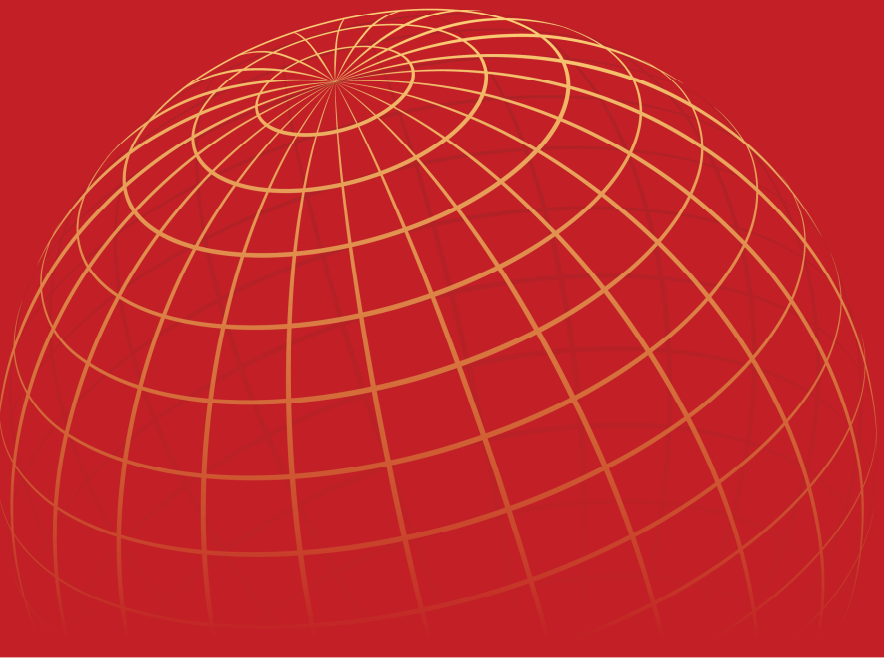


CHAPTER 3

WHO CATCHES A COLD WHEN EMERGING MARKETS SNEEZE?

Since 2010, a synchronous growth slowdown has been underway in emerging markets, especially in some of the largest ones. Given the size and integration with the global economy of the largest emerging markets—the BRICS (Brazil, the Russian Federation, India, China, South Africa)— a synchronous slowdown in these economies could have significant spillovers to the rest of the world through trade and finance. Specifically, a 1 percentage point decline in BRICS growth is associated with lower growth in other emerging markets by 0.8 percentage point, in frontier markets by 1.5 percentage points, and in the global economy by 0.4 percentage point over the following two years. Spillovers could be considerably larger if the BRICS growth slowdown were combined with financial market stress. Adverse growth spillovers present challenges that need to be addressed with both fiscal and monetary policies as well as structural reforms.

Introduction

Growth in emerging markets (EM) has been slowing, from 7.6 percent in 2010, to 3.7 percent in 2015 and is now below its long-run average (Figure 3.1). This slowdown has been highly synchronized across emerging markets, with significant declines in growth in most emerging market regions.[1] In the largest emerging markets—the heterogeneous group of BRICS (Brazil, Russia, India, China, and South Africa)—growth has slowed from almost 9 percent in 2010 to about 4 percent in 2015, on average, with India being a notable exception. This slowdown reflects both easing growth in China, persistent weakness in South Africa, and steep recessions in Russia since 2014 and in Brazil since 2015.

Both external and domestic as well as cyclical and structural factors have contributed to the slowdown in emerging markets (Didier et al. 2015).

- *External versus domestic factors.* On average, external factors have been the main cause of the slowdown between 2010-13. Such factors have included weak global trade after the global financial crisis, falling commodity prices (which have dampened prospects in the half of emerging markets that are commodity exporters), and bouts of financial market turbulence. Since 2014, however, a series of country-specific, domestic shocks have become the main source of the slowdown (Didier et al. 2015). Such country-specific challenges have included a steady slowdown in productivity growth, bouts of policy uncertainty, and shrinking fiscal and monetary policy buffers that have constrained the use of policy stimulus (Box 3.1). Total factor productivity growth, especially, has almost halved in emerging markets to just over 1 percent, on average, in 2010-14 from about 2 percent in 2000-07, on average. This has been only partially offset by higher capital accumulation, including as a result of crisis-related investment stimulus in several large emerging markets.

- *Structural versus cyclical factors.* One-off, cyclical and structural factors have driven the slowdown to varying degrees across countries. On average across emerging markets, longer-term structural factors may have accounted for about one-third of the growth slowdown during 2010-14. In individual countries, however, the contribution of structural factors has ranged from one-tenth to virtually all of the slowdown since 2010.

