries, despite major differences in inflation rates. In more recent years, the nominal interest rates of peripheral countries were well above the interest rates observed in core euro-area countries despite lower inflation, due to increased risk of sovereign default in the periphery. Therefore, wage and price declines in the peripheral countries may not be followed by reductions in nominal interest rates, while lower prices increase debt/income ratios, further challenging debt sustainability. A more symmetric intra-euro adjustment would have helped to find a better balance between regaining price competitiveness and maintaining debt sustainability in the peripheral countries.<sup>7</sup>

In addition, the overall macroeconomic situation in the euro area was generally weak, at least in 2010–2013, i.e., during the initial years of the euro-area financial assistance programs. Weak external conditions made the adjustment of peripheral countries even more difficult.

### 10.2.6 Unique Troika Formation

Finally, the Troika arrangement was unprecedented, with the three institutions operating under different rules and mandates.

The IMF's role was similar to that in all other IMF-supported programs: its own staff assessed and negotiated program modalities and the IMF Board made the final decisions. The key novelty for the IMF was to share program discussions and financing with European partners and coordinate the assessments and financing: program financing had to be approved and actually disbursed by both the IMF and European facilities to have adequate funding.

The roles of the European Commission and the European Central Bank were more unusual. As explained by Pisani-Ferry et al. (2013), the European Commission merely acted on behalf of the member states, rather than as an independent institution representing the general interest of the European Union, which is its normal function. The European Commission's role was also complicated due to its responsibility of safeguarding the proper application of European treaties. For example, it needs to ensure that European fiscal rules enshrined in the Stability and Growth Pact are followed by all member states; yet in the case of

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<sup>7</sup> For a more detailed discussion of this issue, see Darvas (2013).

a country under financial assistance, considerations different from the Stability and Growth Pact rules could emerge. Another example is bank recapitalization from public funds, which was an element of all financial assistance programs. However, the European Commission has a clear mandate to avoid competitive distortions arising from state aid to financial institutions.

The role of the ECB was also unusual. In a standard IMF program, including the joint IMF–EU programs for Hungary, Latvia, and Romania, the national central bank negotiates along with the receiving country’s government. Program conditionality was used to set measures to be adopted in connection with the national central bank. However, in the case of euro-area programs, the European Central Bank negotiated as part of the team of the lenders, along with the IMF and the European Commission.

The ECB’s participation in the design and monitoring of financial assistance programs creates potential conflicts of interest with its other tasks, which may bias program conditionality and expose the ECB to pressure from the other Troika institutions (Darvas and Merler 2013).

- There is a potential conflict with the ECB’s price stability mandate. In the program negotiations, the fear that fiscal unsustainability in a particular country might result in pressure on the central bank to soften its monetary stance might lead the ECB to overemphasize the need for fiscal consolidation. In the implementation phase of programs, the ECB might be tempted to deviate from its price stability objective in order to help improve fiscal sustainability in a given country program. The experience so far has demonstrated that the ECB had indeed argued for very ambitious fiscal adjustment strategies, yet there is no evidence at all of an inflationary bias and in fact the major problem is that inflation undershoots the target.
- There is a potential conflict of interest with the ECB’s function as a lender of last resort to banks. Banks in program countries are typically under high stress and need to rely heavily on ECB liquidity. In the program negotiations, the ECB might seek to minimize liquidity operations that constitute a risk to its own balance sheet, and label banking problems as solvency problems that would need to be addressed through a state bailout or through bail-in of private shareholders and creditors. In the implementation phase of programs, however, the ECB might actually be inclined to provide liquidity on soft terms, as would any central bank interested in the success of the program.
- There is a potential conflict of interest with the ECB’s bond-purchase programs. By buying bonds of vulnerable countries, the ECB becomes a creditor of the governments receiving

financial assistance, and this may influence its position in the negotiations. Fear of losses stemming from its bond holdings might lead the ECB to be especially tough on fiscal consolidation or especially timid on debt restructuring—if the latter were needed. The Greek case, in which the ECB loudly rejected debt restructuring even a few weeks before such a decision was made by euro-area heads of state, and then negotiated a special position so that ECB holdings of Greek government bonds were not restructured, clearly underlines this threat.

- Furthermore, the 2012 announcement of the ECB's outright monetary transactions (OMT) introduced a very unusual situation, which could be best described as “monetary policy with conditionality.” Undoubtedly, the OMT announcement in 2012 was a major turning point in the euro-area crisis and was a wise decision by the ECB Governing Council (Darvas 2012c). The OMT is regarded as a monetary policy instrument, but it can be activated only if there is a European Stability Mechanism program in place, which is implemented properly. Therefore, a monetary policy instrument is activated subject to considerations that would not strictly pertain to a central bank in the exercise of its monetary policy duties. And the ECB explicitly commits to terminate the OMT not only—as would be logical—in case the latter is no longer warranted from a monetary policy perspective, but also in case the beneficiary country fails to comply with the required conditionality.

### 10.3. Three Different Ways to Assess Program Success

There are three ways to assess the success of financial assistance programs (Pisani-Ferry et al. 2013):

- Success in creating conditions to regain market access;
- Degree of compliance with loan conditionality; and
- Actual economic performance that is no worse than planned.

#### 10.3.1 Criterion 1: Creating Conditions to Regain Market Access

All countries except Greece were able to return to market borrowing. Since a major goal of any financial assistance program is to help the country regain its ability to borrow from the market on a sustainable

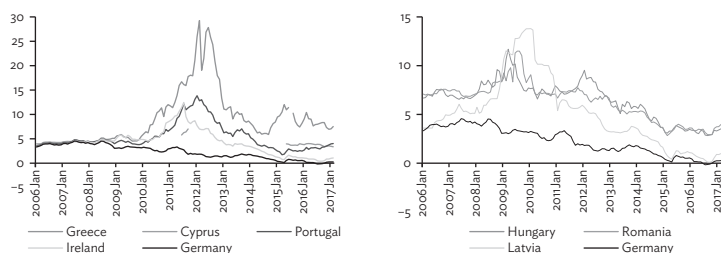
basis, six of the seven EU countries that received financial assistance should be considered successful in this regard.

However, two euro-area countries, Portugal and Cyprus, have to pay a relatively high spread to Germany, about 300–350 basis points for a 10-year bond (Figure 10.6). Given the still high level of public debt of these countries as a share of GDP (131% in Portugal and 107% in Cyprus at the end of 2016),<sup>8</sup> they may face market tensions once the ECB stops quantitative easing and interest rates rise, unless a very robust economic recovery starts, leading to a reduction in spreads.

The Irish government's return to the capital markets was so successful that its current 10-year government bond spread to Germany is only about 50–70 basis points. In fact, the cost of borrowing was much lower than the interest rates on IMF loans and, therefore, Ireland repaid the IMF early in 2014–2015, saving about €1.5 billion in interest.

Latvia, a country that joined the euro area in 2014, also experienced a marked fall in its borrowing costs and can borrow at a lower rate than Ireland. In autumn 2016 the spread of Latvian bonds over the German 10-year yield fell below 20 basis points and was still at a rather low level of 64 basis points in January 2017, following a general global increase in government bonds yields after the November 2017 US presidential election. Public debt is very low in Latvia at 39% of GDP (end-2016 data) and the Latvian government has demonstrated its determination to keep the budget under control even in the midst of a 20% GDP decline during the recent crisis, which likely explains the low borrowing cost.

**Figure 10.6: 10-Year Government Bond Yields, January 2006–January 2017 (%)**



Note: For Cyprus, correct data are not available for several months.

Source: European Central Bank.

<sup>8</sup> Data source: February 2017 AMECO data set of the European Commission.

In the two floating exchange rate countries, Hungary and Romania, the 10-year spread to Germany is currently at about 300 basis points. While the spreads of these countries are similar to the spreads of Portugal and Cyprus, they should be assessed more favorably, for three reasons:

- First, these countries could borrow at about the same spread to Germany in the precrisis period when there were huge capital inflows into these countries (Darvas and Szapáry 2010), while the spread of Cyprus and Portugal to Germany was almost zero in the precrisis period. Therefore, the current spreads of Hungary and Romania have just returned to the favorable precrisis values, while in Portugal and Cyprus current rates are much higher.
- Second, according to current forecasts, Hungary and Romania are expected to grow faster and therefore expected to have higher inflation than Cyprus and Portugal, implying that the real interest will be lower in Hungary and Romania than in Cyprus and Portugal.
- Third, the level of public debt as a share of GDP is much lower in Hungary and Romania than in Cyprus and Portugal, which combined with the lower real interest rates, implies that the real resources needed to service public debt are much lower in these two central European countries than in Cyprus and Portugal.

Regarding Greece, we note that the Greek government issued €4 billion in 5-year bonds in April 2014 at a rate of 4.95%, which was assessed favorably by the government and boosted plans of a return to the capital markets.<sup>9</sup> However, the 4.95% rate was still very high (and the 10-year interest rate was at 6.2% that time, an even higher rate) and, in our assessment, borrowing at such a rate would have led to an unsustainable debt trajectory. Also, the volume of this 2014 bond issuance was relatively low and the bond was issued under English law, which offered relatively strong protection. Therefore, even if the second financial assistance program would have been finalized smoothly and the stalemate between the new Greek government and official creditors in the first half of 2015 would have been avoided, Greece would have not been able to return to the capital markets in 2015, in our view.

Finally, we note that in our assessment there is no prospect for Greece returning to the capital markets at the end of the current third financial assistance program in 2018. Even if economic growth were

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<sup>9</sup> See the Reuters report “Greece returns to bond markets, says end of bailout nears” at <http://www.reuters.com/article/greece-bonds-idUSL6N0N21X220140410>

to accelerate in 2017–2018, as we expect, leading to a decline in the public debt/GDP ratio, the ratio will still be very high, and more than 80% of it will be due to official creditors. Greek politics and economic developments will continue to be characterized by major uncertainties. It is inconceivable to us that under such conditions Greece will be able to borrow at an affordable interest rate from the market. So, either a big restructuring of official loans or a fourth financial assistance program will be needed. The Eurogroup indicated at the inception of the third financial assistance program in the summer of 2015 that some form of debt relief could be provided if Greece could meet loan conditions. There does not seem to be political willingness to offer Greece a major haircut in debt, so the debt relief will likely take the form of even longer maturities for loans, longer grace periods, slightly lower interest rates, and interest rate deferral or even holiday. Such measures would be helpful in reducing the cost of annual debt service and repayment, but in our view they will not be sufficient to avert a fourth financial assistance program.

### 10.3.2 Criterion 2: Compliance with Conditionality under Various Headings

Program conditionally typically involves measures to improve fiscal sustainability, financial sector stability, and better functioning of various institutions and markets in order to foster productivity and growth.

Table 10.2 shows large variation both in the number of conditions as well as their composition across the key headings.<sup>10</sup> The number of conditions ranges from 19 in Hungary to 95 in the second Greek program.<sup>11</sup>

Key headings are related to the general government, with 21 conditions on average (ranging from 1 in Hungary to 52 in the second Greek program), and financial sector reform, with 19 conditions on average (ranging from 7 in the first Greek program to 29 in Ireland).

The Hungarian program was heavily focused on the financial sector, with only three conditions in other areas. The Irish program included

<sup>10</sup> The third Greek program is not included, because the IMF has not yet decided to participate in this program and therefore it is not included in the IMF's MONA database, while European institutions do not publish and track the implementation of program conditions as transparently as the IMF. The second and third programs for Romania are not included either, because Romania considered those programs as precautionary and no money was disbursed from them.

<sup>11</sup> Certainly, not all conditions are similarly difficult within and across countries, yet the number of conditions and their distribution across the various headings can indicate the intrusiveness and focus of the programs.

**Table 10.2: Total Number of Conditions by Reform Headings**

	Greece 1	Greece 2	Portugal	Ireland	Cyprus	Hungary	Latvia	Romania
Total	45	95	55	36	50	19	48	24
General government	23	45	20	9	11	1	15	12
Central Bank	1	1	-	-	5	-	-	-
Civil service and public employment reforms, and wages	2	4	4	-	-	-	2	2
Pension and other social sector reforms	3	4	2	-	2	1	3	2
Public enterprise reform and pricing (nonfinancial sector)	4	3	8	-	1	1	3	-
Financial sector	7	22	10	27	20	16	21	8
Exchange systems and restrictions (current and capital)	-	-	-	-	4	-	-	-
Labor markets, excluding public sector employment	3	6	4	-	-	-	3	-
Other structural measures	2	10	7	-	7	-	1	-

Note: Greece 1: 1st financial assistance program for Greece agreed in 2010. Greece 2: 2nd financial assistance program for Greece agreed in 2012.

Source: IMF's Monitoring of Fund Arrangements (MONA) database, considering the final (or last completed) program reviews.

only general government and financial sector measures. The programs for Latvia, Romania, and Cyprus included conditions in a few other areas too, while the two Greek programs and the Portuguese program were rather comprehensive in the sense of having several conditions in various other areas as well.

Conditions related to exchange systems and restrictions were added only for Cyprus in relation to the capital controls that were introduced. None of the seven countries received conditions related to "International trade policy, excluding customs reforms" and "Economic statistics excluding fiscal and central bank transparency and similar measures," two headings which were included in many other IMF programs. Trade policy is an EU-level competence. Statistical methodologies are harmonized in the EU, the production of statistics is supervised by



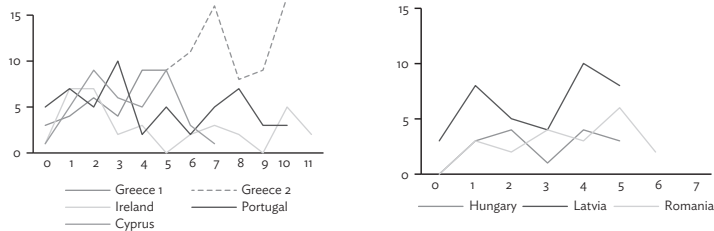
Eurostat, the EU's statistical office, and specific conditions for fiscal statistics were added in some cases. Greece was asked to revise the methodology of public finance statistics, while Ireland, Hungary, and Portugal received some related recommendations, like passing a budget responsibility law.

Building on but modifying the methodology of Terzi (2015), the dynamics of reform efforts measured by the number of conditions met by each review are displayed in Figure 10.7. It is difficult to observe a general pattern, although in Ireland, Cyprus, and Portugal there seems to be some decline toward the end of the program. The largest number of reforms was implemented by Greece, which is not surprising, given that Greece received the largest number of conditions (Table 10.2).

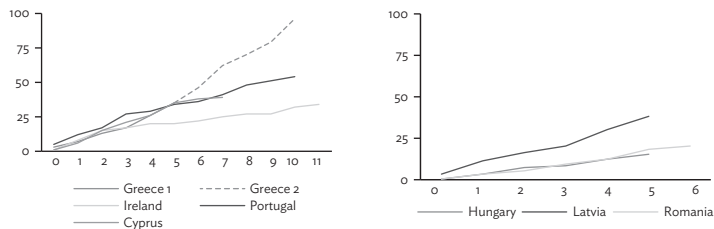
However, not all conditions were met. Figure 10.8 shows that on average only about 70% of the conditions were met on time, another 11% with a delay, and another 4% were implemented partially, leaving, on average, 15% of the number of conditions unmet and 1% waived.

**Figure 10.7: Number of Reforms Implemented**

**(A) By each review**



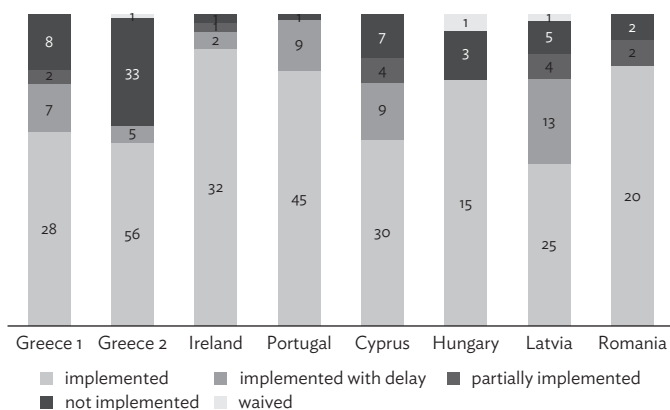
**(B) Cumulatively**



Note: The numbers on the horizontal axis indicate the number of the program review. The time between subsequent reviews was not always the same.

Source: Author's calculations based on the IMF's Monitoring of Fund Arrangements (MONA) database.

**Figure 10.8: Implementation Record—All Conditions**  
(% of the total number of conditions)



Note: For each case, we considered the final (or last) review included in the MONA database, which classifies implementation status in the five categories reported in the figure plus conditions which were still outstanding. Given that we considered the last review for each program, we considered outstanding conditions as not being met. In the case of Greece, some of the outstanding conditions were incorporated in the next assistance program.

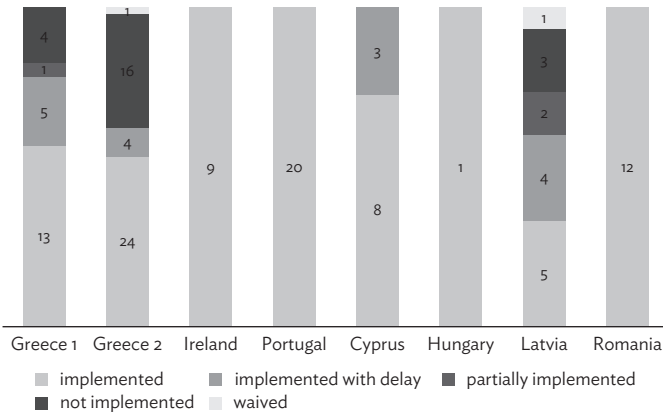
Source: IMF's Monitoring of Fund Arrangements (MONA) database.

The best performers in terms of on-time implementation are Ireland, Romania, Portugal, and Hungary, while in terms of any kind of implementation (on-time, delayed, and partial), Portugal is followed by Ireland, Romania, and Latvia. The second Greek program had the weakest implementation record, which is not surprising given the widely reported tensions between the Greek government and official creditors in the second half of 2015 and the reluctance of the new Greek government (elected in January 2016) to complete the second program. The implementation record was not great in Cyprus, either.

We also focus on two key aspects of the conditions: general government and financial sector reform. Hungary receives a 100% score for its implementation record in the general government reform category, given that its single condition, the passage of draft fiscal responsibility law, was met. Excluding Hungary, the average on-time implementation rate was 71% (Figure 10.9), slightly above the overall implementation rate. Portugal, Ireland, and Romania had the best record in this regard and the second Greek program the worst.

A key element of general government conditionality was fiscal consolidation, since budget deficits increased to high levels by the

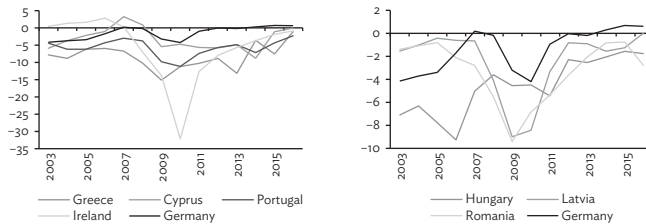
**Figure 10.9: Implementation Record—General Government Conditions**  
(% of the number of conditions)



Note: For each case, we considered the final (or last) review included in the MONA database, which classifies implementation status in the five categories reported in the figure plus conditions which were still outstanding. Given that we considered the last review for each program, we considered outstanding conditions as not being met. In the case of Greece, some of the outstanding conditions were incorporated in the next assistance program.

Source: IMF's Monitoring of Fund Arrangements (MONA) database.

**Figure 10.10: Overall Budget Balance of the General Government**  
(% GDP)



Source: European Commission's February 2017 AMECO database.

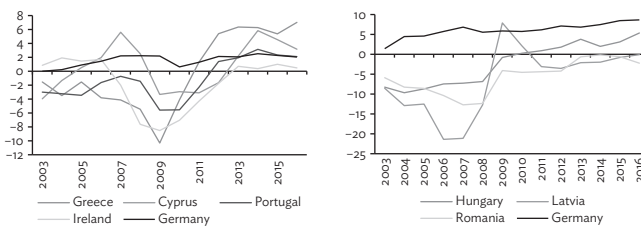
inception of the financial assistance programs (Figure 10.10). The only exception was Hungary, where large budget deficits were recorded in the mid-2000s, which had greatly improved by 2008 due to a major fiscal adjustment.

Unfortunately, there is no good up-to-date measure of fiscal adjustment. The most widely used indicator, the so-called structural budget balance, suffers from a number of conceptual weaknesses and is subject to large revisions, as demonstrated by Claeys, Darvas, and Leandro (2016). Still, in the absence of a better measure, Figure 10.11 indicates the dynamics of the primary structural balance of the general government, which can be illustrative of the fiscal efforts made by the governments.

The largest structural primary deficit, 10% of GDP, was seen in Greece in 2009 and the largest fiscal adjustment was also made by the subsequent Greek governments, amounting to about 16% of GDP. The change in the structural primary balance as a share of GDP was about 8%–9% in Cyprus, Ireland, Portugal, and Romania and 6% in Latvia. Hungary started its fiscal adjustment in 2006 and by 2008 the structural primary balance almost reached a balanced position. That is, by the time the country was forced to ask for financial assistance, it had a rather favorable fiscal situation, which likely explains why there was no conditionality on fiscal adjustment and the sole general government condition was to pass the draft budget responsibility law. Still, after the structural primary surplus fell from 1% of GDP to zero, the Hungarian government also implemented a fiscal adjustment of about 3% of GDP.

On the other hand, Germany implemented a rather modest fiscal adjustment by changing its structural primary balance from a surplus of about 1% of GDP to a surplus slightly below 3%.

**Figure 10.11: Structural Primary Budget Balance of the General Government (% GDP)**



Note: The structural balance is an estimate of the “underlying” budget balance, by excluding the estimated impact of the economic cycle and one-time items from the budget balance. The primary balance is the overall balance excluding interest. The February 2017 database includes data starting from 2010. For earlier years, we use the May 2014 estimates adjusted by the difference between the February 2017 and May 2014 estimates for 2010.

Source: European Commission’s May 2014 and February 2017 AMECO databases.

The second key aspect of the financial assistance programs was financial sector reform. The on-time implementation record was slightly better (at 70%) than the overall implementation rate, with Ireland and Portugal having the best scores. Latvia implemented most of the conditions if we also consider delayed implementation.

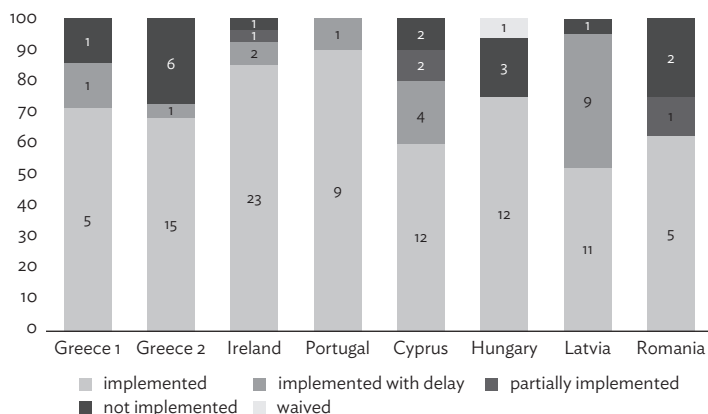
On average, one-fourth of the financial sector reforms were not implemented, and in some cases there were problems with the quality of implementation, as for example highlighted by Véron (2016) by analyzing the Portuguese program.

Furthermore, the high share of nonperforming loans, especially in Greece and Cyprus, signal persistent problems (Figure 10.13).

### 10.3.3 Criterion 3: Expectations versus Outcomes

A key aspect of the design of financial assistance programs is a medium-term macroeconomic projection. The projection determines (among other things) the amount of tax revenues to be collected and the level of

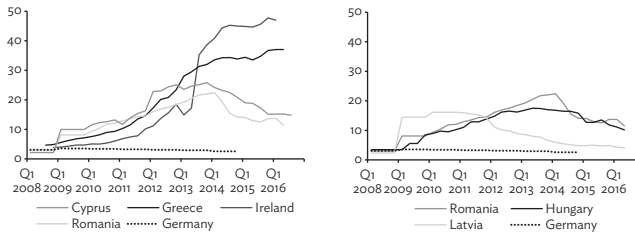
**Figure 10.12: Implementation Record—Financial Sector Conditions**  
(% of the number of conditions)



Note: For each case, we considered the final (or last) review included in the MONA database, which classifies implementation status in the five categories reported in the figure plus conditions which were still outstanding. Given that we considered the last review for each program, we considered outstanding conditions as not being met. In the case of Greece, some of the outstanding conditions were incorporated in the next assistance program.

Source: IMF's Monitoring of Fund Arrangements (MONA) database.

**Figure 10.1 3: Share of Nonperforming Loans, Q1 2008–Q2 2016 (%)**



Note: Quarterly data are not available for Ireland, Portugal, and Romania in 2008 and 2009; Latvia in 2008, 2009, 2010; Hungary in 2008 and Germany in all years. For these years, the corresponding annual data are indicated in each quarter.

Source: IMF Financial Soundness Indicators database.

economic cycle-dependent spending, such as unemployment benefits. Therefore, the macroeconomic projection determines the volume of loans to be provided by the financial assistance program, which is then fixed (in nominal terms) at the beginning of the program.

A funding gap of the government emerges if economic outcomes turn out to be worse than planned in the program. Since a country under financial assistance typically cannot borrow from the market, such a funding gap can be closed by additional fiscal consolidation or privatization, which in turn will likely have an effect on economic developments. Therefore, the macroeconomic projection has a crucial role in financial assistance programs, since macroeconomic underperformance relative to the projection has serious consequences.

Table 10.3 summarizes the key macroeconomic projections made at the inception of the assistance programs and actual outcomes until when the projections were made public. For comparison, the table also includes Germany, by comparing the October 2010 IMF World Economic Outlook projections with the most recent data. We chose the October 2010 projection because that was made around the time when the first three euro-area financial assistance programs were designed.

Before assessing the key findings based on this table, we would like to highlight that it is not possible to assess whether the projections were “unbiased” or “optimistic” or “pessimistic.” Such an assessment would require a detailed analysis of the various assumptions behind the projections, along with an assessment of the models used. This task

**Table 10.3: Macroeconomic Assumptions and Outcomes for the Seven European Union Financial Assistance Countries and Germany**

Period	Greece			Ireland			Portugal			Cyprus		
	Source	Program	Actual	Program	Actual	Program	Actual	Program	Actual	Program	Actual	
	Source Date	May 2010	Oct 2016	Nov 2010	Oct 2016	May 2011	Oct 2016	Apr 2013	Oct 2016	Apr 2013	Oct 2016	
		<b>2009–2015 cumulated</b>		<b>2009–2015 cumulated</b>		<b>2010–2016 cumulated</b>		<b>2012–2016 cumulated</b>				
Real GDP (% change)		1.2	-22.6	11.9	39.7	3.8	-3.7	-9.6			-4.4	
Inflation (% change)		5.4	5.5	2.4	2.3	12.2	8.1	5.6			-2.4	
<b>Period</b>		<b>2015</b>		<b>2015</b>		<b>2016</b>		<b>2016</b>				
Unemployment (%)		13.4	25.0	10.7	9.5	9.8	11.2	17.5			13.0	
Current account balance (% of GDP)		-1.9	0.0	-0.5	10.2	-2.2	0.0	-1.0			-0.9	
General government balance (% of GDP)		-2.0	-3.1	-4.8	-1.9	-1.8	-3.0	-2.3			-0.5	
General government debt (% of GDP)		140.0	176.9	123.0	78.7	111.0	128.4	121.7			106.7	

*continued on next page*

Table 10.3 continued

Period	Hungary		Latvia		Romania		Germany	
	Program	Actual	Program	Actual	Program	Actual	IMF WEO	Actual
	Oct 2008	Oct 2016	Dec 2008	Oct 2016	Apr 2009	Oct 2016	Oct 2010	Oct 2016
	2007-2011 cumulated		2007-2013 cumulated		2008-2011 cumulated		2009-2015 cumulated	
Real GDP (% change)	3.3	-3.4	-4.2	-9.7	0.7	-6.8	12.8	12.6
Inflation (% change)	19.3	20.4	29.2	25.3	13.9	18.5	9.6	8.5
<b>Period</b>	<b>2011*</b>		<b>2013</b>		<b>2011</b>		<b>2015</b>	
Unemployment (%)	8.5	10.1	9.5	11.9	7.7	7.2	6.7	4.6
Current account balance (% of GDP)	-1.0	0.8	-5.5	-2.4	-6.2	-4.9	3.9	8.4
General government balance (% of GDP)	-1.5	-5.5	1.1	-0.6	-2.7	-4.2	-1.4	0.7
General government debt (% of GDP)	66.2	80.8	33.5	35.9	25.7	33.9	75.6	71.0

GDP = gross domestic product, IMF = International Monetary Fund, WEO = World Economic Outlook.

Notes: The reference period is determined by the year before the program started and the latest year for which the program documents reported detailed projections. For Germany, we report the October 2010 IMF WEO projections, which were made at a time around the negotiations for the Irish program. \* For Hungary, unemployment rate projections were published only up to 2009 and therefore, we report the 2009 values for unemployment and 2011 values of all other indicators.

Sources: IMF country reports at the inception of the program and the October 2010 and the October 2016 World Economic Outlook databases.



cannot be performed by relying on publicly available information.<sup>12</sup> We can only compare whether the actual outcomes were better or worse than the projections, but cannot assess whether any deviation was due to bad program design or unexpected factors.

The key observations from Table 10.3 are the following:

- **Gross domestic product:**
  - In Germany, actual growth was practically the same as the October 2010 projection, suggesting that it was possible to make an accurate GDP projection in 2010 for a relatively stable country.
  - In five countries (Greece, Portugal, Hungary, Latvia, and Romania), growth was significantly worse than planned, especially in Greece. The reason behind this underperformance is not known: possible explanations include overly optimistic program design, unexpected negative shocks, or perhaps the difficulties in making projections for vulnerable countries in the midst of the worst economic and financial crisis since World War II.
  - Ireland grew more or less in line with projections up to 2014, while for 2015, statistics show an incredible 26% GDP growth, which was clearly unexpected.<sup>13</sup>
  - Cyprus had better growth than planned. Since the Cypriot financial program is the most recent among the financial assistance programs we consider, and for most other programs outcomes were worse than planned, the design of the Cypriot program may have been prepared on a cautious basis.<sup>14</sup>
- **Unemployment:** The deviation of actual unemployment from program assumptions very much mirrors GDP developments. That is, in most countries actual unemployment was higher than planned when GDP growth was lower than planned. The two exceptions are Romania, where unemployment was slightly lower than planned despite much worse growth, and Germany, where unemployment became significantly lower than planned despite no significant deviation of GDP from the projection.

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<sup>12</sup> The report of the Independent Evaluation Office of the IMF (2016) concluded that Greek and Portuguese programs incorporated “overly optimistic growth projections,” while the Irish program did not.

<sup>13</sup> We note that a number of commentators question the reliability of the 26% GDP growth number for 2015, for example, Coffey (2016) and Regan (2016).

<sup>14</sup> We do not include the third financial assistance program for Greece in our study, since it is a very recent program. However, we note that the outcomes so far have been much better than planned both for GDP and public finances.

- **Public finances:** Deviations of the general government balance and debt from program assumptions also mirror GDP developments. In the five countries with worse-than-planned GDP growth, the budget deficit became slightly larger, and public debt became much larger than planned, while in Ireland and Cyprus, both the deficit and the debt were lower. Public finances also became more favorable in Germany.
- **Current account:** There is a uniform pattern for seven of the eight countries irrespective of the deviation of actual GDP from its projection: the current account improved more than planned, including in Germany. This development suggests that there were common driving forces for higher surpluses in the whole EU. The exception is Cyprus, where the actual current account balance practically equals the planned balance. This could be explained again by the timing of the Cypriot program: this was the most recent program agreed in 2013, by when the current accounts of other EU countries had already outperformed prior expectations.
- **Inflation:** There is no uniform pattern for inflation. Actual inflation turned to be rather similar to the projections in Greece, Ireland, and Hungary, while inflation was significantly lower in Portugal, Cyprus, and Latvia. In Romania, inflation was higher than planned.

In summary, deviation of GDP performance from program assumptions had a decisive role in the deviations of public finances and unemployment from program assumptions. There was practically no deviation of GDP from plan for Germany, but for five of the seven program countries (both inside and outside the euro area) actual outcomes were much worse than planned. Overly optimistic program design, unexpected negative shocks, or perhaps the difficulties in making projections for vulnerable countries in a deep crisis may explain this underperformance. Ireland developed along the projections up to 2014, while growth became better in Cyprus, probably due to the timing of its program. The current account balance increased relative to the projections in all countries including Germany, while there is no uniform pattern in inflation.

### 10.3.4 Why Has Greece Suffered So Much?

While we argued earlier that it is difficult to identify the reasons for the discrepancy between actual and projected macroeconomic

developments, Greece has suffered so much from a 25% GDP depression, which calls for further examination.

Clearly, the precrisis growth model of Greece was unsustainable (Darvas 2015), which meant that some GDP contraction was inevitable. The Greek economy was characterized by widespread state control, inefficient public administration, corruption, excessive increases in public sector employment and wages, large increases in private sector wages well over productivity growth, and insufficient structural reforms.

This model led to very unfavorable business conditions, which was reflected in Greece being ranked 108th out of 181 countries in the World Bank's Ease of Doing Business indicator in 2008. Major vulnerabilities emerged, such as the -16% current account balance as a percentage of GDP in 2008, large foreign debt, a huge budget deficit, and public debt. Public debt increased to 127% of GDP in 2009 and was on an explosive path.

Clearly, the Greek crisis, which erupted from late 2009 onward, was self-inflicted and certain GDP contraction was inevitable. However, the key question is whether the first Troika program exacerbated the output fall. Hard evidence cannot be provided to answer this question and different people have different opinions. In my view, the answer is yes, for the following reasons.

The European Commission and ECB vehemently opposed public debt restructuring in 2010 and early 2011. While the IMF staff had concerns about the sustainability of Greek public debt, the IMF agreed to join the program without debt restructuring.

In the absence of debt restructuring, the large 2009 budget deficit and the large and exploding public debt painted a very dark picture about the future trajectory of public debt. To compensate for that, some key assumptions of the financial assistance program were designed in a way which seemed overly optimistic even back in 2010–2011 (Darvas, Pisani-Ferry, and Sapir 2011):

- Macroeconomic projections foresaw a short-lived and modest economic contraction: a 4.0% GDP decline in 2010, a 2.6% decline in 2011, and accelerating economic growth starting in 2012;<sup>15</sup>
- The primary budget balance target required an extremely ambitious adjustment: change from -8.6% of GDP in 2009 to 5.9% by 2014 and 6% in each year between 2015 and 2020;<sup>16</sup>

<sup>15</sup> See Table 1 on page 26 of <http://www.imf.org/external/pubs/ft/scr/2010/cr10110.pdf>

<sup>16</sup> See Table A.1 on page 38 of <http://www.imf.org/external/pubs/ft/scr/2010/cr10110.pdf>

- Extremely ambitious privatization receipts were planned: €5 billion by the end of 2011, €15 billion by the end of 2012, and €50 billion by the end of 2015, which amounts to 20% of GDP in total in 5 years.<sup>17</sup>

From late 2010, markets started to worry about the sustainability of Greek public debt as it became clearer that the above three main program assumptions would not be met. But all three Troika members, including the IMF, continued to vehemently oppose public debt restructuring in 2010 and most of 2011, while the initial proposals for debt restructuring in the second half of 2011 were very timid. Therefore, major uncertainty arose about the sustainability of Greek public debt, which led to uncertainty about Greece's euro membership. The uncertainty receded only sometime in 2012, after the large public debt restructuring.

However, the persistent uncertainty about the sustainability of Greek public debt and the euro area membership of the country in 2010–2012 reduced investments in Greece and led to capital flight from the country, which weakened the economy further. GDP also became weaker due to negative confidence effects, a large fiscal multiplier, financial fragmentation in the euro area, and weak overall euro-area economic developments. Negative developments in Greek GDP increased the budget deficit above the program assumption, which necessitated further fiscal adjustment. This in turn led to an even weaker economy and an unfortunate vicious circle of fiscal adjustment and weaker output.

Therefore, in my assessment the uncertainty related to the sustainability of Greek public debt and the consequent uncertainty regarding Greece's euro area membership in 2010–2012 were major negative factors behind the collapse of Greek GDP. These uncertainties relate to program design by the Troika and were approved by euro-area member states and the IMF Board, so the lenders also have a responsibility for program failure.

Greece did not meet all program conditions, but in my view this did not play a major role in the huge output collapse. As shown in Figure 10.9, the implementation record of the first Greek program, measured as the

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<sup>17</sup> The initial May 2010 program included a much more modest target: €5 billion in total by the end of 2015. The second review by the IMF published in December 2010 noted that “*The authorities are preparing a more ambitious three-year privatization strategy than originally foreseen in the program.*” In early 2011, the target was increased to €50 billion; see the third program review by the IMF published in March 2011 <https://www.imf.org/external/pubs/ft/scr/2011/cr1168.pdf>, which puts this plan into perspective by discussing earlier privatization programs of other countries, and pages 13–16 and page 82 of the updated Memorandum of Understanding at <https://www.imf.org/external/np/loi/2011/grc/070411.pdf>

percent of conditions that were implemented, was not very weak and was quite similar to the implementation record of Cyprus. Economic performance of Cyprus was much better than foreseen in its program. While many factors may have influenced Cypriot developments and beyond the implementation record the types of non-implemented measures and the quality of implemented measures matter too, the Cypriot example suggests that less than perfect implementation of program conditionality should not necessarily imply weak economic development.

## 10.4. Disagreements within the Troika

Some studies assessed the cooperation within the Troika. For example, Pisani-Ferry, Sapir, and Wolff (2013) concluded that

*“despite a number of tensions stemming from their different remits and rules, the EU and the IMF have succeeded in cooperating in Greece, Ireland, and Portugal.”*

In a recent study, the Independent Evaluation Office of the IMF (2016) concluded that

*“the troika arrangement ... proved to be an efficient mechanism in most instances for conducting program discussions with national authorities, but the IMF lost its characteristic agility as a crisis manager. And because the European Commission negotiated on behalf of the Eurogroup, the troika arrangement potentially subjected IMF staff’s technical judgments to political pressure from an early stage.”*

In this section we do not contemplate a similarly comprehensive assessment of the cooperation within the Troika institutions. Instead, our goal is to highlight four specific episodes when there was a major disagreement between the Troika members, which could provide valuable lessons for the cooperation between the IMF and regional safety nets in Asia.

### 10.4.1 Disagreement between the IMF and the European Commission: The 2008 Latvian Example

The Latvian program was designed by the “Duo” comprising the European Commission and the IMF. Latvia was not a member of the

euro area in 2008 and, therefore, the European Central Bank did not formally participate in the program.

Latvia has maintained a fixed exchange rate ever since the country became independent from the Soviet Union in the early 1990s. After entering the EU in 2004, the Latvian lat joined the European Exchange Rate Mechanism (ERM II) on 2 May 2005, which fixed the value of the lat to the euro, with standard fluctuation margins of  $\pm 15\%$ . However, Latvia unilaterally maintained a  $\pm 1\%$  fluctuation band around the central rate.<sup>18</sup>

Latvia asked for financial assistance in 2008. A major disagreement developed about the Latvia lat exchange rate between the IMF and the European Commission.

The IMF and the European Commission institutions had diverging priorities:

- IMF: restore stability and promote growth in Latvia.
- The European Commission: help the country in a way that sets a good precedent for others and helps the stability of its neighbors.

The IMF and the European Commission had different assessments and proposals:

- The IMF concentrated its attention on the Latvian exchange rate, which was “fundamentally misaligned,” according to IMF staff assessment. Therefore, the IMF proposed a currency devaluation, or at least allowing the exchange rate to fluctuate in the full  $\pm 15\%$  wide band.
- The European Commission insisted that the narrow exchange rate band should be preserved, which was in line with the priority of the Latvian government and central bank.

Resolution of the dispute:

- The IMF conceded; the narrow  $\pm 1\%$  fluctuation band was not widened.
- A very large fiscal adjustment was implemented (Figure 10.12).
- GDP contracted by 20% and unemployment skyrocketed; 9% of the population (including about 20% of young cohorts) emigrated from Latvia in 2008–2011 (Darvas 2013a).
- Latvia adopted the euro in 2014.

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<sup>18</sup> [https://ec.europa.eu/info/business-economy-euro/euro-area/euro/eu-countries-and-euro/latvia-and-euro\\_en](https://ec.europa.eu/info/business-economy-euro/euro-area/euro/eu-countries-and-euro/latvia-and-euro_en)

It is difficult to assess which institution was right. Latvian authorities, along with the European Commission, regard the program as successful, because the exchange rate peg was maintained, there was fast economic growth after the 20% GDP collapse, and Latvia could join the euro area in 2014.

It is not possible to set a counterfactual scenario on what would have happened with a devaluation. Most likely, GDP contraction in 2008–2010 would have been smaller, the fiscal adjustment could have been smaller, fewer people would have emigrated from Latvia, and the country could have still joined the euro area in 2014.<sup>19</sup> A key question is whether devaluation (or at least the full use of the  $\pm 15\%$  wide exchange rate fluctuation band) in Latvia would have necessitated a similar change in neighboring Estonia and Lithuania, and whether that would have had benign or adverse economic, financial, and social consequences in these two countries.

#### 10.4.2 Disagreement within the Troika: The 2010–2011 Greek Example

The Greek situation in 2010 was exceptional because of the large public sector and external imbalances and because of Greece's membership in the euro area. It came as a surprise to European institutions that a euro-area member required financial assistance, as discussed in section 10.2. One of the central issues in the 2010 negotiations was the sustainability of Greek public debt and whether debt restructuring was necessary.

The three institutions had diverging priorities:

- IMF: restore stability and promote growth in Greece.
- Europeans: ensure stability of the euro area (fear of contagion) and address the Greek debt problem later if needed.

The three institutions had diverging assessments and objectives:

- Up to early 2010, for exceptionally large lending, IMF articles required that “A rigorous and systematic analysis indicates that there is a high probability that the member’s public debt is sustainable in the medium term.” As Schadler (2016) notes, the consensus report submitted by IMF staff to the IMF Board stated that “On balance, staff considers debt to be sustainable over the medium term, but the significant uncertainties around

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<sup>19</sup> The exchange rate criterion for joining the euro area requires that a country keep its exchange rate in a  $\pm 15\%$  wide exchange rate band 2 years prior to entering the euro area.

*this make it difficult to state categorically that this is the case with a high probability.*” Therefore, IMF staff had doubts about Greek public debt’s sustainability.

- Major European creditor countries did not have consensus about how to help Greece. A large share of Greece’s debt was owed to banks of other EU countries, which had weak balance sheets that time.

Resolution of the dispute:

- Greek public debt was not restructured in 2010 as part of the financial assistance program. Instead, extremely ambitious assumptions were made, as discussed in section 10.3.4.
- Before granting a loan to Greece in 2010, the IMF’s Executive Board approved a major revision to the exceptional access criteria: *“However, in cases where there are significant uncertainties that make it difficult to state categorically that there is a high probability that the debt is sustainable over this period, exceptional access would be justified if there is a high risk of international systemic spillovers.”*
- There were huge economic and social costs in Greece.
- Debt was eventually restructured in March 2012–April 2012, after the negative downward spiral of the economy intensified, as argued in section 10.3.4.

There was dramatic economic and social hardship for Greece after the first financial assistance program. It is again difficult to assess a counterfactual scenario under which debt was restructured in 2010 and thereby the financial assistance program was based on more reasonable assumptions. However, there was practically no contagion to other weaker euro-area countries when debt restructuring was agreed in late-2011 and implemented in March 2012–April 2012, which suggests that an earlier debt restructuring would have not caused major negative spillovers.

It is sometimes argued that by the 2012 date of the Greek debt restructuring, the euro area had a stronger institutional framework to tackle spillovers. However, we find this argument weak. Arguably, two most important measures which helped to contain the euro crisis were the decision regarding the establishment of the European banking union and the announcement of the ECB’s Outright Monetary Transaction (OMT) instrument.<sup>20</sup> Both of these announcements were made in the summer of 2012, well after the decision on Greek debt restructuring.

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<sup>20</sup> See Darvas (2012c).



### 10.4.3 Disagreement within the Troika: The 2010–2011 Irish Example

Ireland was the fifth EU member and the second euro-area country that asked for financial assistance in the aftermath of the global and European financial crises. Ireland primarily suffered from a massive banking crisis, which was especially severe due to the large size of the banking system: the balance sheet of Irish-owned banks was 3.7 times GDP in 2007, while with international financial centers the ratio was 7.1 times GDP. Early in the crisis, the Irish government guaranteed most of the liabilities of Irish-owned banks—a decision made entirely by the Irish authorities. But later, when the problems with the blanket guarantee became clearer and the issue emerged in political debates, the Irish government wished to restructure the banks' senior debt.

The three institutions had diverging priorities:

- IMF: restore stability and promote growth in Ireland.
- Europeans: ensure stability of the euro area (fear of contagion).

The three institutions had diverging proposals:<sup>21</sup>

- The IMF called for imposing losses on senior bank bondholders and estimated that it would benefit Ireland by about €16 billion–€17 billion (10% of GDP);
- The European Central Bank expressed its resolute opposition to such an idea, motivated by the fear of destabilizing senior bank bond markets, and more generally a disruption of bank-funding markets throughout the euro area.

Resolution of the dispute:

- The IMF conceded; senior bank bonds were not restructured;
- However, the episode left a sense of unfairness against Ireland that played a big role in later enabling a financial restructuring known as the “promissory notes transaction,” which was beneficial to Ireland (Véron 2016).

### 10.4.4 Disagreement between the IMF and European Institutions: The 2015–2017 Greek Example

Greece held snap elections in January 2015 and the new government rejected the implementation of the ongoing second financial assistance

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<sup>21</sup> See Brennan (2010), Lane (2011), and O'Rourke (2011) for arguments for and against the restructuring of senior bank debt.

program. After a 6-month stalemate between the Greek government and the Troika institutions, a third financial assistance program was agreed upon in the summer of 2015. The new loan was provided fully by the European Stability Mechanism, the new permanent safety net of the euro area. The IMF was not among the signatories of this third assistance program because it had a major dispute with its European partners about Greek debt sustainability, but did not exclude its later participation. By February 2017, the time of finalizing this chapter, the dispute has yet to be resolved and the IMF has not yet decided about its participation in the assistance program.<sup>22</sup>

Due to the negative associations with the name “Troika” in Greece, this name was dropped and instead the IMF, European Commission, the European Central Bank, and the European Stability Mechanism are called “institutions.”