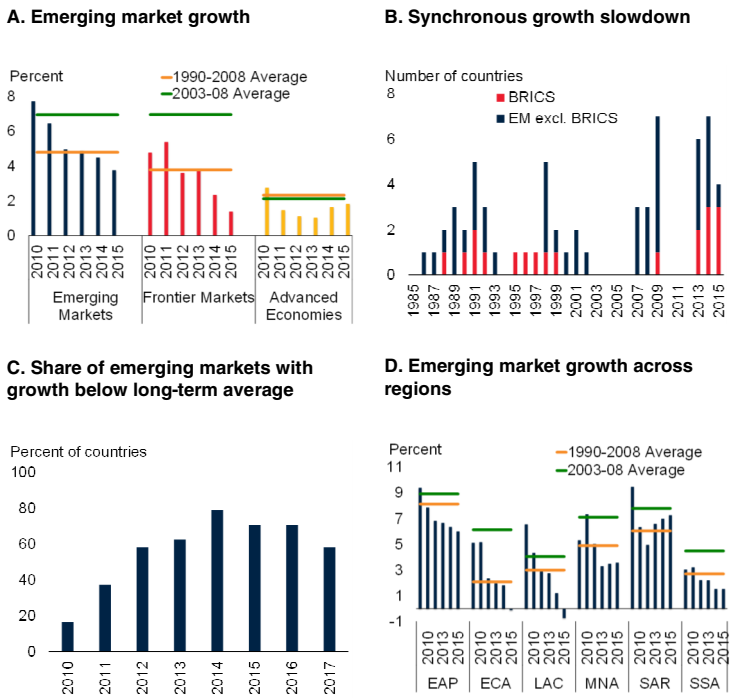
The slowdown follows a decade during which record-high emerging market growth transformed the global economic landscape. Emerging markets accounted for 46 percent of global growth during 2000-08 and 60 percent during 2010-14. By 2014, emerging markets constituted 34 percent of

Note: This chapter was prepared by Raju Huidrom, Ayhan Kose and Franziska Ohnsorge with contributions from Jose Luis Diaz Sanchez, Lei Sandy Ye, Jaime de Jesus Filho, Xiaodan Ding, Sergio Kurlat, and Qian Li.

[1]Emerging markets (EM) generally include countries with a record of significant access to international financial markets. Frontier markets (FM) include countries that are usually smaller and less financially developed than emerging market economies. Therefore, the emerging and frontier market group excludes low-income countries with minimal or no access to international capital markets. The country sample is provided in Annex 3.1.

FIGURE 3.1 Emerging market growth slowdown

Emerging market growth has slowed steadily since 2010, coinciding with a gradual recovery in advanced market economies. The slowdown is broad-based, reaching across regions and affecting an unusually large number of emerging markets for several years, comparable only to previous crisis periods. Unprecedented since the 1980s, the majority of BRICS (Brazil, Russia, India, China, and South Africa) economies are slowing simultaneously.



Source: World Bank Global Economic Prospects and IMF World Economic Outlook.
Note: Due to data availability, FM long-run average for 1990-2008 starts in 1993. GDP data for Czech Rep. are only available from 1990. EM, FM, and AM are defined in Annex 3.1.
A. Weighted average growth.
B. Number of emerging market countries (EM) in which growth slowed for three consecutive years.
C. Long-term averages are country-specific for 1990-2008. Long-term average for the Czech Rep. starts in 1991.
D. EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and Caribbean; MNA = Middle East and North Africa; SAR = South Asia; SSA = Sub-Saharan Africa.

global GDP (in current market prices), more than one-and-a-half as much as they did in 1980 (Figure 3.2). The rising share of the emerging world in the global economy was also reflected in their increased integration into international trade and finance. Emerging markets have become major export destinations for the rest of the world and important sources of remittances, commodity supply and demand, foreign direct investment, and official development assistance.

China is by far the largest emerging market, two-thirds the size of all the other emerging markets combined and twice as large as the other BRICS economies combined. Notwithstanding China's larger size, the broader group of BRICS plays a special role. The BRICS are the largest and most regionally integrated emerging markets in their respective regions and they have been the main source of emerging market growth and integration into the global economy. During 2010-14, the BRICS contributed about 40 percent to global growth, up from about 10 percent during the 1990s. They now account for two-thirds of emerging market activity and more than one-fifth of global activity—as much as the United States and more than the Euro Area—compared with less than one-tenth in 2000.[2]

This chapter studies the following four questions:

- What are the key channels of spillovers from the major emerging markets?
- Do business cycles in BRICS move in tandem with those in other emerging markets and frontier markets?
- How large are spillovers from the major emerging markets?
- What are the policy implications?

Previous studies have typically focused on global growth spillovers from individual BRICS (Box 3.2). The chapter adds to the existing literature on spillovers in four dimensions. First, it extends the analysis to spillovers from a synchronous BRICS slowdown. Second, it includes an explicit comparison of global, regional, and local spillovers from individual BRICS. Third, it systematically differentiates the cross-border spillovers by country groups, including by region and by commodity exporter/importer status. Fourth, in a transparent framework, it examines how turbulence in financial markets can interact with the slowdown in BRICS to generate cross-border growth spillovers.[3]

[2]The economic size of BRICS is much larger in terms of PPP adjusted GDP. BRICS constitute about 30 percent of global activity while the United States constitutes only about 16 percent.

[3]The magnitude of spillovers may depend on the nature of the shock originating in BRICS. Given data limitations, a detailed examination of the sources of the growth shock and its implications goes beyond the scope of this chapter.