The four institutions had diverging priorities:

- IMF: learn from the mistakes of the previous two Greek assistance programs; listen more to the voices of non-European members of the IMF;<sup>23</sup> and ensure the repayment of existing IMF loans to Greece.
- Europeans: ensure consistent implementation of financial assistance programs in the euro area.

The four institutions had diverging assessments and proposals:

- IMF staff concluded that Greece cannot reach a 3.5% of GDP primary balance target (or if it is reached, it will not be maintained for long) and significantly downgraded Greece’s growth outlook. Therefore, IMF staff concluded that Greek public debt is not sustainable. Since the bulk of Greek debt is held by official creditors, the IMF proposed restructuring EU loans, but full repayment of IMF loans.

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<sup>22</sup> In July 2017, after finalizing this chapter, the IMF “in principle,” that is, conditionally, approved a rather small amount of loan, €1.6 billion, as a possible contribution to the third financial assistance program for Greece. It will become effective only after the IMF receives assurances from European partners on debt sustainability and provided that the economic program remains on track, and a new IMF Executive Board decision will be needed to make the arrangement effective. Therefore, this “in principle” approval has not changed the ambiguity of the IMF participation and reflects the continued disagreement between the IMF and its European partners about Greek debt sustainability. See further information at <https://www.imf.org/en/News/Articles/2017/07/20/pr17294-greece-imf-executive-board-approves-in-principle-stand-by-arrangement>

<sup>23</sup> The IMF received sharp criticism from its emerging/developing country members for its earlier handling of the euro-area crisis.

- The Europeans argued that meeting the conditionality of the program (i.e., structural reforms) is more important than giving debt relief, given that Greece has major structural weaknesses but no market borrowing for years. The Europeans criticized the IMF for overly pessimistic assumptions and argued that certain easing of the debt burden can be discussed only after program conditionality is properly implemented.

Resolution of the dispute:

- No resolution so far.
- The IMF has not yet decided about its participation in the third financial assistance program to Greece.<sup>24</sup>

## 10.5. Implications for Asia

While financial assistance for EU countries, and in particular, for euro-area countries, has many distinctive features, Asian countries can draw several lessons. We highlight four key issues: coexistence of global and regional safety nets, their cooperation, systemic spillovers across countries, and social implications of assistance programs.

### 10.5.1 Coexistence of the IMF and Regional Safety Nets

A key lesson from the financial assistance programs provided to the four euro-area and three non-euro EU countries is that joint programs between the IMF and regional safety nets are possible and can be successful. As Pisani-Ferry, Sapir, and Wolff (2013) highlight, the US and Europe opposed the creation of an Asian Monetary Fund in the late-1990s, which now seems unjustified, and an expression unequal treatment, given that the IMF cooperated with European institutions for financial assistance of seven EU countries.

EU countries were in a special situation, given that they have a strong influence on the IMF: the share of EU representatives in IMF Executive Board is higher than the share of EU countries in the combined GDP of all IMF members, and all the IMF managing directors have been Europeans so far. A key question for Asian countries is therefore whether the IMF would be ready to cooperate with Asian regional institutions to a similar degree if needed. It is difficult to answer such a

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<sup>24</sup> See footnote 23 for the continued ambiguity about the IMF participation following the July 2017 “in principle” approval.

question. However, the IMF has showed the capacity to change its view toward more pragmatic approaches in many issues,<sup>25</sup> which suggests that it may cooperate with regional safety nets from other regions, provided that certain preconditions are met. A key precondition seems to be that the regional safety net should have sufficient capacity to partner with the IMF in terms of analysis, advice, and financing. The European experiences show that when this is the case, the IMF and regional institutions can work together. A possible cooperation between the IMF and regional institutions may also be helpful in reducing the “stigma effect,” which has been associated with the IMF programs since the Asian financial crises of 1997–1998. The cooperation in Europe was burdened with major disagreements in the cases of Latvia and Greece, and to a lesser extent, Ireland, while disagreements were less important in the cases of Hungary, Romania, Ireland, and Cyprus.

Some joint European programs were more successful (e.g., Ireland, Cyprus), while the first two Greek programs were major failures. Therefore, cooperation between the IMF and regional safety nets does not guarantee or exclude success.

## 10.5.2 Cooperation between the IMF and Regional Safety Nets

European experiences with jointly funded assistance programs by the IMF and regional institutions suggest that cooperation could be more efficient if there is a prior agreement on

- How to settle possible disputes between institutions,
- Division of labor between the institutions,
- Information sharing, and
- Synchronized decision making.

Furthermore, the major disputes that emerged in the cases of Latvia and Greece suggest that it may be preferable to design the cooperation in

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<sup>25</sup> For example, the IMF and its policies have evolved significantly in post 1997–1998 Asian financial crisis and are moving beyond a one-size fits all approach. For example, (1) the IMF recently endorsed capital controls under certain conditions, while strongly opposing such controls earlier; (2) conducted extensive research on social issues like income inequality, while there was hardly any such research earlier; (3) published several papers on fiscal multipliers and entered into a major debate with the European Commission on this issue, by arguing that multipliers tend to be large in a recession, which should be considered in the design of fiscal strategies; (4) and for Greece, while the IMF wholeheartedly endorsed the 6% of GDP primary balance target of the first financial assistance program of 2010 and the 4.5% of GDP target of the second financial assistance program of 2012, since 2015 it has argued that even a 3.5% target is too ambitious and instead a 1.5% target would be appropriate. We assess many of these changes as pragmatic.

a way to allow withdrawal of either the IMF or the regional institution in case a major dispute is not solved. Such a design can be possible if the remaining party has sufficient financial resources to replace the funding of the withdrawing party. This could be the case either with programs requiring relative small amount of funding, or if either the IMF or the regional institution accepts becoming a junior partner in terms of financing, in which case the junior partner could withdraw its participation and funding.

Another key lesson from Europe, which was also emphasized by the Independent Evaluation Office of the IMF (2016), is that the risk of political interference in technical analysis should be minimized. Final decisions typically involve political considerations too, but the technical work by the staff should be prepared independently.

### 10.5.3 Better Monitoring and Assessment of Systemic Spillovers across Countries

A major source of disagreement between the IMF and its European partners was related to the different perception of the systemic cross-country implications of certain measures, such as:

- The possible impact of a devaluation, or the utilization of the full  $\pm 15\%$  wide exchange rate fluctuation band in Latvia in 2008–2009, for the other two Baltic countries;
- The possible impact of a Greek public debt restructuring in 2010 for other euro-area countries with weaker fundamentals; and
- The possible impact of a restructuring of Irish senior bondholders in 2010–2011 for the bank funding markets in the euro area.

Disagreements arose because of the different methodologies and assessments of these cross-country spillovers. In such cases it seems advisable that technical level experts from the IMF and regional institutions discuss thoroughly the reasons for their disagreements and submit a joint report to the decision-making bodies of both the IMF and the regional institutions in which they clarify the reasons for their disagreement.

### 10.5.4 Social Impact of Financial Assistance Programs

Last but not least, cooperation between the IMF and its European partners suggests that too little attention was paid to the possible social impact of the programs. While the ultimate goal of returning to robust GDP growth remains crucial, which can also help ease social tensions,

program design should focus on the social impact during the adjustment period, including distribution of the burden.

For example, even during the relative successful Irish program, major social problems emerged. As Figure 13 of Darvas, Hüttl, De Sousa, Terzi, and Tschekassin (2014) shows, the share of children aged 0–17 living in jobless households increased to the highest level in Ireland among the 28 EU member states by 2012, while the share of people aged 18–59 living in jobless households became the second highest in Ireland, after Greece.

The social impact of loan conditionality and the distributional implications of various measures should be considered more prominently, which would also increase the ownership of the program.

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# 11

## Regional Financial Regulation in Asia<sup>1</sup>

*Peter J. Morgan*

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### 11.1 Introduction

This chapter examines the institutional implementation of a framework for regional financial regulation in Asia. National-level financial surveillance and regulation continue to be the first line of action for preserving financial stability. Under the auspices of the G20, following the global financial crisis of 2007–2009, there has been an attempt to forge a global consensus on financial reform measures based on proposals made by the Financial Stability Board (FSB), and to strengthen the role of the International Monetary Fund (IMF) both as a surveillance unit and as a global financial safety net. In this chapter, we argue that there is a mediating role for regional-level institutions of financial regulation in Asia. This role includes (i) monitoring financial markets and capital flows to identify regional systemic risks such as sharp movements in capital flows; (ii) coordinating finance sector surveillance and regulation to promote regional financial stability; and (iii) cooperating with global institutions in rule formulation, surveillance, and crisis management.

The Asian financial crisis (1997–1998) highlighted the potential value of financial regionalism, i.e., regional-level cooperation in economic and financial policy. Many economies in the region found themselves subject to similar shocks and contagion, leading to volatile capital movements and the risk of “sudden stops” and reversals of capital flows. The move of the Association of Southeast Asian Nations (ASEAN) member states toward economic and financial integration,

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<sup>1</sup> This chapter is mainly an update of Kawai and Morgan (2014).

known as the ASEAN Economic Community (AEC) is one manifestation of this.<sup>2</sup> Another important development was the creation of the Chiang Mai Initiative (CMI) in 2000 as a regional financial safety net based on bilateral currency swap arrangements, which was transformed into a multilateralized form—the Chiang Mai Initiative Multilateralization (CMIM) in 2007. The Economic Review and Policy Dialogue (ERPD), established in 1999 under the auspices of the ASEAN+3 finance ministers' meeting,<sup>3</sup> provided a forum for discussing regional economic and financial policy issues.

The global financial crisis of 2007–2009 and the subsequent eurozone sovereign debt and banking sector crisis of 2011–2012 added to the urgency for greater financial cooperation by providing reminders of the vulnerability of Asian economies to shocks emanating from the global financial market. Moreover, one of the key lessons of the eurozone crisis is that greater financial market integration requires greater integration of financial regulation and supervision as well. These developments led to the creation of the ASEAN+3 Macroeconomic Research Office (AMRO) under the process of ASEAN+3 finance ministers and central bank governors to monitor economic and financial risks in the region.

Other factors contributed as well. First, the rising regional economic and financial interdependence in Asia, including ASEAN, the People's Republic of China (PRC), Japan, and the Republic of Korea, as a result of the establishment of supply chain networks, financial liberalization, and capital market opening, raised the correlations of economic and financial activity in the region. Second, the presence of large global or regional financial firms in the region increases the risk of spillovers and contagion, and calls for a more coordinated approach to supervision, including the establishment of supervisory colleges.<sup>4</sup> Third, although the global financial crisis stimulated a wave of new financial regulation under the auspices of the G20, the agenda was still very much driven by issues in developed economies. A global regulatory approach of “one size fits all” may not be appropriate for Asia, which increases the need for Asian economies to articulate their viewpoints in global forums like the FSB and the G20. Finally, a large body of literature suggests

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<sup>2</sup> ASEAN members are Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam.

<sup>3</sup> ASEAN+3 includes the 10 ASEAN member countries plus the People's Republic of China (PRC), Japan, and the Republic of Korea. The process was expanded to include central bank governors in 2012.

<sup>4</sup> The eurozone sovereign debt and banking sector crisis has led to increased calls for European Union (EU)-wide supervision of major financial institutions, e.g., Barroso (2012).

that financial development and integration can benefit economic growth,<sup>5</sup> and increased regional regulatory harmonization and mutual recognition can both support this process and reduce systemic risks associated with it.

Financial regulation encompasses three broad aspects: ensuring that all market participants understand the risks they face and take on only those they are capable of coping with in order to promote efficient allocation of credit; protecting consumers from unfair and fraudulent practices; and maintaining systemic stability by monitoring common risk exposures, the solvency of individual institutions, the proper functioning of markets, the operation of the payment and settlement structures, and the levels of a variety of buffers that provide comfort to participants (Sharma and Fullencamp 2012). The experience of the global financial crisis showed that maintaining systemic stability requires both microprudential and macroprudential regulatory approaches. This paper examines four aspects of financial regulation: microprudential regulation, macroprudential regulation, resolution capacity and deposit insurance, and financial safety net for liquidity support. It focuses mostly on the systemic stability aspects, since this is arguably where regional cooperation probably can make the largest contribution.

Although financial integration efforts in Asia, even in ASEAN, are much more modest than those in Europe, the basic goal of increased integration has been well established, especially among ASEAN countries under the AEC. This points fundamentally to the need for greater regional regulatory cooperation between ASEAN and ASEAN+3 economies to reduce risks associated with greater integration.<sup>6</sup> Since regional financial integration is most advanced in Europe, its experience should provide valuable lessons (both positive and negative) for Asia. Nonetheless, the levels of economic and financial development and financial integration in Europe and Asia are very different. Asian economies encompass much greater diversity in terms of economic development, institutional capacity, and financial market depth and openness than do European economies. This suggests that the European experience represents an important reference point, but not a template or a benchmark, and that the appropriate level of financial regulatory cooperation and types of regional institutions will differ substantially from those that have developed in Europe.

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<sup>5</sup> See King and Levine (1993); Cecchetti and Kharroubi (2012); Levine (2005); Beck, Levine, and Loayza (2000); Rajan and Zingales (1998). Whether this effect is causal or not remains controversial, especially in light of the role of financial innovation (Rodrik 2008; Schularick and Steger 2010).

<sup>6</sup> Such efforts could eventually be extended to other parts of Asia as well.

This chapter is organized as follows. Section 11.2 compares economic and financial development and financial integration in Europe and Asia. Section 11.3 discusses the experience of regional financial cooperation and regulation in Asia. Section 11.4 identifies various challenges of regional financial regulation and provides recommendations for strengthening institutions of regional financial regulation. Section 11.5 provides the conclusions.

## 11.2 Comparison of Economic and Financial Development in Europe and Asia

### 11.2.1 Economic Development

This section compares the levels of economic and financial development, financial integration, and the quality of institutions in Europe and Asia. The aim is to provide a perspective of the relevance of Europe's experience to that of Asia, and to identify where different approaches may be desirable. The trend toward financial integration in Europe accelerated around 1990, and included the deregulation of capital movements within the European Monetary System (EMS) economies in 1988 and the adoption of the Maastricht Treaty and the decision in 1992 to establish the Economic and Monetary Union (EMU). Therefore, we believe it is appropriate to compare conditions in Europe at that time with conditions in Asia currently, to gauge the potential for regional financial integration and regulatory cooperation.

Table 11.1 compares levels of per capita real gross domestic product (GDP) in the European Union 15 (EU15), i.e., EU member countries in 1990 plus Austria, Finland, and Sweden, versus those in the ASEAN+3 economies in 2012. The data are shown in 1990 Geary-Khamis dollars to make them comparable. Clearly, economic conditions were much more uniform in Europe in 1990 than in Asia in 2012. Interestingly, the unweighted average real income levels were not that different—\$15,600 for Europe versus \$12,300 for Asia—but the population-weighted average is less than half in Asia, reflecting the large population weights of the PRC and India. Also, the dispersion in Europe was much less, with a standard deviation of \$3,400 versus \$10,000 for the Asian economies. The minimum income level in Europe was \$10,000 versus only \$2,700 for Asia.

**Table 11.1: Real Per Capita GDP in Europe and Asia**

1990 Geary–Khamis dollars			
EU15 Countries, 1990		ASEAN+6, 2012	
Country	GDP per capita	Country	GDP per capita
Austria	16,895	Australia	26,356
Belgium	17,197	Brunei Darussalam	27,273
Denmark	18,452	Cambodia	2,702
Finland	16,866	PRC	8,631
France	17,647	India	3,690
Germany	16,306	Indonesia	5,207
Greece	10,015	Japan	22,002
Ireland	11,818	Republic of Korea	22,879
Italy	16,313	Lao PDR	3,127
Luxembourg	23,028	Malaysia	10,733
Netherlands	17,262	Myanmar	4,248
Portugal	10,826	New Zealand	18,915
Spain	12,055	Philippines	3,178
Sweden	17,069	Singapore	29,851
United Kingdom	16,430	Thailand	9,677
		Viet Nam	3,504
<b>Simple average</b>	<b>15,879</b>	<b>Simple average</b>	<b>12,623</b>
<b>Population-weighted average</b>	<b>15,850</b>	<b>Population-weighted average</b>	<b>7,131</b>
<b>Standard Deviation</b>	<b>3,377</b>	<b>Standard Deviation</b>	<b>10,089</b>

ASEAN+6 = Association of Southeast Asian Nations (ASEAN—Brunei Darussalam, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam) plus the PRC, Japan, the Republic of Korea, Australia, India, and New Zealand; EU15 = The 15 member states of the European Union (EU) as of 31 December 2003, before the new member states joined the EU (The 15 member states are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom); GDP = gross domestic product; Lao PDR = Lao People's Democratic Republic; PRC = People's Republic of China.

Note: Figures for Brunei Darussalam and the Lao PDR estimated using Geary–Khamis conversion factors for Singapore and Cambodia, respectively.

Sources: The Conference Board. Total Economy Database™. <http://www.conference-board.org/data/economydatabase/> (accessed January 2013); and ADB. *Key Indicators for Asia and the Pacific 2013*. Manila. <http://www.adb.org/publications/key-indicators-asia-and-pacific-2013?ref=publications/series/key-indicators-for-asia-and-the-pacific>

## 11.2.2 Financial Development

Financial development is frequently measured by the ratio of total financial assets to GDP, since capital deepening generally accompanies economic development. Table 11.2 shows the levels and standard deviations of the ratios of private bank credit to GDP for the two regions.

**Table 11.2: Ratio of Bank Private Credit to GDP in Europe and Asia**

EU15 Countries (1990)		ASEAN+6 (2011)	
Country	Bank private credit/GDP (%)	Country	Bank private credit/GDP (%)
Austria	85.7	Australia	121.2
Belgium	35.8	Brunei Darussalam	32.6
Denmark	50.2	Cambodia	26.8
Finland	82.3	PRC	121.5
France	89.6	India	47.2
Germany	88.1	Indonesia	25.4
Greece	34.1	Japan	105.7
Ireland	45.3	Republic of Korea	98.4
Italy	52.8	Lao PDR	22.0
Luxembourg	110.4	Malaysia	106.4
Netherlands	77.2	Myanmar	8.2
Portugal	48.0	New Zealand	143.9
Spain	76.7	Philippines	29.8
Sweden	53.8	Singapore	104.2
United Kingdom	108.5	Thailand	101.9
		Viet Nam	107.7
<b>Simple average</b>	<b>69.2</b>	<b>Simple average</b>	<b>75.2</b>
<b>GDP-weighted average</b>	<b>79.2</b>	<b>GDP-weighted average</b>	<b>102.3</b>
<b>Standard Deviation</b>	<b>25.1</b>	<b>Standard Deviation</b>	<b>45.3</b>

ASEAN+6 = Association of Southeast Asian Nations (ASEAN—Brunei Darussalam, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam) plus the PRC, Japan, the Republic of Korea, Australia, India, and New Zealand; EU15 = The 15 member states of the European Union (EU) as of 31 December 2003, before the new member states joined the EU (The 15 member states are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom); GDP = gross domestic product; Lao PDR = Lao People's Democratic Republic; PRC = People's Republic of China.

Sources: World Bank. Global Financial Development. <http://data.worldbank.org/data-catalog/global-financial-development>; for the Lao PDR, CEIC Database <https://ceicdata.com>; for Myanmar, IMF (2013).

The average ratio for Europe in 1990 was actually lower than in Asia in 2011—69% versus 75%—and the gap in the GDP-weighted averages was even larger. However, the standard deviation was much lower—25% versus 45%—indicating a smaller diversity of development.

Table 11.3 shows total bond issues outstanding for the two regions, including both domestic and international issues. The simple average level was somewhat higher in Europe—69% versus 59%—but the GDP-weighted average was much lower. Again, the standard deviation was only about half of that in Asia. Viet Nam and Myanmar in particular stand out with a ratio of only 2%–3%.

Table 11.4 shows the ratio of stock market capitalization to GDP. The average ratio for the European countries in 1990 was only about half of the Asian level in 2011 in both unweighted and weighted terms, but the standard deviation was also much lower. Interestingly, Greece, Austria, Portugal, and Italy had lower stock market levels in 1990 than did Viet Nam in 2011.

Overall, the average level of financial development of Asia currently compares favorably with that of Europe in 1990. Nonetheless, the much higher variance of financial development in Asia does indicate obstacles to financial integration, although they do not appear to be as great as those for income levels.

### 11.2.3 Financial Integration

Financial openness and financial integration are not quite the same thing, but clearly an economy must be financially open to make integration possible, especially on the capital account. Capital account openness has been measured empirically both in *de jure* (based on laws and regulations) and *de facto* terms. *De jure* openness is perhaps more important for financial integration. One popular measure of *de jure* openness is the Chinn–Ito Index (Chinn and Ito 2006), which is an index compiled based on the IMF’s annual report on exchange rate arrangements and regulations (IMF 2012). The index values range between 2.5 (fully open) and –1.8 (fully closed).

Figure 11.1 shows the comparative values for European countries in 1990 and Asian countries in 2011 (the latest year available). Interestingly, both regions showed a considerable divergence of capital market openness, with the standard deviations being very similar, but the average index value of openness in Europe in 1990 was much higher—1.01 versus 0.18 for Asia in 2011. In Europe, only Greece was relatively closed, while seven countries in Asia have high negative scores against only three being completely open. Moreover, as a result of the Maastricht Treaty of 1992, Denmark, France, Ireland, and Italy had moved to complete financial market openness by 1996.

**Table 11.3: Ratio of Total Bonds Outstanding to GDP in Europe and Asia**

EU15 Countries (1990)		ASEAN+6 (2011)	
Country	Outstanding bonds/GDP (%)	Country	Outstanding bonds/GDP (%)
Austria	52.7	Australia	126.5
Belgium	141.5	Brunei Darussalam	N/A
Denmark	151.5	Cambodia	N/A
Finland	38.8	PRC	47.0
France	72.8	India	34.5
Germany	59.6	Indonesia	16.8
Greece	41.5	Japan	263.5
Ireland	54.7	Republic of Korea	118.2
Italy	102.5	Lao PDR	N/A
Luxembourg	62.9	Malaysia	127.4
Netherlands	62.0	Myanmar	3.3
Portugal	40.6	New Zealand	36.2
Spain	39.3	Philippines	48.7
Sweden	77.9	Singapore	55.4
United Kingdom	37.5	Thailand	65.8
		Viet Nam	2.3
<b>Simple average</b>	<b>69.1</b>	<b>Simple average</b>	<b>59.1</b>
<b>GDP-weighted average</b>	<b>68.1</b>	<b>GDP-weighted average</b>	<b>119.1</b>
<b>Standard Deviation</b>	<b>36.1</b>	<b>Standard Deviation</b>	<b>70.5</b>

ASEAN+6 = Association of Southeast Asian Nations (ASEAN—Brunei Darussalam, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam) plus the PRC, Japan, the Republic of Korea, Australia, India, and New Zealand; EU15 = The 15 member states of the European Union (EU) as of 31 December 2003, before the new member states joined the EU (The 15 member states are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom); GDP = gross domestic product; Lao PDR = Lao People's Democratic Republic; N/A = not available; PRC = People's Republic of China.

Note: Since values for countries with data not available are likely to be small, the averages and standard deviation were calculated assuming zero values for those countries.

Sources: World Bank. Global Financial Development. <http://data.worldbank.org/data-catalog/global-financial-development>; CEIC Database <https://ceicdata.com>

Other data also suggest that financial integration in Asia is much less advanced than in the EU. For example, Table 11.5 shows the share of intraregional cross-border portfolio investment in total cross-border investment for a number of regions for the year 2001 (the earliest year



**Table 11.4: Ratio of Stock Market Capitalization to GDP in Europe and Asia**

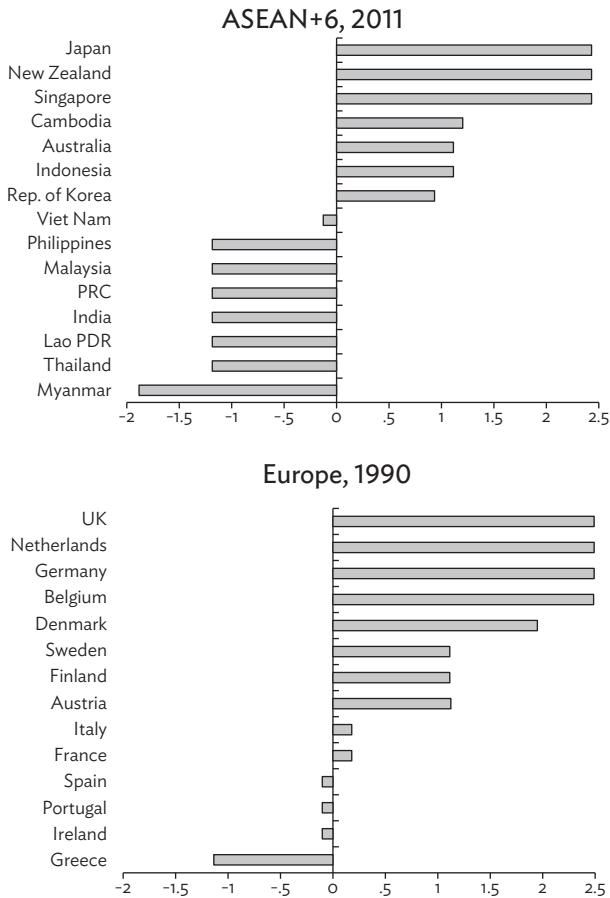
EU15 Countries (1990)		ASEAN+6 (2011)	
Country	Stock market capitalization/ GDP (%)	Country	Stock market capitalization/ GDP (%)
Austria	11.6	Australia	103.5
Belgium	38.0	Brunei Darussalam	0
Denmark	31.9	Cambodia	0.3
Finland	20.9	PRC	58.8
France	30.0	India	69.7
Germany	18.7	Indonesia	45.1
Greece	11.3	Japan	68.8
Ireland	38.1	Republic of Korea	96.2
Italy	15.2	Lao PDR	7.4
Luxembourg	89.6	Malaysia	144.1
Netherlands	51.7	Myanmar	0
Portugal	13.8	New Zealand	40.1
Spain	24.6	Philippines	73.9
Sweden	48.0	Singapore	148.1
United Kingdom	87.1	Thailand	81.7
		Viet Nam	15.4
<b>Simple average</b>	<b>35.4</b>	<b>Simple average</b>	<b>59.6</b>
<b>GDP-weighted average</b>	<b>34.1</b>	<b>GDP-weighted average</b>	<b>69.8</b>
<b>Standard Deviation</b>	<b>25.0</b>	<b>Standard Deviation</b>	<b>48.3</b>

ASEAN+6 = Association of Southeast Asian Nations (ASEAN—Brunei Darussalam, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam) plus the PRC, Japan, the Republic of Korea, Australia, India, and New Zealand; EU15 = The 15 member states of the European Union (EU) as of 31 December 2003, before the new member states joined the EU. The 15 member states are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom; GDP = gross domestic product; Lao PDR = Lao People's Democratic Republic; PRC = People's Republic of China.

Note: Ireland data are for 1995, Cambodia data are for April 2012 (initial public offering), and Lao PDR data are for January 2012. Brunei Darussalam and Myanmar do not have stock markets.

Sources: World Bank. Global Financial Development. <http://data.worldbank.org/data-catalog/global-financial-development>; Lanexang Securities Public Co. (2013) and Cambodia Securities Exchange. <http://www.csx.com.kh/main.do>

data are available) and 2012. Cross-border portfolio investment in Asia represents a much smaller share of total cross-border investment in Asia

**Figure 11.1: De Jure Capital Market Openness in Europe and Asia**

ASEAN+6 = Association of Southeast Asian Nations (ASEAN—Brunei Darussalam, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam) plus the PRC, Japan, the Republic of Korea, Australia, India, and New Zealand; Lao PDR = Lao People's Democratic Republic; PRC = People's Republic of China; UK = United Kingdom.

Note: Indexes are not available for Luxembourg or Brunei Darussalam.

Source: Chinn and Ito (2006). The latest data can be found at the Chinn-Ito Index. [http://web.pdx.edu/~ito/Chinn-Ito\\_website.htm](http://web.pdx.edu/~ito/Chinn-Ito_website.htm)

than in Europe, although it has increased over the past decade, especially in the ASEAN+3 and ASEAN+6 countries.<sup>7</sup> Foreign entry into banking is still heavily restricted in many Asian economies as well.

<sup>7</sup> ASEAN+6 = ASEAN+3 plus Australia, India, and New Zealand.

**Table 11.5: Intraregional Portfolio Investment in Asia Rising but Lagging Europe**

Share of Total Portfolio Investments, %				
Region	2001		2002	
	Assets	Liabilities	Assets	Liabilities
ASEAN	10.5	11.9	10.2	13.4
ASEAN+3	5.3	9.1	13.2	12.4
ASEAN+6	8.6	13.2	18.2	17.2
EU15	60.0	57.1	60.4	60.4
EU27	60.0	57.2	60.5	60.5

ASEAN = Brunei Darussalam, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam; ASEAN+3 = ASEAN plus the PRC, Japan, and the Republic of Korea; ASEAN+6 = ASEAN+3 plus Australia, India, and New Zealand; EU15 = Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom; EU27 = EU15 plus Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, and Slovenia.

Source: International Monetary Fund. Coordinated Portfolio Investment Survey. <http://cpis.imf.org/> (accessed 26 November 2013).

## 11.2.4 Institutional Quality

Finally, there are considerable differences between the EU in 1996 (the earliest year data are available) and Asia in 2012 in terms of institutional quality. Table 6 focuses on regulatory quality, based on the World Bank World Governance Indicators database. Not only is the average percentile ranking in Asia considerably lower than in the EU, the variance is also greater. Greece had the lowest ranking in the EU (71%) while Asia has seven countries below the 50th percentile, including an astonishing low level for Myanmar at 1.9%. This suggests the presence of a relatively greater potential for systemic risks in Asia, and hence a preference for less integrated financial markets.

## 11.2.5 Summary

Surprisingly, the average measures of economic and financial development for the EU in 1990 (or the earliest year when data are available) versus the ASEAN+6 economies in recent years are similar. However, this masks a much greater degree of diversity in the latter group, both in terms of income levels and financial development. Moreover, capital markets in Asia are still relatively closed compared with the level that prevailed in the EU in 1990, not to mention the fully open capital markets there today. This may partly reflect the substantially lower level of regulatory quality in Asia today than in Europe in the mid-1990s.

**Table 11.6: Regulatory Quality Considerably Lower in Asia than in the European Union**

EU15 Countries (1996)		ASEAN+6 (2012)	
Country	Percentile Ranking	Country	Percentile Ranking
Austria	95.1	Australia	97.1
Belgium	86.3	Brunei Darussalam	84.7
Denmark	98.5	Cambodia	39.2
Finland	93.1	PRC	43.5
France	78.9	India	34.0
Germany	91.2	Indonesia	43.1
Greece	71.1	Japan	83.7
Ireland	96.6	Republic of Korea	77.0
Italy	76.0	Lao PDR	22.0
Luxembourg	97.1	Malaysia	69.9
Netherlands	98.0	Myanmar	1.9
Portugal	89.7	New Zealand	96.2
Spain	84.8	Philippines	51.7
Sweden	90.2	Singapore	100.0
United Kingdom	99.5	Thailand	57.9
		Viet Nam	27.3
<b>Simple average</b>	<b>89.7</b>	<b>Simple average</b>	<b>58.1</b>
<b>GDP-weighted average</b>	<b>87.4</b>	<b>GDP-weighted average</b>	<b>62.0</b>
<b>Standard Deviation</b>	<b>8.8</b>	<b>Standard Deviation</b>	<b>29.9</b>

Ahe Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam) plus the PRC, Japan, the Republic of Korea, Australia, India, and New Zealand; EU15 = The 15 member states of the European Union (EU) as of 31 December 2003, before the new member states joined the EU (The 15 member states are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom); GDP = gross domestic product; Lao PDR = Lao People's Democratic Republic; N/A = not available; PRC = People's Republic of China.

Note: Since values for countries with data not available are likely to be small, the averages and standard deviation were calculated assuming zero values for those countries.

Sources: World Bank. Global Financial Development. <http://data.worldbank.org/data-catalog/global-financial-development>; CEIC Database <https://ceicdata.com>

Thus Asia needs a more modest and measured approach to financial surveillance and regulation compared with what has been seen in the EU over the past 2 decades.

Although the EU experience provides many valuable lessons for Asian financial integration, it should only be regarded as a comparison point, not a benchmark or a template. Nonetheless, Asia will inevitably experience progressive, but most likely gradual, capital account liberalization and consequent financial integration. Greater financial integration entails risks as well as benefits, particularly the easier transmission of financial shocks. This highlights the need over time for regional regulatory cooperation to help reduce such risks in Asia.

### 11.3 Experience from Regional Financial Cooperation and Regulation in the European Union

The EU provides by far the richest source of information and experience about regional finance sector policy. The EU has the tightest regional political, economic, and financial structure with the longest history, and also has faced some of the most difficult challenges as a result of the eurozone sovereign debt and banking sector crisis in recent years. Although financial integration in Asia is far less advanced than in Europe, Asian economies can still learn valuable lessons from the European experience. It is beyond the scope of this paper to give a detailed description of developments in the area of regional financial regulation in the European Union, especially following the global financial crisis of 2007–2009 and the eurozone sovereign debt and banking crisis that followed it.<sup>8</sup> This section briefly examines four aspects of European financial regulation: microprudential supervision, macroprudential supervision, resolution capacity and deposit insurance, and financial safety net for liquidity support.

The EU has created by far the most highly developed regional institutions for financial supervision, regulation, and resolution, and has achieved by far the highest regional financial integration and harmonization of rules, standards, procedures, etc. Nonetheless, it is still very much a work in progress. Significant differences in national practices and institutions remain, and have proven to be a substantial barrier to fully harmonizing financial regulations, tax systems, corporate law, and other systemic aspects.

The process of financial regulation in the EU comprises a large number of institutions, including the European Parliament; the EU

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<sup>8</sup> See Kawai and Morgan (2014) for a more detailed description.

Council; the European Commission/Directorate General Internal Market and Services, known as “DG MARKT”; the European System of Central Banks (ESCB), including the European Central Bank (ECB) and national central banks; the European System of Financial Supervision (ESFS), which includes the European Systemic Risk Board (ESRB) and the three European Supervisory Authorities (ESAs)—the European Banking Authority (EBA), the European Securities and Markets Authority (ESMA), and the European Insurance and Occupational Pensions Authority (EIOPA); plus national regulatory supervisors and national deposit insurance entities.

The eurozone crisis revealed a number of shortcomings in the previous architecture, as essentially national-level regulation could not cope with the high degree of financial integration in the region, and the “doom loop” mechanism could not be avoided. The decision to create a full-fledged banking union dramatically altered this situation, and should mark a major improvement.

Recent reforms strengthened the abilities of the EU institutions to adopt legislation that is binding on member countries, a shift generally signaled by reference to a “single rulebook” (De Larosière Report, European Commission 2009). However, member nations can introduce their own legislation as well, sometimes before relevant EU directives emerge. A notable example is financial regulation in the United Kingdom, which follows recommendations made by the Vickers Report (ICB 2011). As discussed below, special resolution regimes have been developed in an uncoordinated manner at the national level, e.g., Germany, the United Kingdom, Ireland, Belgium, and Sweden, although the resolution issue is now being addressed in a coordinated way.

**Microprudential regulation:** The establishment of the Single Supervisory Mechanism (SSM) in 2013 marked the formal assignment of EU-wide banking supervisory responsibility to the European Central Bank (ECB). In practice, the ECB focuses on systemically important banks, and national supervisors look after smaller banks. Along with it, the EBA was created to ensure regulatory balance between euro-member and non-euro-member states, while the ESMA and EIOPA look after securities companies and insurance companies, respectively. EU-wide stress tests were introduced under the SSM. Finally, Article 105.6 of the European Community Treaty provides the ability for member states to confer upon the ECB specific tasks in the domain of financial supervision if they wish.

**Macroprudential regulation:** EU-wide macroprudential regulation was introduced in 2011 with the creation of the ESRB. The ESRB has a mandate to study macroprudential, or systemwide, risks to stability. It is chaired by the President of the ECB, and members include the ECB,

national central banks, the three ESAs, one high-level representative per member state of the competent national supervisory authorities, the European Council, and the Economic and Financial Committee (EFC)—61 members in all (ESRB 2012a). The ESRB has a surveillance function but no binding powers. It can issue risk warnings that should prompt early responses to avoid a buildup of systemic problems and the risk of a future crisis, and it may also recommend specific actions to address any identified risks. The ESRB cannot impose measures on member states or national authorities, but can expect replies to its assessments. It also has the ability, along with the European Supervisory Agencies, to identify emergency situations, and has responsibility for coordinating its actions with those of international financial organizations, particularly the IMF and the FSB, as well as the relevant bodies in third countries on matters related to macroprudential oversight (ESRB 2012b).

**Resolution mechanisms and deposit insurance:** Another key element of the regional regulatory structure is the Single Resolution Mechanism (SRM), which became fully operational on 1 January 2016. The SRM implements the EU-wide Bank Recovery and Resolution Directive in the euro area. The full resolution powers of the Single Resolution Board also became effective as of 1 January 2016 (IP/14/2784) (European Commission 2016).

Deposit insurance in the EU is currently implemented only at the national level. While there have been waves of harmonization—for instance in 2009, a uniform minimum coverage of €100,000 was introduced—they still display significant national differences across the EU. As such, they are not well equipped to deal with the failure of cross-border banks within the EU. Moreover, deposit guarantee schemes are unfunded in many countries, which means that their fiscal position could be affected significantly by the failure of a large institution. On 24 November 2015, the European Commission proposed a European Deposit Insurance Scheme (European Commission 2015). The European Deposit Insurance Scheme would be phased in gradually, remaining in parallel with national schemes until perhaps 2024.

**Financial safety net:** The European financial safety net also evolved over time in response to the sovereign debt and banking crisis. In June 2010, the European Council created the European Financial Stability Facility (EFSF) by which euro member states provided a mainly credit-funded facility to lend to small countries that had lost access to capital markets. However, when the financial crisis contagion spilled over into large member states, especially Italy, the original EFSF bailout fund was insufficient. A more lasting solution to the crisis was found through the development of the “troika” financial safety net, comprising the EFSF (later called the European Stability Mechanism), the ECB, and the IMF.

The troika's first project was the bailout for Ireland in November 2011, followed by that for Portugal in May 2012, and the second Greek bailout in September 2012 (European Commission 2013). These measures finally stabilized the markets and allowed sovereign bond yields to decline substantially in the crisis countries.

The European Stability Mechanism (ESM) provides financial assistance to euro area member states experiencing or threatened by financing difficulties. It is funded by issuance of short- and long-term debt, and this issuance backed by paid-in capital of €80 billion. It closely cooperates with the IMF. The ESM can provide the following type of assistance to member states subject to appropriate conditionality: provide loans in the framework of a macroeconomic adjustment program; purchase debt in the primary and secondary debt markets; provide precautionary financial assistance in the form of credit lines; finance recapitalizations of financial institutions through loans to the governments of ESM members; and directly recapitalize financial institutions (ESM 2015).

## 11.4 Experience from Regional Financial Cooperation and Regulation in Asia

Regional financial cooperation and regulation in Asia is much less developed than in the EU, but some significant developments have emerged, including economic and financial surveillance, financial regulatory harmonization, regional financial safety net, and measures to support financial market development, mainly for local-currency bonds. This section describes these developments.

### 11.4.1 Economic and Financial Surveillance

A number of regional forums have emerged for the purposes of information exchange, economic monitoring, policy dialogue, and peer pressure for better policies. The ASEAN finance ministers established the ASEAN Surveillance Process in 1998. Its objective is to strengthen cooperation by (i) exchanging information and discussing economic and financial development of member states in the region; (ii) providing an early warning system and a peer review process to enhance macroeconomic and financial stability in the region; (iii) highlighting possible policy options and encouraging early unilateral or collective actions to prevent a crisis; and (iv) monitoring and discussing global economic and financial developments, which could have implications for



the region and propose possible regional and national level actions. The ASEAN Surveillance Process includes the ASEAN Finance Ministers Meeting and the ASEAN Select Committee, comprising the members of the ASEAN Senior Finance Officials Meeting and the ASEAN Central Bank Forum (IIMA 2005).

The ASEAN+3 Finance Ministers Meeting process has the Economic Review and Policy Dialogue (ERPD), which meets once a year mainly to discuss macroeconomic and financial issues in East Asia. Starting in 2012, the members' central bank governors joined this forum, which consequently has been renamed the ASEAN+3 Finance Ministers and Central Bank Governors' Meeting. The ERPD receives inputs from the Asian Development Bank (ADB). In addition, the ASEAN+3 finance deputies meet twice a year. Other meetings of Asian finance ministers include the Asia–Pacific Economic Cooperation and the Asia–Europe Meeting. The policy dialogue and surveillance process among ASEAN+3 members is in transition from the “information sharing” stage to the “peer review and peer pressure” stage, while the “due diligence” process has yet to start in a serious manner (Kawai and Houser 2008).

Another key forum is the Executives' Meeting of East Asia–Pacific Central Banks (EMEAP), a cooperative group of central banks and monetary authorities in the East Asia and Pacific region.<sup>9</sup> Its primary objective is to strengthen the cooperative relationship among its members. The EMEAP has activities at three levels: Governors' Meetings, Deputies' Meetings, and working groups. Another organization is the South East Asian Central Banks (SEACEN) Research and Training Centre in Kuala Lumpur, Malaysia, which now has 20 central banks as members.<sup>10</sup> As part of it, the SEACEN Expert Group on Capital Flows was established by the SEACEN Centre in May 2000, in response to the need to manage capital flows to ensure stability in regional financial markets. In addition to the 19 SEACEN central bank members, it includes as observers the Reserve Bank of Australia, the Hong Kong Monetary Authority, and Bank of Japan (IIMA 2005).

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<sup>9</sup> It comprises the central banks of 11 economies: Reserve Bank of Australia, People's Bank of China, Hong Kong Monetary Authority, Bank Indonesia, Bank of Japan, the Bank of Korea, Bank Negara Malaysia, Reserve Bank of New Zealand, Bangko Sentral ng Pilipinas, Monetary Authority of Singapore, and Bank of Thailand (IIMA 2005).

<sup>10</sup> These include Autoriti Monetari Brunei Darussalam; National Bank of Cambodia; People's Bank of China; Reserve Bank of Fiji; Reserve Bank of India; Bank Indonesia; Bank of Korea; Bank of the Lao PDR; Bank Negara Malaysia; Bank of Mongolia; Central Bank of Myanmar; Hong Kong Monetary Authority, Nepal Rastra Bank; Bank of Papua New Guinea; Bangko Sentral ng Pilipinas; Monetary Authority of Singapore; Central Bank of Sri Lanka; Central Bank, Taipei, China; Bank of Thailand; and State Bank of Viet Nam.

Finally, the ASEAN+3 Macroeconomic Research Office (AMRO) was established in 2011 in Singapore as the surveillance arm of the Chiang Mai Initiative Multilateralization (CMIM). Its staff resources are still small but growing—about 30 economists currently—but it has been tasked with conducting full-fledged surveillance of the ASEAN+3 member countries. This distinguishes it from the other forums described above, which do not have their own full-time staff. It is expected that AMRO will grow over time in terms of staff strength and will become an international organization, although it will be a long time before it can achieve a size and depth commensurate with that of the IMF. AMRO was officially designated as an international organization in February 2016.

## 11.4.2 Financial Regulatory Harmonization and Development

### Financial Regulatory Harmonization

The ASEAN Economic Community (AEC) is the most advanced regional framework for financial regulatory harmonization in Asia. The AEC project is summarized in the AEC blueprint, ratified by ASEAN leaders in 2007 (ASEAN Secretariat 2008). The ambitious target of the AEC is to create its Economic Community by 2015 as a region with free movement of goods, services, investment, skilled labor, and “freer” flow of capital. The broad aims of the project are both to enjoy the scale economies of a unified market and to reduce the development gap among its member countries. To be sure, the blueprint recognizes in practice that some countries will progress faster than others, and liberalization will be done on a voluntary basis, which it characterizes as the “ASEAN minus X” formula. This is a necessary aspect of the voluntary nature of ASEAN cooperation. Regarding the finance services sector, the blueprint aims for a first round of liberalization by 2015, with other subsectors or modes being liberalized by 2020 (ASEAN Secretariat 2008).

The first round of the AEC was implemented in 2015, although the degree of progress of implementation varied by country depending on the stage of financial and economic development. Recognizing that regional economic integration is an ongoing process, ASEAN has been developing the AEC Blueprint 2025 to promote the creation of a networked, competitive, innovative, and highly integrated and contestable ASEAN (ASEAN 2015). The finance sector integration vision for 2025 encompasses three strategic objectives: financial integration, financial inclusion, and financial stability, and three crosscutting areas

(Capital Account Liberalization, Payment and Settlement Systems, and Capacity Building) (ASEAN Secretariat 2015).

Important components of the AEC include the ASEAN Framework Agreement on Services (AFAS), the ASEAN Trade in Services Agreement as the legal instrument for further integration of services sectors in the region, the ASEAN Banking Integration Framework (ABIF), the ASEAN Insurance Integration Framework (AIIF) and the ASEAN Capital Market Infrastructure (ACMI) blueprint. The aims of the AFAS are to (i) enhance cooperation in services among member states in order to improve the efficiency and competitiveness, and to diversify production capacity and services supply and distribution by their services providers within and outside ASEAN, (ii) eliminate substantially restrictions to trade in services among member states, and (iii) liberalize trade in services by expanding the depth and scope of liberalization beyond those undertaken by member states under the GATS with the aim of realizing a free trade area in services (ASEAN Secretariat 1995: 1).