The findings are as follows:

- *Channels.* Cross-border economic linkages among emerging markets, and with BRICS specifically, have grown significantly since 2000. Reduced import demand from BRICS would weaken trading partner exports. In particular, reduced commodity demand would dampen growth in commodity exporters. Lower remittances from Russia would reduce household incomes and consumption in neighboring countries. In addition, although not estimated econometrically here, confidence spillovers could be sizeable and affect a larger group of countries (Levchenko and Pandalai-Nayar 2015).

- *Impact.* A 1 percentage point decline in BRICS growth would reduce growth in other emerging markets by 0.8 percentage point and in FM by 1.5 percentage points at the end of two years. The estimated impacts on advanced markets are modest, on average. On balance, a 1 percentage point decline in BRICS growth is estimated to reduce global growth by 0.4 percentage point at the end of two years. Notwithstanding sizeable impacts of growth fluctuations in BRICS on other emerging markets and frontier markets, those from major advanced economies remain larger still.

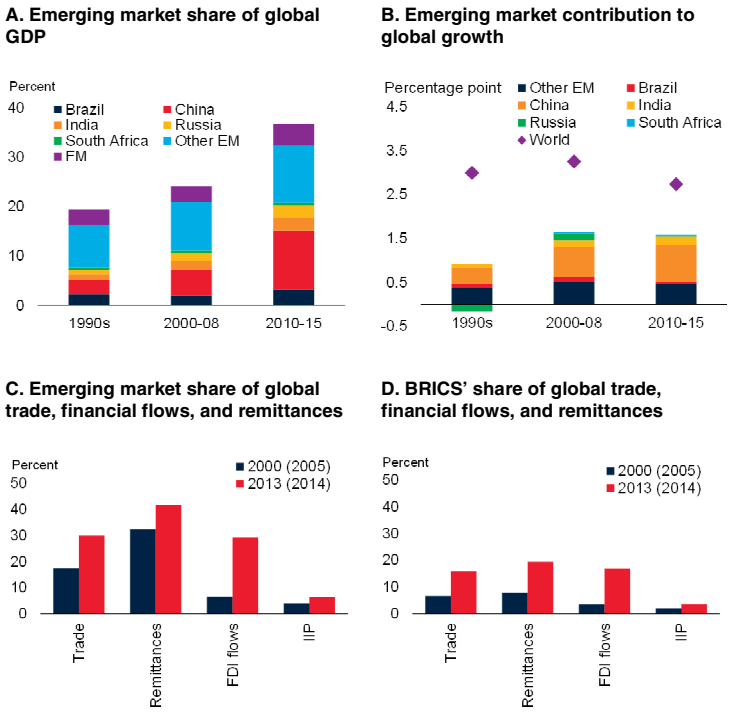
- *Global versus regional effects.* A growth impulse in China would affect growth in other emerging markets in East Asia by about as much as growth in other emerging markets around the world. In contrast, the repercussions of a slowdown in Russia would be mostly confined to Europe and Central Asia. Slowdowns in Brazil, India, and South Africa would mainly affect smaller, neighboring countries.

- *Interacting effects.* Slower-than-expected growth in BRICS could coincide with other strains on the global economy such as bouts of global financial market volatility. If, in 2016, BRICS growth slows further, by as much as the average growth disappointment over 2010-14, instead of picking up as forecast, growth in other emerging markets could fall short of expectations by about 1 percentage point and global growth by 0.7 percentage point. If such a BRICS growth decline scenario were to be combined with financial sector turbulence, e.g. similar to the 2013 "Taper Tantrum," emerging market growth could slow by an additional 0.5 percentage point and global growth by an additional 0.4 percentage point.

- *Policy responses.* The growth slowdown in BRICS has been part cyclical decline from the immediate post-crisis rebound in 2010, part structural slowdown. Hence, a mix of counter-cyclical fiscal or monetary policy stimulus and structural reforms could be used to support activity. A renewed structural reform

FIGURE 3.2 Rising economic significance of emerging markets

Emerging markets have increasingly contributed to global growth since the 1980s. Their rising economic significance is also reflected in other dimensions: trade, financial flows, and remittances.



Sources: World Development Indicators; UNCTAD; Bank for International Settlements; World Economic Outlook.
A. B. EM stands for emerging markets, FM for frontier markets.
C. D. Due to data constraints, global trade (exports plus imports) from 2000 and 2013; remittances (inflows plus outflows) data from 2000 and 2013; foreign direct investment (FDI) flows (inflows plus outflows) from 2000 and 2014; and international investment position (IIP, including direct investment, portfolio investment, financial derivatives, and other investment assets and liabilities) from 2005 and 2013.

BOX 3.1 Sources of the growth slowdown in BRICS

BRICS growth has been slowing since 2010, increasingly because of moderating potential growth. Until 2013, the slowdown was predominantly driven by external factors, but the role of domestic factors has increased since 2014. Deceleration in productivity growth suggests that a return to pre-global crisis rates of BRICS growth is unlikely.

The so-called BRICS (Brazil, Russia, India, China, and South Africa) are the largest emerging markets, accounting for about two-thirds of emerging market GDP. BRICS growth has slowed from almost 9 percent in 2010 to about 4 percent in 2015. By 2015, three of the BRICS (China, Russia, South Africa) had been slowing for three or more consecutive years and Brazil was in a steep recession. Long-term growth expectations in these economies have been repeatedly downgraded since 2010.[1]

A country-specific Bayesian Vector Autoregression (BVAR) model helps quantify some of the sources of this slowdown (Didier et al. 2015).[2] The model explains BRICS growth as a function of domestic factors (domestic inflation, short-term interest rates, and the real exchange rate), and external factors (U.S. growth, 10-year bond yields, China's growth, the EMBI spread, and terms of trade).[3]

An unfavorable external environment—including a terms-of-trade deterioration and U.S. growth setbacks in 2013 and early 2014—appears to have been the main source of the slowdown between 2010 and the first quarter of 2014. However, since then, domestic factors—including rising short-term interest rates and, in China, real appreciations—have been the predominant cause (Figure 3.1.1). Underlying these short-term movements has been a steady decline in productivity growth. Although difficult to measure on a high-frequency and comparable cross-country basis, bouts of political uncertainty have dented investor sentiment in some BRICS.

This box addresses the following questions:

- What have been the external factors driving the BRICS slowdown?
- What have been the domestic factors driving the BRICS slowdown?

External factors

Among the most important external factors are weak global trade, a steady decline in commodity prices since 2011, and tightening global financial conditions. The model indicates that such factors were predominant 2010Q1-2014Q1 (Figure 3.1.1).

Weak trade. During 2000-07, global trade grew at an average annual rate of about 7 percent. Since 2010, however, global trade growth has slowed. By 2014, global trade had fallen 20 percent short of its pre-crisis trend (World Bank 2015a). An outright contraction in the first half of 2015—the first since 2009—reflected falling import demand from emerging markets, including from Asia and Central and Eastern Europe. Five factors have contributed to the weakness in global trade.

- Advanced markets, which constitute about 60 percent of world import demand, have been growing at a rate of less than 2 percent. By 2014, real GDP in the United States and the Euro Area was 8-13 percent below the pre-crisis trend level, and import demand was 22-23 percent below the pre-crisis trend.
- Investment demand in advanced markets has been particularly weak. Since capital goods are typically the most import-intensive component of aggregate demand, the switch in composition has reduced the income elasticity of trade.
- The maturation of global value chains has further reduced the elasticity of trade flows to activity and exchange rates (Ahmed, Appendino, and Ruta 2015).
- Higher capital requirements and tightened financial regulations have reduced banks' willingness to extend trade finance (World Bank 2015a).
- The pace of trade liberalization has slowed since the crisis.

Easing commodity prices. A steady decline in commodity prices has set back growth in commodity-exporting BRICS (Russia, Brazil, and South Africa). Prices of oil and metals have declined by 50-60 percent from their 2011 peaks and are expected to remain low for the next decade (World Bank 2015b, Baffes et al. 2015). Agricultural prices are

Note: This Box was prepared by Lei Sandy Ye.

[1]The average five-year ahead consensus growth forecast of Brazil, China, India, and Russia has decreased from 6.5 percent in 2010 to 4.7 percent in 2015.

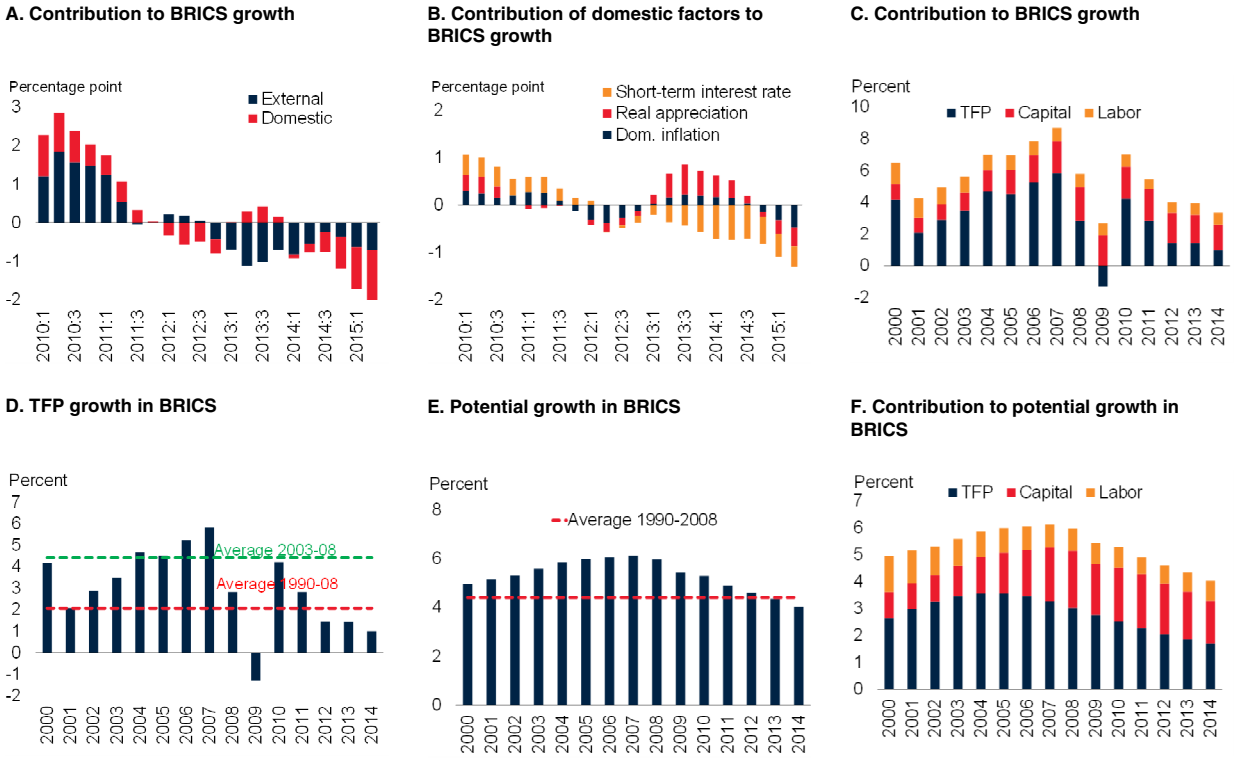
[2]The Bayesian methodology follows Litterman (1986). The sample includes quarterly data for 1998Q1 to 2015Q2 for all BRICS economies.