The aim of the ABIF is to achieve a more integrated banking market, by allowing any two ASEAN economies to enter into reciprocal agreements to provide Qualified ASEAN Banks with greater market access, and operational flexibilities consistent with those of domestic banks in the respective host countries (ASEAN Secretariat and World Bank 2015). The ABIF scheme has two major objectives: (i) to foster a deeper and more efficient (lower cost) banking market, and (ii) to develop strong regional banks that can compete with global banks. The ABIF guidelines were approved by the ASEAN Central Bank Governors' Meeting in December 2014, and the provision for enabling Qualified ASEAN Banks implementation was signed by ASEAN finance ministers in March 2015, as part of the Protocol to implement the 6th Package of Financial Services under the AFAS.

Deeper regional banking integration also requires a commitment to greater cooperation in surveillance and regulation. These range from prudential regulation in financial and professional services to pro-competitive regulation in telecommunication and transport services. In these areas too, there is scope for regional coordination and cooperation, to reap economies of scale in regulation and to prevent the fragmentation of the regional market because of divergent national regulation (ASEAN Secretariat and World Bank 2015).

The aim of the AIIF is to promote deeper penetration in insurance markets, with greater risk diversification, deeper underwriting capacity, improved and strengthened insurance sector supervision and regulatory frameworks (ASEAN Secretariat 2015).

The aim of the ACMI is to further deepen and interlink capital markets by progressing toward more connectivity in clearing,

settlement, and custody linkages to facilitate investment in the region, and allowing investors and issuers to tap cross-border ASEAN capital markets efficiently (ASEAN Secretariat 2015).

More broadly, the ASEAN capital market integration program aims at developing a unified pan-ASEAN market for financial services and capital flows under the ASEAN Capital Markets Forum (ACMF).<sup>11</sup> In order to strengthen ASEAN capital market development and integration, the blueprint calls for the following actions (ASEAN Secretariat 2008: 17):

- Achieve greater harmonization in capital market standards in ASEAN in the areas of offering rules for debt securities, disclosure requirements, and distribution rules;
- Facilitate mutual recognition arrangement or agreement for the cross recognition of qualification and education and experience of market professionals;
- Achieve greater flexibility in language and governing law requirements for securities issuance;
- Enhance withholding tax structure, where possible, to promote the broadening of the investor base in ASEAN debt issuance; and
- Facilitate market-driven efforts to establish exchange and debt market linkages, including cross-border capital-raising activities.

It further notes that the liberalization of capital movements is to be guided by the following principles: (i) promoting an orderly capital account liberalization consistent with member countries' national agenda and readiness of the economy; (ii) allowing adequate safeguards against potential macroeconomic instability and systemic risk that may arise from the liberalization process, including the right to adopt necessary measures to ensure macroeconomic stability; and (iii) ensuring the benefits of liberalization are shared by all ASEAN countries (ASEAN Secretariat 2008: 17).

An overall assessment of the achievements of the AEC is difficult to make, as many country scorecards have not yet been released publicly. Clearly, progress has been slower than desired. One recent development is that the ACMF devised the ASEAN and Plus Standards Scheme, a framework for information disclosure standards that apply to

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<sup>11</sup> Established in 2004 under the auspices of the ASEAN Finance Ministers, the ACMF focuses on strategic issues to achieve greater integration of the region's capital markets under the AEC Blueprint 2015. Members include the relevant capital market supervisory agencies in ASEAN member countries.

regional cross-border securities issuance (equities and bonds). ASEAN Standards are common to all ASEAN member countries and conform to International Organization of Securities Commissions (IOSCO) international standards, and the associated accounting and auditing standards are identical with international standards. On the other hand, the Plus Standards are an additional set of standards necessitated by the accepted practices, laws, and regulations of individual countries. In June 2009, securities market regulators in Malaysia, Singapore, and Thailand announced their decision to adopt this framework. Other countries are planning to join the framework, but have not yet specified any dates (The 21st Century Public Policy Institute 2011).

Harmonization in the EU was driven to a large extent by market liberalization and adoption of international standards (Posner and Veron 2010), but, in the current environment and taking into account the diverse levels of economic and financial development within the region, this force is weaker in ASEAN. Nonetheless, given the essentially voluntary nature of ASEAN cooperation, strong peer pressure is needed to produce more effective results.

## Financial Development

Unlike the case of the EU, which has relatively mature financial markets, financial development remains an important objective in Asia. Banks have been the workhorse of the Asian economic growth model, partly because they could be influenced by policy makers to lend in line with development policy objectives, and partly because they could develop long-term relationships with borrowers and thereby exercise effective oversight. However, the Asian financial crisis of 1997–1998 highlighted problems of inadequate bank governance and regulation, as well as risks related to currency and maturity mismatches. This led to recognition of the need to develop regional local currency bond markets as a “spare tire” for financing during times of crisis. Numerous initiatives have been undertaken to promote bond market development, including the Asian Bond Markets Initiative (ABMI) and Asian Bond Funds (ABF), but further work needs to be done in this area for Asian bond markets to achieve their potential, particularly with regard to corporate bonds.

One major element of the ABMI was the establishment of the AsianBondsOnline website in 2004, which is supported by ADB. It provides the latest information about Asian bond markets in the region, which are also published in the *Asia Bond Monitor*. To facilitate the demand for local currency bonds, the Credit Guarantee and Investment Facility (CGIF) was set up in May 2010 as a trust fund of ADB with an initial capital of \$700 million (ADB contributes \$130 million as paid-in

capital). The main function of the CGIF is to provide credit enhancement to allow the region's marginal issuers to issue local currency bonds and larger issuers to issue across national border by overcoming the sovereign credit ceiling. The ASEAN+3 Bond Market Forum (ABMF) was established in 2010 to provide a common platform to foster standardization of market practices and harmonization of regulations relating to cross-border bond transactions in the region and produce stock-taking reports on the ASEAN+3 bond markets.

The ABF was initiated by EMEAP to strengthen the demand side for Asian local currency bond funds. The ABF-1 was established in June 2003 with a total size of \$1 billion. It invests in sovereign and quasi-sovereign US dollar bonds issued by eight members (excluding Japan, Australia, and New Zealand). However, more relevant for local currency bonds was the ABF-2, launched in December 2004 with a total size of \$2 billion. It includes the Pan Asia Bond Index Fund (PAIF), a single bond fund index investing in sovereign and quasi-sovereign local currency bonds issued by eight members and a Fund of Bond Funds with eight country sub-funds. It is open to investment by the public, and local currency exchange-traded bond funds listed in Hong Kong, China; Malaysia; and Singapore.

### 11.4.3 Financial Safety Net

Following dissatisfaction with the role played by the IMF during the Asian financial crisis of 1997–1998, a regional cooperative financing arrangement to supplement IMF resources was agreed in May 2000 at the ASEAN+3 Finance Ministers' Meeting in Chiang Mai, which was referred to as the “Chiang Mai Initiative.” It initially took the form of bilateral currency swap agreements, but in May 2007 the member countries agreed to convert the bilateral schemes of the CMI into a multilateralized self-managed reserve pooling scheme governed by a single contractual agreement, or the Chiang Mai Initiative Multilateralization (CMIM). The size of the agreement was set at \$120 billion, and the amount of the allocation that would be withdrawn without triggering an IMF program was raised from 10% to 20% (so-called “IMF conditionality” or “IMF linkage”) (Sussangkarn 2010). As mentioned above, the AMRO was established in May 2011 to provide surveillance capability within the region.

However, the CMI (and later CMIM) were never used, even during the global financial crisis of 2007–2009. The link to IMF conditionality was one problem,<sup>12</sup> due to the “IMF stigma” in the region, but the process

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<sup>12</sup> Previously, members needed to have an IMF program to be able to tap more than 20% of their borrowing quota. This was raised to 30% in May 2012. In view of the

for releasing funds was also considered cumbersome and untested. The CMI (or CMIM) needed various other improvements to make it more effective as well. First, the CMI (or CMIM) borrowing quota was not likely to be enough if more than one country got into serious problems. Second, instead of just borrowing from the CMI (or CMIM), countries could arrange bilateral currency swap facilities with CMI (or CMIM) members or other authorities—such as Australia and New Zealand. Finally, the AMRO needed to have sufficient resources and staffing to support the capabilities of an Asian monetary fund (Sussangkarn 2010).

To address these issues, the ASEAN+3 finance ministers and central bank governors announced a number of reforms in May 2012, including: doubling the CMIM resources to \$240 billion; increasing the IMF-de-linked portion to 30% with a view to increasing it to 40% in 2014; lengthening the maturity and supporting period for the IMF-linked portion from 90 days to 1 year and from 2 years to 3 years, respectively; lengthening the maturity and supporting period of the IMF-de-linked portion from 90 days to 6 months and from 1 year to 2 years, respectively; and introducing a crisis prevention facility called CMIM Precautionary Line (CMIM-PL) (ASEAN Secretariat 2012). The last facility would correspond to the Flexible Credit Line and Precautionary Credit Line facilities of the IMF. These improvements should enable the CMIM to move closer to becoming a full-fledged Asian monetary fund. However, progress has been slower than expected. For example, the de-linked portion remains at 30%. The recent statement by the ASEAN+3 finance ministers and central bank governors noted that the qualification indicators for the precautionary credit facilities should be linked with the ERP matrix (JMof 2016).

## 11.5 Challenges for Regulatory Cooperation in Asia and Policy Recommendations

This section discusses challenges for cooperation in financial regulation in Asia, highlights the differences between regional regulatory approaches in the EU and ASEAN, and describes some of the challenges in extending the ASEAN model to the rest of Asia. It then describes policy recommendations for strengthening regional financial regulation in Asia.

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negative perception of the IMF that developed during and after the Asian financial crisis, going to the IMF has become anathema in much of Asia since then.

### 11.5.1 Cooperation Challenges in Asia

Asia has no overarching political structure comparable to the EU, and there is little willingness in the region to concede national sovereignty in these areas. The AEC provides a possible model for wider Asian cooperation, but progress even within ASEAN has been slow, and institutions weak. Barriers to stronger regionalization of political and economic institutions in Asia include the lack of an overall agreement on the definition of “Asian” membership; great diversity in terms of economic and financial development, financial and economic systems, institutional quality, capital account openness, and regulatory regimes; weak and underdeveloped current regional institutions, with no legal authority; and the voluntary nature of cooperation even within ASEAN.

The weaker structure of regional institutions and greater diversity in financial development and capital market openness in ASEAN (and even more so in ASEAN+6 as a whole) require a different approach than in the EU. The EU approach in principle has been to fully harmonize laws and regulations, mainly in accordance with international standards, while only small, unharmonized parts are addressed through mutual recognition, and it has completely liberalized controls on cross-border capital transactions. In contrast, ASEAN is aiming for general harmonization, coupled with mutual recognition given for complementary purposes. It aims to attain increased levels of capital flows within the region, but stops well short of calling for complete deregulation of capital flows. This difference points to a key role for mutual recognition in the financial integration process in ASEAN, as discussed in greater detail above.

Within ASEAN, perhaps the first challenge is to promote financial development in those countries that are lagging behind, mainly the “CLMV” countries (Cambodia, the Lao People’s Democratic Republic, Myanmar, and Viet Nam). Only stronger convergence within the region can set the stage for achieving the targets of financial openness and regulatory harmonization laid out in the AEC as described in Section 11.3. Until such convergence is achieved, ASEAN member countries will need to pursue a multi-track approach, with those countries that have achieved the relevant milestones of financial development committing to further steps of financial opening. Along with this, ASEAN economies need to strengthen institutions for regional cooperation to promote regional harmonization of regulations, taxation, etc., using the ASEAN finance ministers’ and central bank governors’ surveillance process (ERPD) as the starting point. This is particularly important in view of the great divergence of regulatory performance and capacity within the region. One beneficial step would be to include financial regulators and



deposit insurance corporations in at least some deliberations so that the monitoring of regional financial stability could be strengthened.

Institutions for regulatory cooperation need to be strengthened at the level of the ASEAN+3 countries as well. One challenge is to strengthen the CMIM and the AMRO to fulfill their functions as a regional financial safety net and surveillance unit, respectively. Monitoring and exchanging information about potential economic imbalances and volatile capital flows can reduce the threat to economic and financial stability presented by them.

### 11.5.2 Recommendations for Regional Financial Regulation in Asia—Improving the ASEAN Economic Community Process

The AEC process can be improved through promoting mutual recognition, increasing regulatory harmonization, and enhancing cross-border supervisory cooperation via memorandums of understanding (MOUs). Recommended steps to promote mutual recognition include the following:

- Ensuring conformity to IOSCO principles to the extent possible, including expanding the scope of the ASEAN and Plus Standards Scheme;
- Expanding mutual recognition to the maximum extent possible by preserving domestic market soundness while securing investor protection and ensuring proper management of systemic risk; and
- Strengthening cooperation and information exchange among different regulatory authorities.

Mutual fund passporting is one example of an area that could benefit substantially from mutual recognition.

Major ways to increase regulatory harmonization are as follows:

- Standardizing and integrating direct market infrastructures (trading platforms, clearing/settlement systems);
- Harmonizing indirect infrastructures (laws and regulations, credit rating agencies, accounting/auditing standards, tax systems); and
- Harmonizing foreign exchange regulations.

Studies have identified tax withholding rules as one major hurdle to participation in regional bond markets by international investors (The 21st Century Public Policy Institute 2011).

Enhancing cross-border supervisory cooperation via MOUs has the potential to improve the effectiveness of monitoring globally or regionally systemically important financial institutions (SIFIs), although experience shows that MOUs can be relatively weak reeds, especially in a crisis. The AMRO has already begun regional monitoring, but this effort needs to involve national supervisory bodies as well. One key problem is dealing with global SIFIs whose headquarters are outside the region. In this case, supervisory colleges with a global reach are the appropriate institutions, but they could still prove problematic if home country authorities are distant from Asia—such as in the US and Europe—and not knowledgeable about conditions there. In that case, requiring Asian branches of such institutions to become subsidiaries may be a desirable option. However, the pros and cons of requiring Asian branches of such institutions to become subsidiaries would need to be carefully assessed, both in terms of financial stability and the costs and impacts such ring-fencing would entail for cross-border capital allocation.

### **Next Steps for ERPD, CMIM, and AMRO**

The ERPD so far has been mostly a forum for discussion. The policy dialogue among the finance ministers and central bank governors needs to be strengthened. The inclusion of the central bank governors in the ASEAN+3 finance ministers annual meeting in 2012 was a positive first step. Important further steps include developing a “peer review” methodology and practice; and regularly monitoring of capital flows and exchange rate movements.

As mentioned above, a number of steps were taken over the past several years to significantly strengthen the CMIM, including doubling the size of its resources, increasing the portion of the quota that can be tapped without an IMF program, and introducing precautionary lending instruments. The size of the facility that each member can borrow should be further enlarged either through an additional increase in the total resources or a change in the formula to define the maximum amount each member economy can borrow. The ASEAN+3 authorities should also consider extending CMIM membership to Australia, New Zealand, and India, and encourage the development of a financial safety net in South Asia as well. In the future, the CMIM should aim to reduce its link with IMF over time, ultimately to zero, by providing sufficient resources for AMRO and improving its surveillance capacity. It also needs to operationalize its financial safety net functions, which have not yet been tested. At the same time, it needs to develop a framework for cooperation with the IMF in the event that a widespread systemic

shock occurs involving multiple countries. With these, a de facto Asian monetary fund will have emerged.

## Creating an Asian Financial Stability Dialogue

To make substantial progress in improving regional financial stability, there needs to be a suitable driving force. Plummer (2010), Kawai (2011), and others support the idea of an Asian financial stability dialogue (AFSD), which was first suggested by Kuroda (2008). The AFSD would provide a forum for broader information sharing in the areas of macroeconomic and financial stability, including financial regulators and deposit insurance corporations, as well as finance ministries and central banks. The AFSD could discuss regional financial vulnerabilities, regional capital flows, common issues for finance sector supervision and regulation, and common efforts at financial integration.

There is currently an Asian regional forum led by the Bank for International Settlements (BIS), but such a forum should be led by Asian countries (in the form of an AFSD), and they may invite the BIS to participate. This entity could build on existing institutions in the region, including the ERPD and the EMEAP. The body should include the participation of finance ministries, central banks, financial market regulators and supervisors, and deposit insurance corporations, i.e., a wider scope than that of the ERPD, which focuses on macroeconomic policy issues. Its objective would be to monitor factors affecting regional financial stability, including national financial market conditions and capital flows, and to induce appropriate policy actions including macroprudential policy and coordination of capital flow management.

For example, policy spillovers (e.g., cross-border effects of blanket guarantees of deposit insurance, capital control measures, or adoption of macroprudential policies) are likely to have side effects on capital flows that could be destabilizing for other economies in the region, and call for concerted action at the regional level. Table 11.7 shows recent capital control measures introduced in Asian economies. The AFSD could identify regional SIFIs and discuss how the national authorities in the region can improve cross-border supervision over them. It could also provide a regional counterpart to the FSB, an element of regional institutional architecture that is currently missing. In particular, the AFSD could liaise with the FSB for Asia's non-FSB member countries.<sup>13</sup>

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<sup>13</sup> To be sure, the FSB established in 2011 the Regional Consultative Group for Asia (and similar groups in other regions) with the specific intention of communicating with non-FSB-member countries in Asia (FSB 2012). However, it still seems likely that an

**Table 11.7: Recent Measures Affecting Capital Inflows in Asia**

<b>Outright prohibitions on funds transfer and payments</b>	
Taipei,China	2009: Prohibited use of time deposits by foreign funds. 2010: One-week deadline for money to be invested or repatriated. 2010: Measures to curb trading in foreign currency.
<b>Explicit quantitative limits or approval procedures</b>	
PRC	2002: QFII introduced. 2006: QDII limits introduced. 2011: Limits on Hong Kong, China's banks' net open positions and ability to access yuan through mainland foreign exchange market; also RQFII limits introduced.
India	2013: Cut maximum outward direct investment by companies and individuals to 100% of net worth.
Republic of Korea	2010: Limits on FX derivative contracts on domestic banks (50% of capital) and foreign banks (250%). 2011: Limits on FX derivative contracts on domestic banks (40% of capital) and foreign banks (200%). 2012: Limits on FX derivative contracts on domestic banks (30% of capital) and foreign banks (150%).
<b>Explicit taxes on cross-border flows (Tobin tax)</b>	
Indonesia	2010: One-month holding period on SBLs (central bank notes).
Republic of Korea	2011: Withholding tax on treasury and monetary stabilization bonds.
Thailand	2010: 15% withholding tax on capital gains and interest income on foreign bonds.
<b>Compulsory reserve or deposit requirements (URR)</b>	
Thailand	2006: Unremunerated reserve requirements (30%) on loans, bonds, mutual funds, swaps, and non-resident baht accounts (abolished 2008).

FX = foreign exchange, PRC = People's Republic of China, QFII = qualified foreign institutional investors, QDII = qualified domestic institutional investors, RQFII = PRC renminbi QFII, SBLs = central bank notes, URR = unremunerated reserve requirement.

Sources: Central bank reports and other reports.

In the early stages, such an arrangement could focus on issues that would help advance the areas of common interest that have already been identified and that are largely being dealt with under separate initiatives, such as the management of volatile short-term capital flows. Plummer

AFSD would have greater ownership by Asian members and could speak for them with more authority.

(2010) sees it initially focusing on improving early warning systems, being able to assist in negotiations on common exchange rate changes, and, perhaps, helping in crisis management. The principal question is how far an AFSD might proceed beyond simply monitoring, diagnosing potential threats, and suggesting remedies. One of the problems revealed in the run-up to the global financial crisis is that some organizations, particularly the BIS, did diagnose various sources of fragility, but had no powers to act upon them.

To maximize its effectiveness, the AFSD should complement and coordinate with existing regional entities, including the ERPD, EMEAP, and AMRO. For example, the AMRO and ERPD could focus mainly on macroeconomic policies and surveillance, so the AFSD could focus more on financial stability issues. Since not all Asian economies are members of the FSB or the Basel Committee on Banking Supervision, the AFSD could help to consolidate the viewpoints of Asian economies so they could be delivered in global forums such as the FSB and the BIS. One question is whether the AFSD would have its own secretariat, or would be dependent on other institutions such as the AMRO for macroeconomic and finance sector surveillance.

## 11.6 Conclusions

An increasingly financially integrated Asia will need more intensive financial cooperation, including greater efforts to harmonize and coordinate financial supervision and regulation. In particular, greater financial openness increases the potential vulnerability of Asian economies to the vicissitudes of volatile capital flows, underlining the needs for regional efforts to improve financial stability. Increased economic integration as a result of trade liberalization and the development of supply chain networks has also increased the value of policy coordination, including stabilizing intraregional exchange rates. Finally, a gap has opened up between national regulation efforts and global regulatory cooperation centered on the G20, the IMF, and the FSB, especially for non-G20 economies. Establishing a regional regulatory architecture can help to fill that gap.

The EU represents the most advanced stage of regional financial integration and regulation in the world today, and can provide valuable lessons for Asia, although it is by no means a benchmark or a template. The eurozone sovereign debt and banking sector crisis has highlighted many weaknesses in the EU regional architecture that need to be addressed. Fundamentally, the largely national-level regulatory structure was ill-equipped to deal with the high level of financial integration in the

EU. Supervisory colleges based on voluntary MOUs have proved to be weak reeds, and tended to be supplanted by ad hoc arrangements in an emergency. EU-wide supervisory institutions have been strengthened recently, but their new powers are largely untested, and most power still rests with national-level supervisors. Regulatory harmonization has made great progress, but continued national variations make full harmonization elusive. Regimes for resolution and deposit insurance in particular remain unharmonized.

In response to these perceived inadequacies, the EU has committed itself to shifting financial regulation from the national to the regional level by establishing a banking union. This region-wide regulatory framework includes the Single Supervisory Mechanism headed by the ECB (launched in 2013), the European Systemic Risk Board (2011), the Single Resolution Mechanism (2016), a unified deposit insurance structure (not yet implemented), and the financial safety net—the European Stability Mechanism (2011). These measures will have to be supported by fiscal union and greater political union as well. This means that the implications of the single market and the single currency are at last being followed to their necessary conclusions. Without these developments, there can be no lasting solution to the eurozone sovereign debt and banking sector crisis.

Asia has not reached the EU's stage of having regional political and legal institutions and integrated financial markets, let alone a single currency, so it is not feasible or necessary to emulate EU-wide policy arrangements at this stage. Despite rather high average levels of financial development, levels of economic and financial development, financial openness and institutional regulatory capacity vary much more widely in Asia than in the EU. Moreover, while harmonization in the EU was driven to a large extent by market liberalization and adoption of international standards, this force is weaker in ASEAN, reflecting both the current economic environment and varying levels of economic and financial development within the region.

Despite its shortcomings and slow pace, the ASEAN Economic Community process probably provides the most feasible and relevant model for regulatory cooperation on a voluntary basis. It would be desirable to extend this framework further within Asia, say to the ASEAN+3 countries for a start. This approach will require a greater tolerance for different timetables of liberalization and harmonization. Only those member countries that have achieved the requisite development milestones should move on to higher stages of integration and regulatory harmonization. The AEC can be strengthened further by taking steps to implement best practice regulation, promote mutual recognition in areas such as fund management, harmonize market

infrastructure, and promote cross-border supervisory MOUs. Use and publication of country “scorecards” should be increased to incentivize harmonization efforts.