[3]Estimates for China do not separately include its growth as an external factor.

BOX 3.1 Sources of the growth slowdown in BRICS *(continued)*

FIGURE 3.1.1 Sources of the growth slowdown in BRICS

Since 2010, the drivers of the BRICS growth slowdown have pivoted from external to domestic factors. External drivers included weak global trade and commodity prices and bouts of financial market turmoil. Domestic factors included slowing productivity growth, rising domestic policy uncertainty and eroding buffers that have constrained the use of accommodative policies. TFP growth and potential growth in BRICS have slipped to below pre-global crisis averages.



Source: Didier et al. (2015).
A. B. Each bar shows the percentage point deviation of growth from the sample mean. External factors include U.S. growth and 10-year bond yields, Chinese growth, EMBI spreads, and terms of trade. Domestic factors include domestic inflation, the real exchange rate, and short-term interest rates. Unweighted average contribution to BRICS growth, including China. Based on Bayesian VAR (Didier et al. 2015). The last observation is 2015:2.
C.D.E.F. Unweighted averages.

about 30 percent below their 2011 peaks. This has sharply worsened the terms of trade of Brazil, Russia, and South Africa. Slowing growth in commodity-importing BRICS (China, India) itself contributes to softening commodity prices (World Bank 2015b).

Tighter financing conditions. Net capital flows to BRICS have undergone bouts of volatility, culminating in sharp and sustained capital outflows in the first half of 2015. The decline in net capital flows largely reflected developments in China: in the first half of 2015, portfolio outflows from China rose ten-fold and net other investment inflows fell by four-fifths from the second half of 2014. Remittance inflows to BRICS have also slowed sharply, from a rate of increase of 15.4 percent in 2010 to under 3 percent in 2015.

The volatility of capital flows to BRICS has weighed on investment. Since 2010, investment growth in BRICS has slowed from 16 percent in 2010 to 5 percent in 2014. A series of country-specific factors have contributed to this, including political and geopolitical uncertainty, structural bottlenecks and uncertainty about major reform initiatives. The slowdown in remittances may directly impact consumption in these economies (World Bank 2015a).

Domestic factors

Domestic factors include a sustained productivity slowdown and bouts of policy uncertainty. The BVAR results suggest that since 2014Q1 these have overtaken external factors as the main contributors to decelerating BRICS output (Figure 3.1.1).

BOX 3.1 Sources of the growth slowdown in BRICS *(continued)*

Productivity growth slowdown. Domestic factors accounted for a sizable share of the slowdown in BRICS, especially since early 2014. These included a productivity slowdown. Using a production function approach, GDP growth may be decomposed into the contributions of total factor productivity (TFP), and the individual factors of production (Didier et al. 2015). Based on this decomposition, slowing BRICS growth has mostly reflected slowing TFP growth (Figure 3.1.1). Since 2012, TFP growth in BRICS has been below its historical average during 1990-2008. Slowing TFP growth has also been reflected in declining potential growth.

Uncertainty. Bouts of uncertainty in BRICS have weighed on investment. This was associated with periods of stock market and currency volatility. Looking ahead, if heightened policy, and especially political, uncertainty persists, it may constrain policymakers' ability to support growth. Counter-cyclical fiscal and monetary policies may be harder to implement when investors focus on rising uncertainty or widening vulnerabilities or both. Capital outflows and depreciations amidst weakening confidence may limit the effectiveness of counter-cyclical policies in lifting activity. Structural reforms also often stall amidst political uncertainty.