Even within this less ambitious framework, Asian economies can strengthen regional financial cooperation in various ways. They can strengthen the ERPD by giving greater teeth to the surveillance process. They can enhance and diversify the resources, functions and membership of the CMIM and AMRO for surveillance and provision of a financial safety net, which may eventually develop into an Asian monetary fund. They can create an AFSD to monitor regional financial markets, facilitate policy dialogue and cooperation, and secure regional financial stability. These regional regulatory institutions can also strengthen ties with their respective global institutions, primarily the IMF and the FSB.

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# 12

## Reforms to the European Union Financial Supervisory and Regulatory Architecture and their Implications for Asia

*Zsolt Darvas, Dirk Schoenmaker, and Nicolas Véron*

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### 12.1 Introduction

European Union (EU) countries offer a unique experience of integration among sovereign nations, including regulatory and institutional integration of financial services. Driven by the desire to bring peace, security, stability, prosperity, and cohesion for their citizens after two devastating world wars, a growing number of European countries decided to pool sovereignty to an increasing extent. Starting with the 1952 establishment of the European Coal and Steel Community by six founding members, various policy areas were integrated throughout the subsequent decades, leading to the current European Union with 28 members.<sup>1</sup> A major step in the process was monetary integration with the introduction of a common currency, the euro, in 11 countries in 1999, with 8 additional countries joining between 2001 and 2015.

Financial integration of European economies started with growing trade integration, various financial regulatory initiatives from the late 1970s and the scrapping of capital controls by participating European nations from the late 1980s. While financial integration made progress, financial supervisory and regulatory institutions remained national,

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<sup>1</sup> Although the UK voted to leave the EU on 23 June 2016, Brexit has not happened yet. The eventual financial supervisory and regulatory cooperation between the UK and the EU after Brexit is not known and therefore we do not analyze Brexit-related issues in this chapter.

with limited efforts to cooperate and share information. Even monetary unification in 1999 was not accompanied by the establishment of supranational institutions for financial supervision and resolution, even though there was a clear logic for it (Folkerts-Landau and Garber 1992; Schoenmaker 1997).

While robust financial supervisory integration did not appear politically feasible in economically good times, the euro-area crisis that intensified after the great financial crisis of 2007–2009 made such a move the most palatable option to preserve the integrity of the euro area and to restore financial stability. There were deeper roots to the euro-area crisis, which, most likely, would have materialized even without the turmoil that came from the United States (US) subprime market (Darvas 2012). But the transatlantic financial disruption of 2007–2009 created an uncertain global environment, weakened all European economies (even those that had comparatively sustainable economic models) and led to an acute financial and sovereign crisis in the euro area. While some institutional developments for improved cross-border supervision of financial services in the EU as a whole were decided in 2009 (shortly after the collapse of Lehman Brothers in 2008), and implemented in 2011, the biggest institutional development was the establishment of the European banking union for euro-area countries (Véron 2015). Euro-area heads of state and government decided at a summit on 28–29 June 2012 to establish the banking union, at the height of the euro-area crisis. The banking union created a truly supranational arrangement for banking supervision, centered on the European Central Bank, which in November 2014 officially assumed supervisory authority over all banks in the euro area, with operational delegation to national authorities for the supervision of smaller banks. This centralization of bank supervision was followed by new arrangements for bank resolution, which have been mostly in place since January 2016. Additionally, a euro-area-wide common deposit insurance system is currently under discussion. A number of other initiatives for the financial sector are also being considered, under the umbrella framework known as Capital Markets Union, even though current Capital Markets Union reforms do not involve changes to the financial architecture (Véron 2016) and therefore are not described in any depth in this chapter.

The goal of this chapter is to review recent developments in the EU's financial supervisory and regulatory architecture, to assess its strengths and weaknesses, to draw lessons for regional financial regulatory architecture in Asia, and to highlight ways in which Asian financial regulatory and supervisory cooperation could be strengthened and improved. While the focus of the paper is on the EU's financial

supervisory and regulatory architecture, this must be put into the broader context of various regulatory initiatives that are intended to make European financial institutions and markets more stable, resilient, and supportive of economic development.

Section 12.2 reviews precrisis European financial regulatory initiatives and the resulting institutional architecture. Section 12.3 analyzes recent developments in the EU's financial supervisory and regulatory architecture, and also identifies the strengths and weaknesses of the current financial architecture and assesses proposed changes to it. Section 12.4 compares financial integration in Asia and in Europe, and highlights relevant implications for regional financial regulatory and supervisory cooperation. Finally, Section 12.5 identifies selected lessons from the EU developments for the regional financial regulatory and supervisory architecture in Asia, and gives recommendations on how Asian financial regulatory and supervisory cooperation could be strengthened and improved.

## 12.2 The Precrisis Financial Landscape in Europe

### 12.2.1 Early Financial Regulatory Milestones

A number of prominent European-level financial services laws have shaped the financial landscape in Europe:<sup>2</sup>

- (i) The First Banking Directive (77/780/EEC, December 1977) provided a single definition of credit institutions and outlined principles of nondiscrimination to enable establishment of cross-border branches.
- (ii) The Second Banking Directive (89/646/EEC, December 1989) harmonized bank authorization rules, stipulated capital requirements, and allowed banks licensed in an EU country to lend through branches throughout the EU that would be subject to home-country authority for most purposes (exceptions cover liquidity regulation and oversight, monetary policy, and reporting requirements).
- (iii) The Investment Services Directive (93/22/EEC, May 1993) introduced a “European passport” (dismantling existing legislative barriers to cross-border activity), harmonized

<sup>2</sup> See Rodriguez (1994) for more details on the first three items. See OEE Etudes (2009) for details on the fourth item, the Financial Services Action Plan.

capital requirements for investment banking firms, and included specific provisions for stock exchanges and other regulated markets.

(iv) The Financial Services Action Plan (communication from the Commission COM (1999) 232, May 1999) was a comprehensive reform program that led to, among other initiatives:

- A. The Regulation on international accounting standards (EC 1606/2002, July 2002), which paved the way for adoption and implementation of International Financial Reporting Standards in the EU;
- B. The Markets in Financial Instruments Directive, known as MiFID (2004/39/EC, April 2004), which built on the 1993 Investment Services Directive to establish the legal basis for EU-wide competition between trading platforms and replaced the former national stock exchange monopolies;
- C. The first Capital Requirements Directive (CRD) (two separate texts, 2006/48/EC and 2006/49/EC, June 2006), transposing the Basel 2 accord of 2004 into European legislation;
- D. The Solvency 2 Directive (2009/138/EC, November 2009)—but started long before the start of the global financial crisis), creating a comparable regulatory framework for insurance and reinsurance companies.

### 12.2.2 The Lamfalussy Financial Regulatory and Supervisory Architecture

While financial supervision remained exclusively national while the above-listed efforts at financial regulatory harmonization were being implemented, some efforts were made to improve coordination among national supervisory authorities. In 2001, a high-level group headed by former central banker Alexandre Lamfalussy delivered a report (European Commission 2001) that provided the basis for the so-called “Lamfalussy process,” implemented in 2001 for securities and markets regulation and in 2004 for banking and insurance supervision. The goals were to adapt financial regulation to allow a higher level of financial integration and to adapt it to market developments. The Council of the European Union (or Council)<sup>3</sup> agreed on the need to provide convergent

<sup>3</sup> The Council of the European Union (Council for short) is composed of the relevant ministers of EU member states—finance ministers in the case of financial regulatory

regulation and supervision standards. This framework involved four levels of decision making:<sup>4</sup>

1. Level 1: Principles-based legislation, setting broad legislative principles, and addressing the issues that are to be decided by the European Parliament<sup>5</sup> and the Council under the EU legislative procedure known as co-decision (“ordinary legislative procedure”).
2. Level 2: Implementing legislation, in the form of technical implementing measures that should be aimed at ensuring a high degree of harmonization and flexibility in the regulatory framework. To draft the technical implementing details set forth broadly in the level-1 legislation, the European Securities Committee was created, with a primarily regulatory function under Art. 202 of the EU Treaty. In addition, the Committee of European Securities Regulators (CESR), a level-3 committee (see below), had an advisory function at level 2, in addition to its role of coordinating the implementation of EU securities regulation at level 3. Similar bodies were later created for banking and insurance supervision (see below).
3. Level 3: Regulatory and supervisory coordination, focused on a greater level of cooperation between national supervisors. Three so-called level-3 committees of national authorities were created to facilitate such coordination: the CESR, the Committee of European Banking Supervisors (CEBS), and the Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS). Each of these level-3 committees relied on a small secretariat, respectively located in Paris for CESR, London for CEBS, and Frankfurt for CEIOPS. The committees comprised the relevant national authorities (including central banks in the case of CEBS) of all EU countries, observers from the European Economic Area (Iceland, Liechtenstein, and Norway) and the European Commission in CESR and CEIOPS and the European Central Bank in CEBS (with the European Commission having observer status).

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decisions. Confusingly, the Council is a separate arrangement from the European Council, which includes the head of state or government of each EU member state, the European Council President, and the President of the European Commission. See <http://www.consilium.europa.eu/en/home/>.

<sup>4</sup> See a diagram summarizing these four levels on page 6 of the Lamfalussy committee final report (European Commission 2001).

<sup>5</sup> Members of the European Parliament are elected by EU citizens every fifth year.

4. Level 4: Control of compliance and enforcement, intended to ensure greater enforcement of EU laws, with the main role being played by the European Commission as the guardian of the treaties.

These tangled arrangements highlighted the hybrid role of the European Commission, which combines executive, legislative, political, and administrative features. The Commission's role in the regulation of financial markets includes preparation of EU legislative proposals for the European Parliament and Council, and participation in discussions about legislative proposals between EU member states, European institutions, and other relevant stakeholders.

Moreover, the European Commission is the competent authority in enforcing the EU's competition policy framework for major cases with cross-border impact, while national competition authorities have jurisdiction over local cases (for example, mergers of domestic companies with no international activity). Competition policy has become a very important part of the EU financial policy framework, especially (but not only) through the EU's mandate to check state aid. Since 1999, a string of landmark decisions by the European Commission to enforce competition policy rules in the financial sector, and in particular to allow the cross-border acquisitions of financial institutions that domestic authorities tried to prevent, has played a crucial role in ensuring the integrity of the EU's single market and in fostering cross-border financial integration.

## **12.3 Recent Changes to the European Union's Financial Supervisory and Regulatory Architecture**

### **12.3.1 Changes to the European Supervisory Architecture, 2009–2011**

#### **Microprudential Supervision: the European Supervisory Authorities**

The recent changes to the EU's financial architecture were prompted by the great financial crisis of 2007–2009 and the subsequent euro crisis of 2010–2012. In October 2008, the European Commission appointed a group chaired by former managing director of the International Monetary Fund, Jacques de Larosière, to give advice on the future of European financial



regulation and supervision. The resulting de Larosière Report (European Commission 2009) concluded that the supervisory framework needed to be strengthened to reduce the risk and severity of future financial crises. It recommended creating three European supervisory authorities (ESAs): one for the banking sector (European Banking Authority [EBA]), one for the securities sector (European Securities and Markets Authority [ESMA]), and one for the insurance and occupational pensions sector (European Insurance and Occupational Pensions Authority [EIOPA]). These three new ESAs replaced the Lamfalussy level-3 committees (CESR, CEBS, CEIOPS) and were established in the same locations (respectively, Paris, London, and Frankfurt).

The de Larosière Report also recommended establishing a European Systemic Risk Board (ESRB), to monitor and to assess potential threats to financial stability that arise from macroeconomic developments and from developments within the financial system as a whole (see details in the next section).

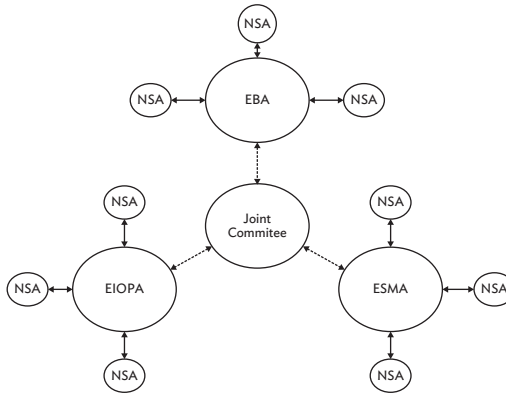
The underlying rationale for setting up the ESAs was to ensure closer cooperation and better exchange of information between national supervisors, to facilitate the adoption of EU resolutions to cross-border problems, and to advance the coherent interpretation and application of rules (De Haan, Oosterloo, and Schoenmaker 2015). By preparing uniform standards and ensuring supervisory convergence and coordination, the ESAs were intended to shape the further development of a “single rulebook” applicable to all 28 EU countries and thus contribute to the single market. The three ESAs and the ESRB started their operations in January 2011.

The powers assigned to the ESAs include the following:

- developing draft technical standards, guidance, and recommendations;
- resolving cases of disagreement between national supervisors, where legislation requires them to cooperate or to agree;
- contributing to ensuring the consistent application of technical rules of EU law, including through peer reviews; and
- performing a coordination and enforcement role in emergency situations.

The de Larosière report envisaged a European System of Financial Supervision that would comprise the three ESAs, a joint committee to coordinate them, the ESRB, and all participating national authorities. The European System of Financial Supervision would foster the replacement of the EU’s hodgepodge of partially harmonized national financial-sector regulations with a genuine single rulebook. Figure 12.1 illustrates the functioning of the three ESAs, highlighting that they work closely with

**Figure 12.1: The European Supervisory Authorities Work Closely with National Supervisory Authorities**



EBA = European Banking Authority, EIOPA = European Insurance and Occupational Pensions Authority, ESMA = European Securities and Markets Authority, NSA = National Supervisory Authority.

Source: De Haan, Oosterloo, and Schoenmaker (2015).

the national supervisory authorities. As such, this network combines nationally based supervision of firms with coordination at the European level to foster harmonized rules, coherent supervisory practices, and enforcement. Through the joint committee, the three ESAs cooperate and ensure consistency in their practices. Therefore, while the three ESAs are not supervisors as the name “European supervisory authorities (ESAs)” misleadingly suggests (except ESMA’s direct supervisory role discussed below), they contribute more effectively to the consistency of European supervisory practices than the previous level-3 committees of the Lamfalussy framework (CESR, CEBS, CEIOPS) could.

In addition to this indirect supervisory impact, ESMA also exercises direct supervisory authority over a limited set of regulated financial firms with a pan-European profile, namely, credit rating agencies and trade repositories. This direct supervisory role may be expanded in the future toward other market segments, such as financial market utilities, but there are no current plans to do so.

### Macroprudential Supervision

One of the main lessons from the 2007–2009 global financial crisis was that the supervisory arrangements then in place overemphasized the supervision of individual firms, and underemphasized the supervision

of the financial system as a whole (macroprudential supervision) (De Haan, Oosterloo, and Schoemaker 2015). The interconnections between institutions might lead to system-wide risks that are not internalized by them. Financial institutions have correlated balance sheets resulting from the similarity of their asset portfolios, because of the interconnectedness within networks that creates the potential for quick contagion, and because of the potential fire sale of assets that can take place during stress episodes (Claeys and Darvas 2015).

Macroprudential policy could play a key role in ensuring system-wide stability, by increasing the resilience of the financial system and by taming the financial cycle with targeted tools. More specifically, Smets (2014) suggested that macroprudential policy should have four intermediate targets:

1. mitigate and prevent excessive credit growth and leverage,
2. mitigate and prevent excessive maturity and liquidity mismatch,
3. limit excessive exposure concentrations, and
4. limit bail-out expectations

Blanchard, Dell’Ariccia, and Mauro (2013) suggest that macroprudential tools can be roughly divided into three main categories:

- tools seeking to influence lenders’ behavior, such as time-varying capital requirements, leverage ratios, or dynamic provisioning;
- tools focusing on borrowers’ behavior, such as ceilings on loan-to-value (LTV) ratios or on debt-to-income (DTI) ratios; and
- capital controls known as “capital flow management tools,” that target “hot money” flows.

While macroprudential policies are relatively new and mainly under construction, the recent literature assessing these measures has found some encouraging results. In particular, a number of papers show that carefully set limits to ratios such as the LTV and the DTI could help to tame financial imbalances.<sup>6</sup>

A major advantage of these tools is that they can be applied to a particular sector affected by financial imbalances, for instance, the real estate sector. In the euro-area context, these tools have the additional advantage that they can be tailored to country-specific circumstances, while the monetary policy of the European Central Bank (ECB) can only consider the euro area as a whole.

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<sup>6</sup> See, for example, Borio and Shim (2007); Lim et al. (2011); Igan and Kang (2011); Jimenez et al. (2012); Kim (2013); Cerutti, Claessens, and Laeven (2015); and Kuttner and Shim (2016).

In order to strengthen supervisory arrangements on both sides of the Atlantic, the EU and US authorities established new bodies responsible for macroprudential supervision, i.e., the ESRB in the EU and the Financial Stability Oversight Council in the US. Moreover, at the global level, G20 leaders in 2009 established the Financial Stability Board as a successor body to the prior, more limited Financial Stability Forum.

The ESRB is responsible for the macroprudential oversight of the EU's financial system, defined as contributing to the prevention or mitigation of systemic risks that arise from developments within the financial system and considering macroeconomic developments, in order to avoid periods of widespread financial distress.

The ESRB comprises a general board as its decision-making body, a steering committee that sets the agenda and prepares the decisions, a secretariat and an advisory technical committee, and an advisory scientific committee. While all relevant stakeholders are represented within the ESRB, a prominent role has been granted to central banks, i.e., the majority of the voting members of the general board are central bank representatives, the chair is the ECB president, and the ECB also provides the secretariat along with analytical, statistical, administrative, and logistical support to the ESRB.

The ESRB's tasks include the following:

1. the collection and analysis of all information relevant for macroprudential oversight;
2. the identification and prioritization of systemic risks;
3. the issuance of warnings where such risks are deemed to be significant;
4. the issuance of recommendations for remedial action, and monitoring of measures taken in response to warnings and recommendations;
5. cooperation with the ESAs, including the development of indicators of systemic risk and the conduct of stress-testing exercises;
6. the issuance of confidential warnings on emergency situations addressed to the European Council; and
7. coordination with the International Monetary Fund, the Financial Stability Board, and other macroprudential bodies.

Although ESRB recommendations are not binding, the parties addressed are obliged to respond under the principle of "comply or explain." In other words, they must follow the recommendation, or explain why they are not doing so.

## 12.3.2 The Establishment of the European Banking Union

### Rationale

The notion of a banking union explicitly appeared on the EU policy agenda only in the first half of 2012, following numerous earlier calls by economists and analysts (Véron 2011). At that time, the intensification of the euro-area crisis necessitated bold measures to counter the increasing market pressure being felt by several interlinked banks and euro-area sovereigns, and the increasing financial fragmentation, which created a risk of major negative impacts on the economy of the euro area and beyond. Several observers questioned whether the euro would survive the crisis. In this disorderly environment, the idea of a banking union offered a politically more acceptable option compared with other alternatives, such as the issuance of Eurobonds (joint and several liabilities of euro-area member states) and a more rapid move toward a full-fledged fiscal union. The European Council of 28–29 June 2012 marked the start of Europe’s banking union (the expression itself became widely used in the spring of 2012, but was endorsed by the European Council only later in 2013), most consequentially by deciding to shift bank supervisory authority from the national to the European level, under a framework labeled the Single Supervisory Mechanism (SSM), also known as European Banking Supervision.

The explicit motivation for this landmark decision was to “*break the vicious circle between banks and sovereigns.*” National bank resolution regimes and the home-country bias in banks’ government-bond holdings imply that there is a correlation between banking and sovereign debt crises, which in the euro-area context became increasingly disruptive. When a government gets into trouble, so does the country’s banking system (e.g., Greece). And a failing banking system can worsen the government’s budget because of a potential government-financed bank bailout, which comes on top of a higher budget deficit resulting from the economic downturn caused by the banking crisis (e.g., Ireland or Spain).

Merler and Pisani-Ferry (2012) documented that most euro-area countries were characterized by the large size of their banks’ portfolios of domestic government bonds, which were markedly larger than in the United Kingdom (UK) or the US. Moreover, during the crisis this vulnerability increased, because all vulnerable countries saw a decline in the share of government debt held by nonresidents. Germany, by contrast, saw an increase in the share held by nonresidents.

This lethal correlation between banks and sovereigns, or “doom-loop” or “vicious circle” as it is frequently referred to, was a key reason

for the initiation of the banking union. The 29 June 2012 Euro Area Summit statement started with the words: “*We affirm that it is imperative to break the vicious circle between banks and sovereigns.*”

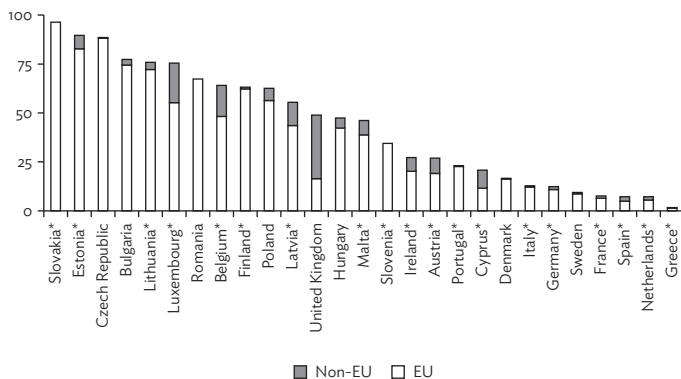
At a more fundamental level, the creation of the banking union was a response to the mismatch between the integrated European banking market and the largely national sector-specific banking policies, including for prudential supervision and crisis management. The combination of cross-border banking and national supervision and resolution leads to coordination failure between national authorities, which (understandably) put national interests first. This in turn can undermine fair competition between banks in different countries, lead to suboptimal resolution decisions, and might put financial stability at risk. Completion of the banking union would solve this coordination failure through the adoption of supranational banking policies. The coordination failure argument is related to the single EU market (which allows unconstrained cross-border banking), and thus to the European Union as a whole, beyond the euro area (Schoenmaker 2015; Véron 2015).

Consistent with this pan-EU rationale, the legislation establishing the banking union (described below) left the door open for non-euro-area EU members to join without adopting the euro as their currency (i.e., without joining the euro area). Thereby, the coordination failure problem could be addressed in the EU as a whole, should non-euro-area members decide to join the banking union through the process referred to in that legislation as “close cooperation.” Since the banking systems of most non-euro-area EU countries are highly integrated with the euro-area banking system, entering the banking union could be beneficial for those countries. It could improve the supervision of cross-border banks, ensure greater consistency of supervisory practices, and provide ample supervisory information, thereby increasing the quality of supervision, avoiding competitive distortions, and fostering financial integration (Darvas and Wolff 2013; Hüttl and Schoenmaker 2016). Figure 12.2 shows that in most non-euro EU members, a very large share of domestic banking assets is owned by subsidiaries and branches of EU banks, which are predominantly euro-area banks.

A simplified but widespread descriptive framework holds that a complete banking union should be composed of the following elements:

1. uniform regulation, including detailed technical standards (“single rulebook”);
2. a single mechanism for bank supervision;
3. a single mechanism for bank resolution;
4. a single deposit insurance scheme; and
5. a common fiscal backstop for bank resolution and deposit insurance.

**Figure 12.2: Share of Total Bank Assets from Foreign-Owned Branches and Subsidiaries, 2015**



EU = European Union.