Eroding policy buffers. Since the crisis, the fiscal positions of BRICS have deteriorated considerably. On average, their fiscal balance has weakened from near-balance in 2007 to -4 percent of GDP in 2014. In South Africa, debt has increased by about 19 percentage points of GDP since 2007, and Brazil and India's debt levels are in excess of 60 percent of GDP. Monetary policy space has diverged between commodity exporters and importers. In Brazil and Russia, monetary policy is constrained by above-target inflation, partly as a result of depreciation. In contrast, low oil prices have reduced inflation and increased room for rate cuts in China and India. However, this room may diminish if inflation rebounds once oil prices stabilize.

Conclusion

The factors driving the growth slowdown in BRICS are likely to remain in place, although sharp recessions in Brazil and Russia are expected to begin to ease in 2016. The external environment is likely to remain challenging for emerging markets. As global supply chains mature, the advanced market recovery remains fragile, and emerging market growth remains reliant on government support, trade is likely to remain weak. Large investments worldwide in commodity production over the past decades are likely to keep downward pressure on commodity prices.

Domestic policy environments may become increasingly constrained as weak growth erodes the resilience of private and public balance sheets. Aging populations may dampen potential growth. Weak growth prospects are likely to continue to weigh on investment, which may, in turn, slow the technological progress required to sustain high productivity growth. A combination of countercyclical policies and structural reforms are needed to reinvigorate growth.

push could help lift growth prospects and, to the extent it encourages investment, support domestic demand, as well as help improve investor sentiment and capital flows. This would be especially useful for countries that have limited room for expansionary fiscal and monetary policies.

What are the key channels of spillovers from the major emerging markets?

A growth slowdown in emerging markets, in particular in one or several of the BRICS, could have significant spillover effects given their share of global output and growth. They have become important export markets and significant sources of remittances. Some of them also supply foreign direct investment (FDI) and official development assistance (ODA) to other emerging markets, frontier markets, and low-income countries (LIC) as well as advanced markets.

Global output and growth. Since 2000, emerging markets have accounted for much of world growth. During the pre-crisis years of 2003-08, emerging market growth averaged 7.1 percent, well above its long-term average of about 5 percent. During the crisis, global activity was shored up by emerging markets, despite a sharp slowdown in 2008. Partly as a result of large-scale

stimulus in the largest emerging markets, they continued to grow in 2009, when the rest of the world contracted, and they expanded strongly in 2010. Frontier markets have grown almost as rapidly as emerging markets since 2000, though from a smaller base, to 4.6 percent of global GDP in 2014.

Global trade. Emerging markets now account for 32 percent of global trade (compared with 16 percent in 1994). This has partly reflected their deepening integration into global supply chains. For example, the value added from emerging markets embedded in U.S. or Euro Area exports nearly doubled to about 7 percent in 2011 from 3 percent in 2000. Among emerging markets, the BRICS have accounted for most of the increase in trade flows to emerging markets and frontier markets between 2000 and 2014 (Figure 3.3). Most of the emerging markets' value-added trade with other emerging markets and frontier markets is with the BRICS. As the largest economies in their respective developing country regions, the BRICS also account for a sizeable share of regional exports.

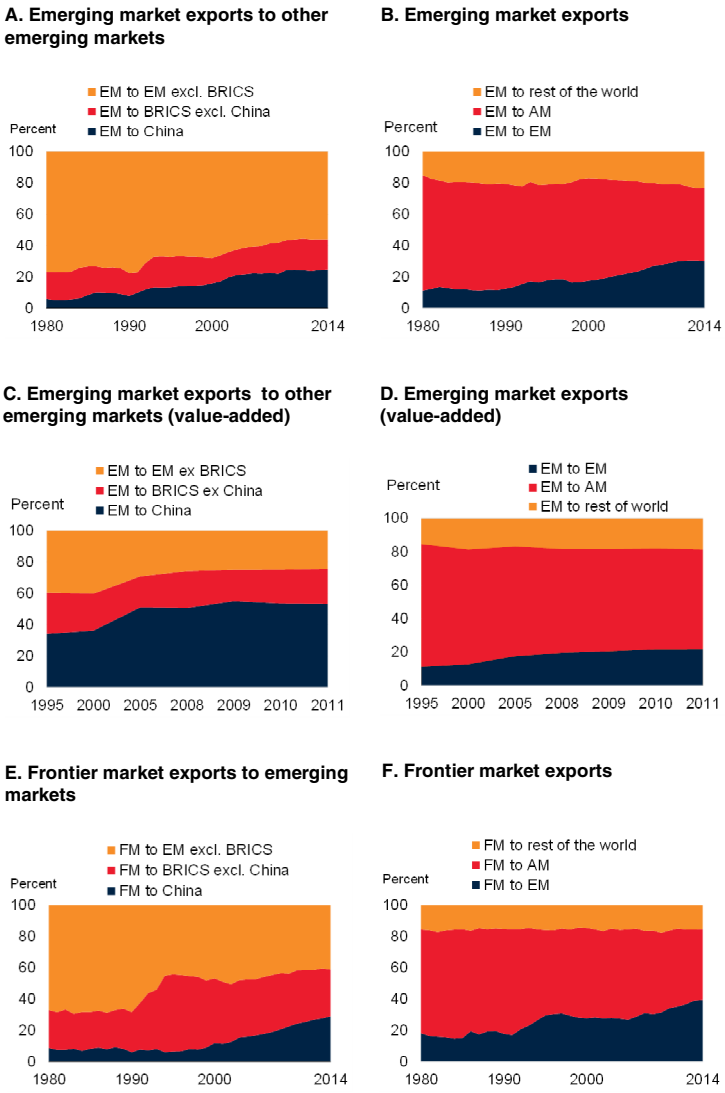
Global commodity markets. BRICS have played a significant role in global commodity markets (World Bank 2015c). Rapid growth in China's industrial production through the 2000s was accompanied by a sharp increase in demand for metals and energy. Virtually all of the increase in global metals demand and more than half of the increase in global primary energy demand between 2000 and 2014 originated in China (Figure 3.4).[4] India's demand for primary energy and metals has also grown rapidly but less than China's, partly as a result of more services-based growth (World Bank 2015b). Large emerging market and frontier market commodity producers have benefited from this increased demand for their products. For several commodities, a few individual emerging markets and frontier markets accounted for 20 percent or more of global exports (e.g. Indonesia for nickel, aluminum and coal; Chile for copper; Russia for oil; and Brazil for iron ore and soybeans; World Bank 2015c).