Note: countries marked with an asterisk are current members of the euro area.

Source: Bruegel using data from the European Central Bank.

Such a system is intended to address the bank-sovereign vicious circle the following ways.

1. Regulation would (i) make creditor participation in bank resolution (“bail-in”) the rule, leaving public sector support (“bail-out”) to unusual and extraordinary occasions, thereby reducing the potential cost of banking crises to the taxpayer; and (ii) set limits on bank holdings of domestic government bonds, thereby reducing the channels through which a sovereign debt crisis can spread to a banking crisis.
2. Consistent supervision would improve the quality of banking oversight and thereby reduce the probability of bank failures, on the basis that national supervisors tend to be more lenient with domestic banks than supranational banks (Véron 2015).
3. Consistent resolution would reduce cross-country coordination failures, make resolution more effective, and better enforce the common rules than in a purely national framework.
4. A common deposit guarantee would increase trust in bank deposits, thereby reducing bank funding costs and the probability of bank runs, and thus enhancing financial stability.
5. Systemic banking crises cannot be completely excluded, even though their probability can be reduced by strict regulation

and supervision. Moreover, even under an effective resolution system and strong bail-in rules, the need for public sector support cannot be fully excluded. But if public sector bank recapitalization or a top-up to the national deposit guarantee fund, when needed, would be financed by the domestic government, then banking woes could spread to the public sector, thus reviving the bank-sovereign vicious circle. In contrast, if a common fund steps in under such situations, then the costs are spread across the banking union area (“risk sharing”) and the specter of banking troubles spreading to domestic public finances is significantly reduced. A final element is thus a centralized fiscal backstop to the common fund. Deposit insurance funds typically have a credit line from the government (Gros and Schoenmaker 2014).<sup>7</sup>

Furthermore, a consistent and rigorously implemented system involving these five aspects might also change bank behavior by limiting undue risk-taking and bail-out expectations, thereby reducing the risk of bank failures.

## The Current Architecture of the Banking Union

In contrast to the above-described complete banking union, the current architecture is incomplete. It can be summarily described as near-complete in terms of regulation and supervision (though without the above-suggested sovereign exposure limits), but with a lopsided and untested resolution framework, no European-level deposit guarantee, and no explicit European-level financial backstop.

In terms of legislation, the European Act for European Banking Supervision (or SSM Regulation) was enacted on 15 October 2013 with unanimous support from all EU countries. The Single Resolution Mechanism (SRM) Regulation was enacted on 15 July 2014. A proposal for a European deposit insurance scheme was published by the European Commission on 24 November 2015, but is still far from being finally adopted.

The European Central Bank (ECB) assumed supervisory authority on 4 November 2014, when it became the single licensing authority for all banks in the euro area and the sole authority to approve their changes of ownership and new management. The ECB directly supervises

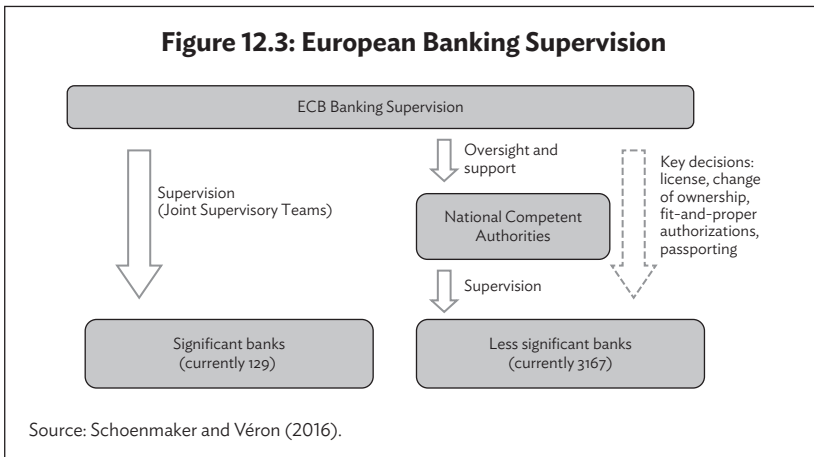
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<sup>7</sup> Moreover, centralized supervision is consistent with a centralized fiscal backstop: to the extent that the centralized supervision is responsible for the bank failure, the costs of such a failure should not be charged only to the home country of the bank.



129 “significant institutions”—broadly speaking, the largest ones, based on criteria set by the SSM regulation<sup>8</sup>—and oversees the supervision of more than 3,000 “less significant institutions” by national supervisors (referred to in the banking union jargon as national competent authorities). Figure 12.3 illustrates the framework.

By contrast to the highly centralized scheme adopted for European banking supervision, the resolution framework created by the SRM Regulation entails a complex, and as yet entirely untested, division of responsibilities between European and national authorities. The SRM Regulation established a Single Resolution Board, with staff located in Brussels, which has a central (but far from exclusive) role in resolution decision making and manages a Single Resolution Fund. Despite its name, the Single Resolution Fund is initially established as a series of national “compartments” coexisting with a mutualized fund, and is expected to eventually become entirely mutualized among all euro-area member states only after a lengthy transition period that runs



<sup>8</sup> Four criteria are considered for the assessment of whether a financial institution is significant: (i) size (the total value of its assets exceeds €30 billion); (ii) economic importance (for the specific country or the EU economy as a whole, including if it is one of the three most significant banks established in a particular country); (iii) cross-border activities (the total value of its assets exceeds €5 billion and the ratio of its cross-border assets/liabilities in more than one other participating member state to its total assets/liabilities is above 20%); and (iv) direct public financial assistance (it has requested or received funding from the European Stability Mechanism or the European Financial Stability Facility). The status of banks may change and the ECB conducts regular reviews of all banks authorized within the participating countries. See more information at <https://www.bankingsupervision.europa.eu/banking/list/criteria/html/index.en.html>

until 2024. The resolution process is governed by a newly harmonized (and also largely untested) legislation that covers the entire EU, not just the euro area, and is known as the Bank Recovery and Resolution Directive (BRRD).<sup>9</sup>

### 12.3.3 An Early Assessment of European Banking Supervision

Key provisions of the BRRD and of the SRM Regulation entered into force only in January 2016, and at the time of writing, the SRB has not taken any resolution decision, making it too early to assess the new European banking resolution framework. By contrast, European banking supervision has now been in place for almost 2 years and can thus be subjected to an early, if inevitably tentative, assessment.

Such an assessment is inevitably constrained by the obvious fact that, while supervisory failures can be very visible (and costly), supervisory successes are intrinsically difficult to observe or interpret. We offer two approaches in this section: one based on the qualitative and narrative review of supervisory practices developed in Schoenmaker and Véron (2016), and the other based on the observation of quantitative outcomes that bear a connection with supervisory processes. Both approaches have limitations, like the dependence of the first approach on perceptions, while the banking union in itself is not the sole determinant of the indicators listed for the second approach. Yet, keeping these limitations in mind, they together provide an indication of the strengths and weaknesses of the current form of the banking union.

#### Bank Supervision Practices

Schoenmaker and Véron (2016) assessed the practice of European banking supervision under the Single Supervisory Mechanism in its first 18 months of operation, i.e., from November 2014 to May 2016. Based on the detailed chapters discussing the functioning of the SSM in nine countries and the editors' overall own analysis, Schoenmaker and Véron (2016) reach the following key conclusions:<sup>10</sup>

- **European banking supervision is effective.** Supervision of cross-border banking groups in the euro area is conducted in a joined-up manner that contrasts with the previous fragmented,

<sup>9</sup> See <http://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A32014L0059>

<sup>10</sup> Excerpt from Schoenmaker and Véron (2016).

country-by-country practice. The key mechanism is the operation of joint supervisory teams, which for each supervised banking group enable information sharing between the ECB and relevant national supervisors while providing a clear line of command and decision making. The size of the joint supervisory teams (up to several dozen examiners) also allows for specialization on topics such as capital and governance.

- **European banking supervision is tough, at least when it comes to significant (larger) banks.** It is generally more intrusive than previous national regimes, with supplementary questions during investigations and more on-site visits. The ECB is less vulnerable to regulatory capture and political intervention. An early quantitative indication is that the ECB has not shied away from increasing capital requirements by imposing higher capital add-ons under its Supervisory Review and Evaluation Process (SREP). Fewer changes have been introduced so far for the supervision of less significant banks, which still varies significantly in different countries, but appears generally less demanding than that of significant banks.
- **European banking supervision appears to be broadly fair, at least for significant banks.** Among these, we have not found compelling evidence of country- or institution-specific distortions or special treatment by the ECB, for example, in the determination of SREP scores. The situation is more complex when it comes to less significant banks that remain subject to national supervision, including those tied together in what EU legislation calls institutional protection schemes.
- **European banking supervision makes mistakes.** There have been cases of overlapping and redundant data requests. The ECB's communication on maximum distributable amounts was ill-prepared and contributed to volatility on bank equity markets in early 2016. The supervisory board appears to act as a bottleneck in some procedures and does not optimize its use of delegation for day-to-day decisions.
- **European banking supervision is insufficiently transparent.** The ECB's supervisory board and SREP process are seen as black boxes by numerous stakeholders. Banks complain about the opacity of the determination of SREP scores, which are based on multiple factors. European banking supervision still provides pitifully little public information about all supervised banks, in stark contrast to US counterparts.
- **European banking supervision has not yet broken the bank-sovereign vicious circle and created a genuine single**

**banking market in the euro area.** Many lingering obstacles to a level playing field are outside European banking supervision's remit, including deposit insurance, macroprudential decisions (beyond banking), and many other important policy instruments that remain at national level. But even within its present scope of responsibility, European banking supervision maintains practices that contribute to cross-border fragmentation, such as the imposition of entity-level (as opposed to group-level) capital and liquidity requirements, or geographic ring-fencing, and the omission of geographic risk diversification inside the euro area in stress test scenarios. It has not yet put an end to the high home bias toward domestic sovereign debt in many banks' bond portfolios. Nor have many cross-border acquisitions been approved by ECB banking supervision so far.

Developments since June 2016 (when Schoenmaker and Véron 2016 was published) have not materially modified this assessment, but highlight the challenges faced by the ECB in maintaining high supervisory standards. In particular, the banking sector fragility in Italy, which was mentioned in the June assessment, remains a major concern that the ECB has not yet been able to address comprehensively. Despite ongoing market concerns about the sustainability of the business model of Deutsche Bank, at the time of writing there is no indication of a failure by the ECB in its supervision of that systemically important institution, which is the euro area's third-largest bank by total assets. Nevertheless, choices made by the ECB during the stress testing of Deutsche Bank and of several dozen other EU banks in the early summer of 2016 were questioned by the media as possibly denoting favorable special treatment (Noonan, Binham, and Shotter 2016).

## Outcomes

The results of a round of stress testing published in late July 2016 suggest that the banking system is much more resilient than in previous years (Table 12.1). Except for Monte dei Paschi di Siena, Italy's third-largest bank, all banks satisfy Pillar 1 requirements in the adverse scenario.

The development of credit default swap (CDS) spreads of banks highlight that US and Japanese banks were hit by market turmoil much more than euro-area banks in the immediate aftermath of the collapse of Lehman Brothers in September 2008 (Figure 12.4). However, while the perceived riskiness of US and Japanese banks improved significantly by the second half of 2009, the pressure on euro-area banks increased from early 2010, reaching especially high levels in Italy and Spain in

**Table 12.1: Overall Outcome of Recent Stress Tests of European Banks**

	CET1 ratio before the stress scenario (%)	CET1 ratio stressed (%)
2011 Stress test	8.9*	7.7*
2014 Stress test	11.1 (9.9)	8.5 (7.6)
2016 Stress test	13.2 (12.6)	9.4 (9.2)

Notes: Common Equity Tier 1 (CET1) capital ratio: in the context of CRD IV, a measure of capital that is predominantly common equity as defined by the Capital Requirements Regulation, as a percentage of risk-weighted assets under CRD IV. The asterisk indicates CT1 (Core Tier 1) ratio (instead of CET1), which on average comprises 95% CET1. Fully loaded requirements are in parentheses, which are calculated without applying the transitional provisions set out in CRD IV Regulation. All stress tests have a 3-year horizon: e.g., the 2016 stress test uses 2015 balance sheet data (second column) and reports, among other things, the capital position at the end of the adverse scenario, which is 2018 (third column). The same holds mutatis mutandis for the other tests. The sample differs across the years: the 2011 one had 95 banks, the 2014 one had 105, and the 2016 one had 51. Pillar 1 requirements: 4.5% CET1, 6% T1, and 8% total capital ratio.

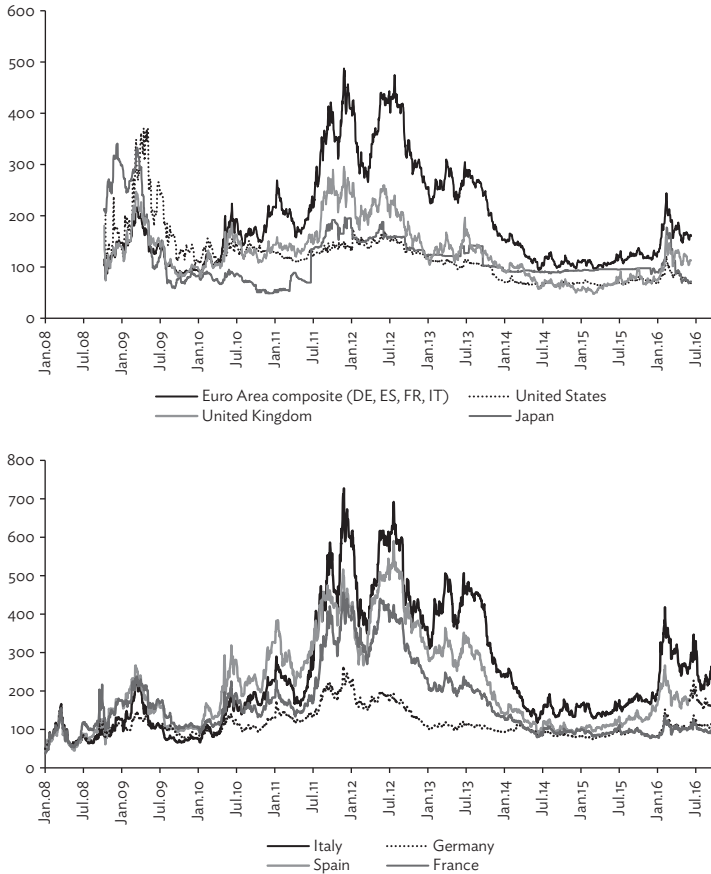
Source: European Banking Authority (2016).

2011–2012. Market pressure declined after the summer of 2012, when European leaders initiated the banking union and ECB President Draghi delivered a landmark speech promising “*to do whatever it takes to preserve the euro.*”<sup>11</sup> The decline in CDS spreads was especially marked in the second half of 2013 and first half of 2014, a decline in which the development of the banking union has likely played a role. In 2016, there was significant volatility and an increase in CDS spreads, not least because of the troubles of the Italian bank Monte dei Paschi di Siena, the only bank that failed the 2016 stress tests (adverse scenario). However, the announcement of a capital plan for Monte dei Paschi di Siena improved market sentiment, and CDS spreads fell in late July and the first half of August 2016.

Figure 12.5 highlights the heterogeneity of the euro area in terms of nonperforming loans (NPLs). As highlighted by Schoemaker and Véron (2016), data are based on national NPL definitions that may not be fully harmonized. An increase in reported NPLs might signal a deterioration in the quality of loans, but might also result from better measurement and curbs on practices variously referred to as loan forbearance, “evergreening,” or “extend-and-pretend.” Nevertheless, Figure 12.5 indicates that the share of NPLs is relatively high and rising (or at best, is stable at a high level) in Greece, Italy, and Portugal, while in

<sup>11</sup> <https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html>

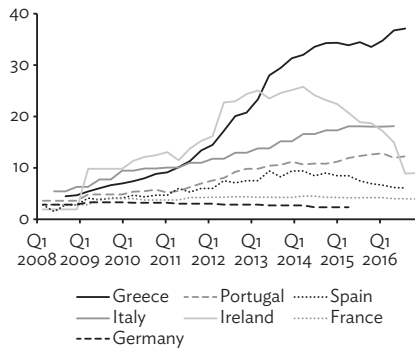
**Figure 12.4: Credit Default Swap Spreads of Top Financial Corporations, 1 January 2008–10 October 2016**



DE = Germany, ES = Spain, FR = France, IT = Italy.

Note: Average of the top 5 banks for each country. The following banks are included: Italy: Unicredit, Unione di Banche Italiane, Banco Popolare, Intensa Sanpaolo, Banca Monte dei Paschi di Siena; Spain: Banco Santander, BBVA, Banco Popular Espanol, CaixaBank, Caja de Ahorros y Monte de Piedad de Madrid; France: BNP Paribas, Credit Agricole, Credit Lyonnais, Societe Generale, Natixis; Germany: Deutsche Bank, Commerzbank, Bayerische Landesbank, Nord LB, Unicredit Bank AG; United Kingdom: HSBC, STD Chartered, Barclays, Lloyds, BK of Scotland; United States: Bank of America, Citigroup, Goldman Sachs, Morgan Stanley, PNC; Japan: Aozora Bank, Mizuho Bank, The BTMBI.

Sources: Thomson Reuters Datastream Professional and Bruegel computations.

**Figure 12.5: The Share of Nonperforming Loans**

Note: Quarterly data are not available for Ireland and Portugal in 2008 and 2009 and Germany for all years; for these years, the corresponding annual data are indicated in each quarter. For France and Italy, biannual data are available.

Source: IMF Financial Soundness Indicators database.

Ireland and Spain NPLs have started to fall significantly, suggesting that the major restructuring and recapitalization of their banking systems have improved the soundness of banks in these countries.

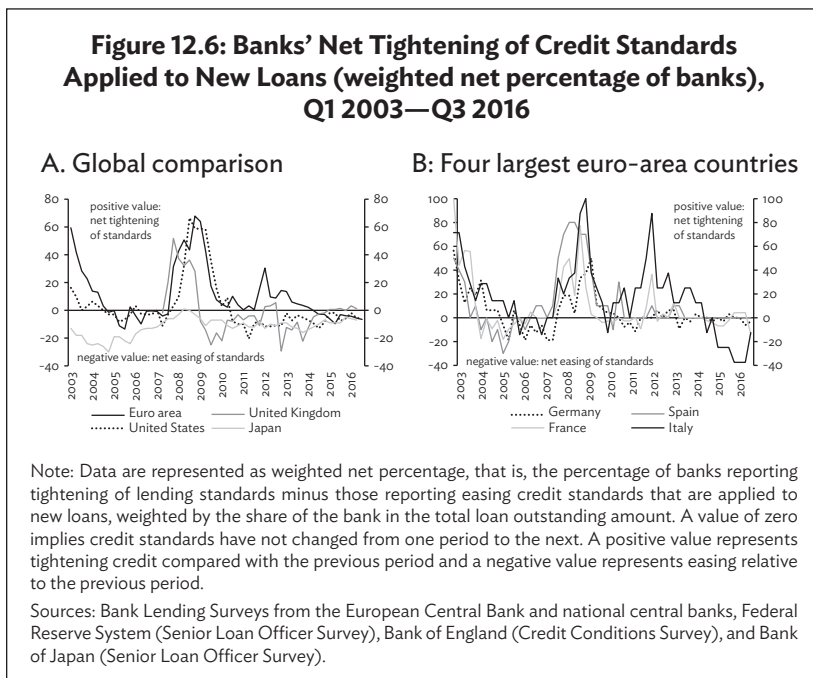
A key question is whether the core business of traditional banking, supplying the economy with credit, has sufficiently resumed. A major problem with the analysis of credit developments in the context of the banking union is that credit growth is influenced by many factors beyond the behavior of banks, including credit demand, which is strongly impacted by current and expected economy activity. In turn, the economic outlook depends on various factors other than banking system soundness, such as fiscal, monetary, and structural policies, as well as developments in the rest of the world. Various monetary policy measures, such as special central bank schemes for lending to banks, also influence banks' ability and willingness to supply credit. The availability of alternative sources of finance, such as the substitution of bank loans with debt securities, also influences credit developments. Nevertheless, academic research suggests that credit supply constraints typically play a major role in weak credit performance during financial crises (see Darvas 2013a, for a survey). Darvas (2013c) concludes that a proper cleanup of the banking system is a precondition for the resumption of credit growth in the euro area. Bank supervision has a major role to play in this bank balance sheet cleanup process. Figures 12.6–12.8 relate to

(i) credit standards as derived from bank lending surveys, (ii) actual credit growth, and (iii) interest rates on bank loans.

The left panel of Figure 12.6 suggests that credit standards were tightened substantially in the euro area, the US, and the UK in 2007–2009, but not in Japan. Subsequently, credit standards were eased in early 2009 in the UK and Japan and in late 2010 in the US. In contrast, in the euro area, credit standards were tightened again in 2011–2013, reflecting the difficult position of the euro-area banking sector during the euro crisis. More recently, however, credit standards have been eased in the euro area, too. The banking union has likely played a significant role in this easing.

The right panel of Figure 12.6 shows the same data for the four largest euro-area countries. Not surprisingly, credit standards in 2011–2013 were tightened most in Italy and least in Germany, while France and Spain are in between. However, starting in the third quarter of 2014, credit standards eased significantly in Italy.

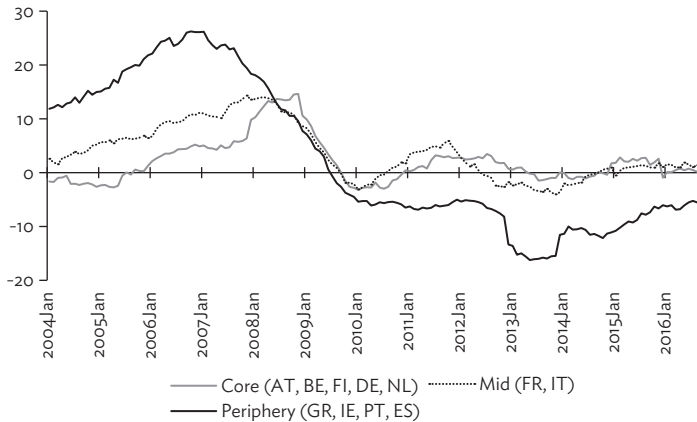
Figure 12.7 reports credit growth in three country groups within the euro-area: “core” (Austria, Belgium, Finland, Germany, and the Netherlands); “mid” (France and Italy); and “periphery” (Greece, Ireland, Portugal, and Spain). While there are differences within each





**Figure 12.7: Bank Loans to Nonfinancial Corporations, January 2004–August 2016**

(% change compared with the same month of the previous year)



AT = Austria, BE = Belgium, DE = Germany, ES = Spain, FI = Finland, FR = France, GR = Greece, IE = Ireland, IT = Italy, NL = the Netherlands, PT = Portugal.

Source: Authors' calculations using data from the European Central Bank.

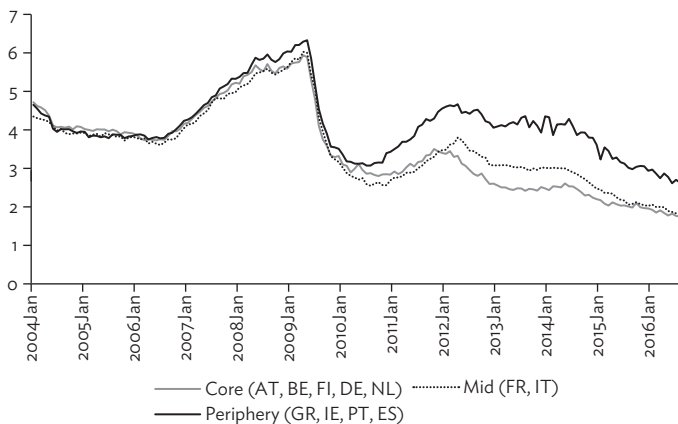
of these groups, there are even greater differences between groups, underlining the heterogeneity of the euro area. In “core” and “mid” euro-area countries, some credit growth had resumed by late 2014, a development in which European banking policies might have played a role. In the “periphery,” contraction of credit aggregates continued, but at a gradually lower rate.

Following an unsustainable credit boom, which characterized several euro-area periphery countries and led to private debt overhangs, a contraction of aggregate credit stock is a phenomenon that leads to more sustainable corporate finances. In these countries, the key issue is not the growth rate of the aggregate credit stock, but rather whether the process frequently called “zombification” (Caballero, Hoshi, and Kashyap 2008) can be avoided, whereby banks with weak balance sheets roll over the dubious loans of their existing clients (instead of realizing further losses) and do not grant credit to young and potentially more productive firms. Overall, the evidence available suggests that some periphery countries may now have escaped zombification (especially Ireland and Spain), but others may still be trapped in a “zombie banking” cycle, including Portugal and possibly also Italy.

For the same three country groups, Figure 12.8 shows interest rates on loans to nonfinancial corporations. While loan rates were rather uniform across the euro area from 2003 to 2008, the euro crisis, which started to intensify in late 2009, was accompanied by a major divergence, whereby loan rates especially in the periphery, and to a lesser extent in mid countries, increased to values well over the rates in core countries. Both financial fragmentation and the increased risk in the periphery countries might have contributed to the interest rate divergence. The recent narrowing of the spread relative to core countries is therefore welcome, in which European banking policies may also have played a role.

Next, we look at an indicator of financial integration in the euro area: bank loans to domestic borrowers and borrowers in other euro-area countries (cross-border loans). Figure 12.9 shows that loans granted by euro-area banks to residents in other euro-area countries almost tripled from 1999 to 2008, whereas loans granted to domestic borrowers grew at a lower rate. Since the crisis, however, domestic lending has changed little, whereas intra-euro area lending fell rapidly. However, starting from early 2014 the fall in cross-border lending has stopped and a

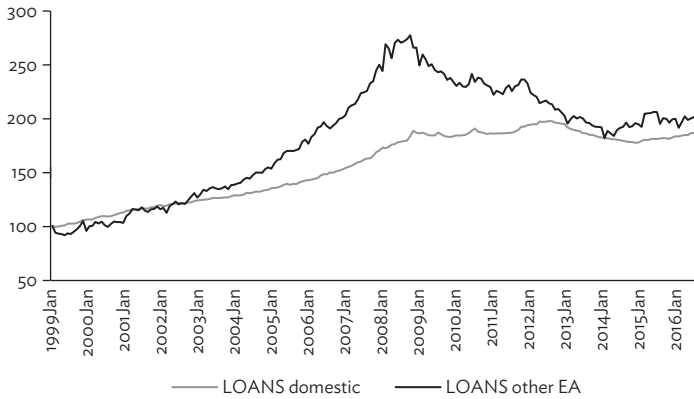
**Figure 12.8: Interest Rate on Bank Loans to Nonfinancial Corporations, January 2003–August 2016 (% per year)**



AT = Austria, BE = Belgium, DE = Germany, ES = Spain, FI = Finland, FR = France, GR = Greece, IE = Ireland, IT = Italy, NL = the Netherlands, PT = Portugal.

Source: Authors' calculations using data from the European Central Bank.

**Figure 12.9: Bank Loans to Domestic Borrowers vs. Borrowers in Other Euro-Area Countries (1999/01 = 100), January 1999–June 2016**



EA = euro area.

Source: Authors' calculation based on data from the European Central Bank.

gradual recovery has started, signaling that the financial fragmentation that characterized the crisis years may be gradually left behind.

Last, a key issue is whether the banking union was able to lessen the bank–sovereign vicious circle, which was the key motivation behind its initiation, as we argued above. Assessment of this issue is made difficult by the relatively short time since the inception of the banking union, the lack of major sovereign crises and banking failures, but also by the European Central Bank's large-scale asset purchases,<sup>12</sup> which have exerted a downward pressure on sovereign and private sector yields.

Still, it is worthwhile to go through the list of banking union-related factors we put forward in Section 12.3.2, which can mitigate the vicious circle:

1. Putting appropriate regulation in place. The Bank Recovery and Resolution Directive (BRRD) introduced strict rules for the bail-in of bank creditors.<sup>13</sup> These rules, however, have not yet been fully tested. There have been attempts to circumvent

<sup>12</sup> See details about ECB's asset purchases at: <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>

<sup>13</sup> See Darvas (2013b) for a brief discussion of the bail-out versus bail-in debate.

them (e.g., in Italy), but it is too early to label them ineffective or even ill-designed. A separate but related regulatory challenge is the current high exposure of many (though not all) euro-area banks to their home-country sovereign, which evidently reinforces the bank–sovereign vicious circle. Discussions have started on the possible limitation of such exposures through appropriate prudential rules, but they raise thorny political challenges and are still at a stage that is far from conclusive. Indeed, the large home bias in banks' holdings of debt securities has only marginally declined in Spain and Italy and was practically unchanged in Portugal, as indicated by Figure 61 and 63 of Darvas et al. (2016).

2. European banking supervision is in place and has improved the quality of banking oversight, as argued above. As a result, it reduces the probability of bank failures. Moreover, the ECB conducted a comprehensive assessment of the banking system before it formally started its supervisory function in October 2014: in anticipation of the results of this assessment, several banks increased their capital position, which has contributed to banking sector soundness. And as mentioned above, more recent stress tests in 2016 suggested that all tested banks (except Monte dei Paschi di Siena) have broadly adequate capital even in an adverse scenario, which may be viewed as suggesting that financial resilience has improved. All these factors contribute to reduce the probability of a vicious circle originating from banking failures. On the other hand, as observed by Schoenmaker and Véron (2016), the SSM maintains practices that contribute to cross-border fragmentation, such as the imposition of entity-level (as opposed to group-level) capital and liquidity requirements, or geographic ring-fencing, and the omission of geographic risk diversification inside the euro area in stress test scenarios, which are certainly not helpful in the context of the bank–sovereign vicious circle.
3. The Single Resolution Mechanism (SRM) is in place, but as mentioned above, has not yet been tested. Within the Single Resolution Board, the chair and executive members at the center can press ahead for resolution measures even if the relevant national resolution authority (or authorities) is reluctant. But the complex decision-making structure is a shortcoming of the new SRM regime (Schoenmaker 2015; Véron 2015). Because of the involvement of the European Commission and the Council, the decision making can easily become protracted while time is of the essence in crisis management. Moreover, the process

might become politicized, for example, when “national banking champions” are the subject of potential resolution measures. To close or restructure troubled banks with a firm hand, more distance from the political process would be desirable. The Federal Deposit Insurance Corporation is an example of a well-functioning agency with resolution powers in the US, but the SRB is not directly comparable in terms of independence and resources, let alone experience.

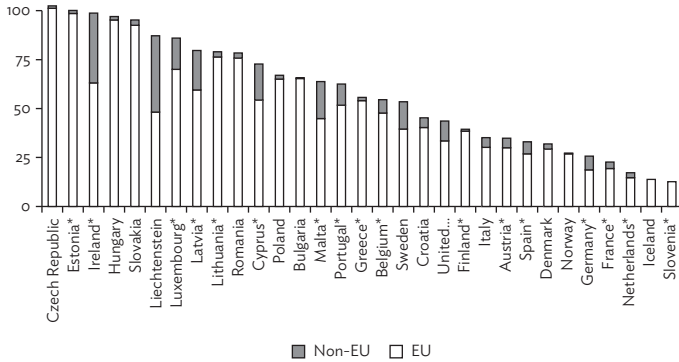
4. The European deposit insurance scheme was proposed by the European Commission on 24 November 2015, yet negotiations for it have stalled and we see little prospect for a breakthrough in the immediate future.
5. Direct recapitalization of banks by the European Stability Mechanism (ESM) is in principle possible, but is so much constrained by guidelines adopted in 2014 that it may never be used. The Single Resolution Fund is gradually paid up by contributions from banks but its size remains limited (around €10 billion at the time of writing), and it still lacks a credible euro-area-wide backstop. As discussed in Section 12.3.2, a common backstop is crucial to achieve adequate risk-sharing within the banking union.

Therefore, while a number of banking union-related factors, which mitigate the bank–sovereign vicious circle, have been introduced and are effective, others are untested or have a remote prospect for completion. Still, in our assessment the BRRD regulation and the Single Supervisory Mechanism already made major contributions to mitigate this “doom loop.”

### 12.3.4 The Start of Solvency II for Insurers, 2016

Traditionally, the focus of attention for both academics and policy makers concerned with financial stability is on banking. Nevertheless, insurance is also important for prudential supervision. In the literature, gross written premiums (GWP) are used as indicator for the geographic segmentation of the insurance business. Cross-border insurance, measured by GWP, amounts to 36% of total GWP in EU countries in 2012, while the comparable number for banking, measured by assets, stands at 25% of total banking assets in EU countries (Figure 12.2). Figure 12.10 shows the cross-border penetration for individual EU countries. The share of cross-border insurance has increased over the last decade, notwithstanding the global financial crisis (Schoenmaker and Sass 2016).

**Figure 12.10: Share of Total Insurance Premiums from Foreign-Owned Branches and Subsidiaries, 2012**



Notes: Cross-border penetration via branches and subsidiaries from EU and non-EU countries as percentage of total gross written premium (GWP). Countries marked with a star are current members of the euro area.

Source: Schoenmaker and Sass (2016).

EIOPA, the European supervisory authority, plays a coordinating role among the national insurance supervisors (see Section 12.3.1). With the advance to Solvency II, the new risk-based capital framework for European insurers, this coordinating role of EIOPA has become even more important. First, EIOPA has a strong role in setting the technical standards underpinning Solvency II to ensure a level playing field. Second, EIOPA has an advisory role for the approval of internal models under Solvency II. But final authority rests with the national supervisors. The design and rollout of an (international) insurance group's internal model are typically done at the head office, whereby the home country supervisor takes the lead. But the host country supervisor has to approve the use of the internal model for the foreign subsidiaries in its jurisdiction. In case of disagreement among home and host supervisors in the so-called supervisory colleges, EIOPA has thus an advisory role, but the home supervisor has the final say (Schoenmaker and Sass 2016).

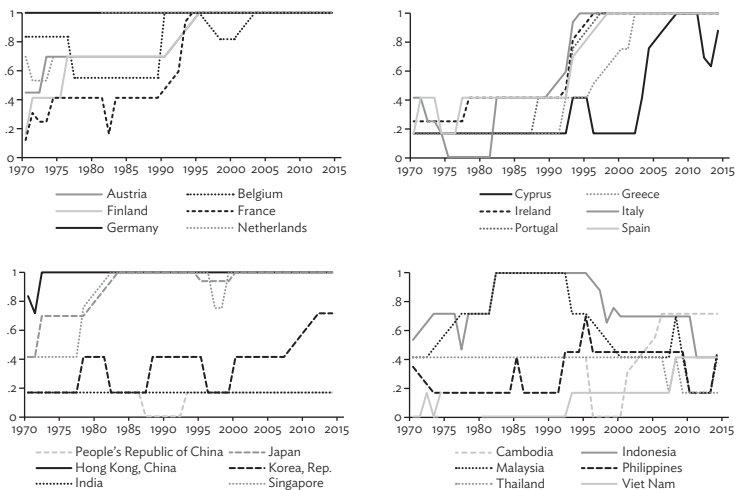
The increasing share of cross-border insurance may tilt the supervisory balance from coordination toward centralization in an "insurance union" at some future point. EIOPA would then be in charge of the supervisory colleges, just as the ECB is in charge of the joint supervisory teams in the banking union.

## 12.4 Comparison of Financial Integration in Asia and in Europe

A key difference between Asian and European economies is related to financial openness. Figure 12.11 shows that in most European countries full capital account openness (as measured by the Chinn–Ito index) has been achieved by the early 1990s. The laggards were Greece (by 2002) and Cyprus (by 2008), i.e., by about their respective entry in the euro area, while Germany had a fully open capital account already in 1970. Cyprus introduced capital controls in 2012, which is reflected in the index.<sup>14</sup>

In contrast, while Hong Kong, China; Japan; and Singapore opted for fully open capital accounts decades ago, capital flows are much more restricted in most Asian economies. Indonesia and Malaysia also opted for full capital account openness around 1990, but there were major and permanent setbacks around the 1997–1998 Asian crisis. In the Republic

**Figure 12.11: The Chinn–Ito Index of Capital Account Openness, Selected European and Asian Economies, 1970–2014**



Source: Updated data set of Chinn and Ito (2006), [http://web.pdx.edu/~ito/Chinn-Ito\\_website.htm](http://web.pdx.edu/~ito/Chinn-Ito_website.htm).

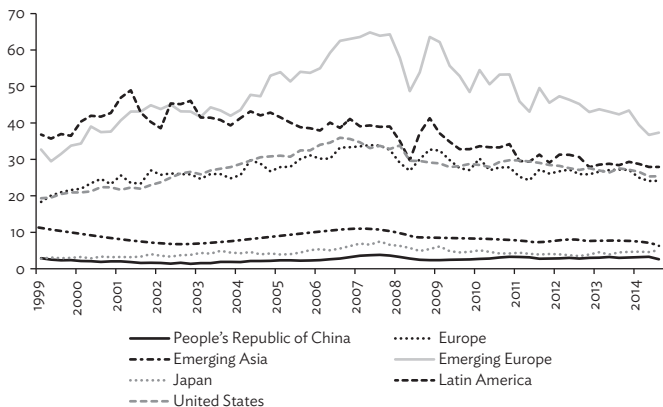
<sup>14</sup> Greece also introduced capital controls in 2015, which is not yet visible, given that the Chinn–Ito index is available up to 2014.

of Korea, which is among the most developed nations in Asia, there were major restrictions to capital flows (and a temporary setback after the 1997–1998 crisis) for decades, and after the recent increase, openness remains inferior to the openness of European economies.

Gross capital flows also tend to be much more significant in Europe than in Asia. In the four largest euro-area countries, gross capital inflows and outflows typically exceeded 10% of gross domestic product (GDP) annually, and in some years they exceeded even 20% of GDP. In contrast, in the six Asian countries reported in the chart, gross capital flows rarely exceeded 10% of GDP. The differences in the magnitudes of gross capital flows have led to even more significant differences in gross foreign assets and liabilities. In France, Germany, and Spain, foreign assets and/or liabilities amount to about 200% of GDP, and in Italy they are about 150%. In contrast, in Asian countries the shares of foreign liabilities tend to be smaller than 100% of GDP, and foreign assets are generally even much lower. A further indicator, foreign bank penetration, also suggests that Europe is much more integrated than Asia (Figure 12.12). This indicator is especially high in emerging Europe, yet values for Western Europe are also well above Asian values.

To summarize, all indicators considered in this section suggest that financial openness and integration is much higher in Europe than in

**Figure 12.12: Foreign Bank Penetration by Region**



Note: Lending by foreign banks, as a percentage of total bank lending to nonbanks in a given country or region. The data are for the major countries and regions. In the case of regions, the data for the respective countries in that region are aggregated.

Source: Authors' calculations based on IMF International Financial Statistics and BIS Consolidated Banking Statistics.



Asia. Increased political and trade integration, as well as harmonized EU-wide financial regulatory measures and the introduction of the euro have likely boosted financial integration. Full capital account openness (as a result of financial regulation) made possible the high level of financial integration. In contrast, beyond the increase in trade integration, the other factors were not at work in Asia.

## 12.5 Lessons from European Financial Integration for Regional Financial Regulatory and Supervisory Architecture and Cooperation in Asia

Asia is much less financially integrated than Europe, and there is no comparable political and legal integration in Asia. Therefore, expectations about possible regional financial regulatory and supervisory cooperation in Asia have to be realistic; the long process of European regulatory and supervisory integration is unlikely to be followed in Asia in the foreseeable future. Yet, we see three main areas in which Asian policy makers could draw lessons from European experiences: (i) the need for a harmonized microprudential framework, (ii) macroprudential structures, and (iii) Asian participation in global financial authorities.

### 12.5.1 A Harmonized Microprudential Framework

The overview of European financial integration in this chapter suggests that the starting point for financial policy convergence, with a view toward financial system integration, is a harmonized framework of rules and regulations. A sound basis is provided by international standard setters, such as the Basel Committee on Banking Supervision, the International Association of Insurance Supervisors, or the International Organization of Securities Commissions. Asian countries are now well represented in the membership of these international bodies. But global standards are often not specific enough to satisfy the requirements of a genuine supranational “single rulebook.”

Europe has stepped up regulatory harmonization further in a regional setting under the leadership of the European Commission, with an increasingly significant role for specialized agencies (the three European Supervisory Authorities: EBA, EIOPA, and ESMA) and other European-level participants such as the ECB for banking policy. Increased harmonization has allowed national supervisors to increase the scope for mutual recognition.

Efforts at regulatory harmonization and mutual recognition in Asia should of course consider the realities of the region. At this point, it appears more realistic to envisage a web of bilateral or multilateral “equivalency” frameworks than a fully-fledged sector-wide system of supranational rulemaking. For example, if a bank or insurer is supervised under “equivalent” rules, the host country could accept incoming business from banks and insurers supervised in other relevant Asian countries. Such a system of harmonization and mutual recognition may help financial integration, while minimizing compliance costs for banks with cross-border operations. Further steps in the financial regulatory and supervisory architecture might follow the specific patterns of financial integration among financial institutions and markets in Asia.

### 12.5.2 A Proper Macroprudential Framework

There is a growing recognition that healthy individual financial institutions are a necessary, but not a sufficient condition to ensure stability of the financial system, which has led to renewed interest in macroprudential policies.

A potential limitation of macroprudential tools is that they can be subject to regulatory arbitrage, either by provoking greater cross-border borrowing (Cerutti, Claessens, and Laeven 2015) or by migration of activities from banks to the shadow-banking sector (Cizel et al. 2016). A case in point is the application of loan-to-value (LTV) ratios to mortgages. While most countries traditionally apply such LTV restrictions to banks, mortgages are also offered to retail clients by insurers and pension funds. It is thus important that such measures be applied across the financial system (ESRB 2016).

Given that the shadow-banking sector has become one of the main sources of systemic risk, one of the main challenges in the next few years will be to find instruments that have an impact on the bank-like activities of nonbanks. For instance, in the US, the 2010 Dodd-Frank Act widened the remit of the Federal Reserve, allowing supervisors from the newly created Financial Stability Oversight Council to oversee nonbank financial institutions that they deem to be systemically important. In Europe, the creation of the European Systemic Risk Board (ESRB) in 2010 and the delegation of some macroprudential authority to the ECB under the SSM Regulation were beneficial, in our view. However, possibly because of diverging national interests, macroprudential supervision is awkwardly shared between the ECB, ESRB, and national authorities. As highlighted by Darvas and Merler (2013), the ECB can only apply those tools to seek to influence lenders’ behavior, as categorized by Blanchard et al. (2013), but cannot apply tools aimed at controlling borrowers’ behavior, such as LTV and debt-to-income (DTI) ratios. These latter

tools remain in the hands of national authorities. The ECB's limited remit might well be the weakness of the institutional arrangement, but the practice of macroprudential policies will show if this limitation is severe or if cooperation between the ECB and national authorities, under the watch of the ESRB, ensures the proper implementation of the various macroprudential tools.

A key lesson for Asia is therefore the need for a proper macroprudential framework to increase the resilience of the financial system, to dampen the financial cycle, and to stem undue capital flows. Such efforts can also build on the experiences of a number of Asian countries with the adoption of such tools.

### 12.5.3 Asian Participation in Global Authorities

Last but not least, Asian countries could push for further rebalancing and empowerment of global financial standard-setters and authorities (such as the Basel Committee, Financial Stability Board, or the International Organization of Securities Commissions) in order to foster greater convergence at the global level, from which Asia stands to benefit disproportionately. As documented by Véron (2014), Asia is now reasonably represented in the membership of most such global bodies, but not so in their leadership (let alone their geographic location, which remains overwhelmingly European and to a lesser extent North American). Even in terms of membership, further adjustments are desirable: for example, with the advent of the banking union, it is no longer justified that authorities from individual euro-area countries (Belgium, France, Germany, Italy, Luxembourg, the Netherlands, and Spain) continue as full members of the Basel Committee in addition to the ECB and SSM. A system of global bodies with more balanced representation of stakeholder jurisdictions may in turn be given a stronger mandate to set more specific standards, to better monitor their implementation, or even in some cases to directly or indirectly supervise relevant market participants with a global footprint. The EU experience illustrates how a vision of supranational regulation and even of supranational supervision could move from being utopian to being realistic in a matter of a few years: as recently as a decade ago, the very notion of supranational financial supervision in Europe was typically dismissed as a pipe dream, but it is now up and running. While the specific circumstances of the European Union have no equivalent in Asia, Asians might draw inspiration from this experience to consider proactive initiatives to compensate for recent failures of leadership of Europe and the United States, and to promote a more coherent and credible international framework for the effective oversight of an increasingly integrated global financial system.

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# Global Shocks and the New Global and Regional Financial Architecture

## *Asian Perspectives*

In light of the evolving global economic order and the experiences of the global financial crisis of 2008–2009, this book addresses the important question of how Asia's regional architecture for economic and financial surveillance, financial safety nets, and crisis management can be strengthened and meshed with those of the International Monetary Fund (IMF) and the Financial Stability Board to establish an effective mechanism for dealing with economic and financial shocks. This includes shocks emanating from both within the region and those transmitted via contagion from other regions. It assesses the capacity of regional institutions for surveillance and financial safety nets, focusing on the ASEAN+3 Macroeconomic Research Office (AMRO) and the Chiang Mai Initiative Multilateralization (CMIM). It also reviews the potential scope for developing coordinated regional financial regulation in Asia, taking into account the European Union experience with regard to financial supervisory and regulatory architecture and its relevance for Asia. Finally, it examines how the IMF, as a provider of global financial safety nets, can work with regional financing arrangements, including both the CMIM and bilateral swap arrangements.

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**Naoyuki Yoshino** is the dean of the Asian Development Bank Institute and emeritus professor at the Department of Economics, Keio University, Tokyo, Japan.

**Peter J. Morgan** is senior consulting economist and co-chair of research, Asian Development Bank Institute, Tokyo, Japan.

**Pradumna B. Rana** is associate professor and coordinator of the International Political Economy Programme in the Centre for Multilateralism at the S. Rajaratnam School of International Studies, Nanyang Technological University, Singapore.

**ADBI**Press

ASIAN DEVELOPMENT BANK INSTITUTE  
3-2-5 Kasumigaseki, Chiyoda-ku  
Tokyo, 100-6008 Japan  
Tel +81 3 3593 5500  
[www.adbi.org](http://www.adbi.org)