During the 2000s, high prices and improved technology encouraged the development of new capacity, including U.S. shale oil production, new copper mines in Eritrea and new oil fields in

[4]Chinese demand for agricultural commodities has grown in line with global demand. In general, demand for metals and primary energy tends to be highly income elastic whereas demand for agricultural commodities tends to have low income elasticities but grows in line with population (World Bank 2015b).

FIGURE 3.3 BRICS in EM and FM trade

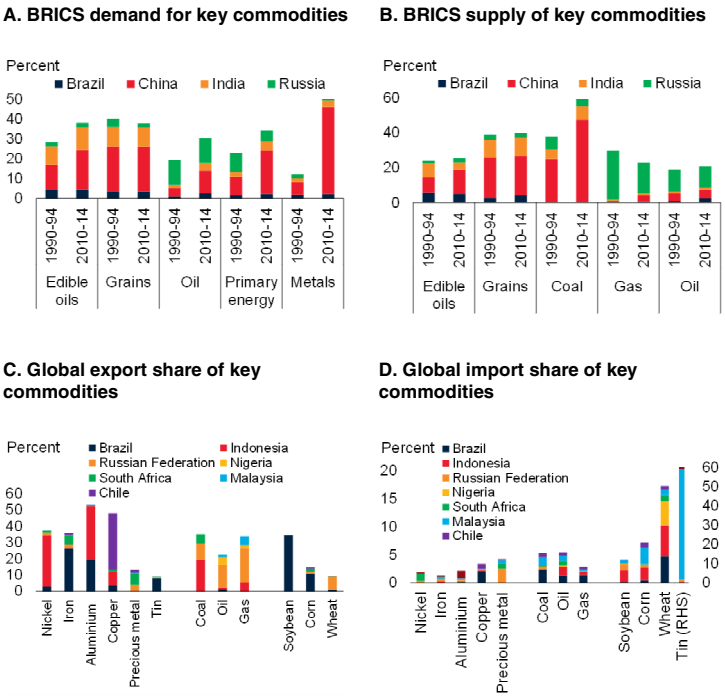
Among emerging markets, trade linkages with BRICS, especially China, have increased in the last two decades. Advanced markets continue to be important trading partners for emerging markets.



Sources: Direction of Trade Statistics (DOTS); OECD Trade in Value Added (TiVA) database; World Bank.
Note: EM stands for emerging markets, FM stands for frontier markets, AM stands for advanced markets.
C. D. Data only available for 1995, 2000, 2005, and 2008-11.

FIGURE 3.4 Commodity demand and supply

China, and to a lesser extent, India, are major sources of demand for key commodities. In addition, China is a major source of global coal production, and Russia, of oil and gas.



Sources: BP Statistics Review; U.S. Department of Agriculture.
C. D. Share of each emerging market in total global exports and imports of each commodity, average 2008-13. Includes exports and imports of ores (e.g. bauxite) and oil products.

Myanmar (Baffes et al. 2015, World Bank 2015c). The commodity super-cycle, however, began to unwind in early 2011 when most commodity prices began to slide as new capacity came onstream at the same time as growth in major emerging markets increasingly tilted away from commodity-intensive industrial production. Oil prices were initially kept high by OPEC production cuts but, in the second half of 2014, halved with OPEC's policy shift towards targeting market share.

Global finance. Emerging markets have started playing a major role in a wide range of global financial flows, including foreign direct investment, banking and portfolio investment, remittances and official development assistance.

- *Foreign direct investment* (FDI). Since emerging market growth prospects remain better than those in many advanced markets, emerging markets have attracted a large amount of FDI (30 percent of global FDI inflows, on average during 2000-14). Most of this amount, about two-thirds, has been received by the BRICS. Among BRICS, China is not only the single largest recipient country of FDI inflows, it has also become an important source country for FDI, especially in Sub-Saharan Africa and other natural resource-producing countries (World Bank 2015c).

- *Banking and portfolio investment.* Although from a low starting point, bank claims and portfolio investment to emerging markets have doubled since the early 2000s to about 6 percent and 5 percent of global GDP, respectively. As with FDI, BRICS account for a sizeable portion of these flows. From a much smaller base, global banking flows to frontier markets have also risen, to 1 percent of global GDP in mid-2015.

- *Remittances.* Emerging markets are now among the largest source and destination countries for remittances, accounting for 40 percent of global remittance in- and outflows. Five emerging market and frontier market source countries (Kuwait, Qatar, Russia, Saudi Arabia, and United Arab Emirates) account for 20 percent of global remittance outflows. Emerging market and frontier market recipient countries such as Egypt, India, Nigeria, Philippines, Pakistan, and Vietnam account for 28 percent of global remittance receipts. Remittances from the BRICS are significant, particularly for the ECA and SAR regions (Figure 3.5).

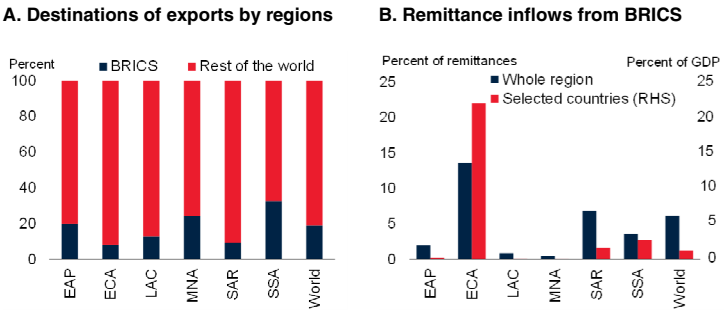
- *Official development assistance* (ODA). The GCC countries, especially Saudi Arabia, Kuwait and the United Arab Emirates, provided significant ODA to Egypt in 2010-14 (on the order of 7 percent of GDP in Fiscal Year 2013/14). China has become an important source for Sub-Saharan Africa while India is providing ODA to Bhutan amounting to 37 percent of GDP in Fiscal Year 2015/16 (World Bank 2015c).

Do business cycles in BRICS move in tandem with those in other emerging markets and frontier markets?

The rising role of BRICS in the world economy suggests that growth fluctuations in their economies could lead to sizeable spillovers to other emerging markets and frontier markets. As the group of emerging and frontier markets has established stronger intra-group trade and financial linkages, common movements in their business cycles have become more pronounced. Growth fluctuations in major emerging markets tend to lead growth in other emerging markets and frontier markets. In addition, growth slowdowns in major emerging markets have been associated with lower growth in other emerging markets and frontier markets and, to a much lesser extent, in advanced markets.

FIGURE 3.5 BRICS in regional trade and remittances

Exports to BRICS are particularly high in EAP, MNA, and SSA regions. BRICS constitute a major source of remittance flows to other emerging markets, especially in ECA and SAR.



Sources: Direction of Trade Statistics (DOTS); World Bank.
Notes: EAP = East Asia and Pacific, ECA = Europe and Central Asia, LAC = Latin America and Caribbean, MNA = Middle East and North Africa, SAR = South Asia, and SSA = Sub Saharan Africa. Graphs use 2014 data for countries of all income categories.
B. Blue bars "Region" show remittance inflows from BRICS into each region. Red bars "Countries (RHS)" show remittance inflow to the three countries with the largest remittance inflows from BRICS (in percent of GDP). The three countries are Kiribati, Mongolia, and Philippines in the EAP region; Armenia, Kyrgyz Republic, and Tajikistan in the ECA region; Bolivia, Guyana, and Paraguay in the LAC region; Egypt, Jordan, and Lebanon in the MNA region; Bangladesh, Nepal, and Pakistan in the SAR region; and Lesotho, Mozambique, and Swaziland in the SSA region.

Emergence of an emerging-frontier market business cycle. The drivers of business cycles can be decomposed into global, group, and country-specific factors. This decomposition exercise is conducted for a sample 106 countries (advanced markets, emerging markets and frontier markets, and other developing countries, Annex 3.1). The global factor represents business cycle fluctuations that are common to all countries and to output, investment and consumption. The group-specific factor captures fluctuations that are common to a particular group of countries, in this case to the group of emerging and frontier markets, and the group of advanced markets and the group of other developing countries.

The degree of business cycle synchronization among emerging and frontier markets is captured by the contribution of the factor specific to emerging-frontier markets (EM-FM-specific factor) to variations in their growth. The EM-FM factor explained a small part of growth fluctuations before the 1980s, when emerging and frontier markets were little integrated with each other (and with the global economy). Since then, a common EM-FM-specific factor has emerged that now accounts for about a quarter of the variation in growth in emerging and frontier markets—almost as much as the global cycle (Figure 3.6).[5] These results suggest that a more pronounced EM-FM business cycle has emerged over time. Hence, the risk has increased that adverse developments in BRICS could be a source of a broader synchronous downturn across the EM-FM group.

Higher synchronization of growth fluctuations. Since the global financial crisis, BRICS growth has become increasingly correlated with growth in other emerging markets and frontier markets, but also with growth in advanced markets. Lead correlations—correlations between BRICS growth and other emerging market, frontier market, and advanced market growth *in the subsequent quarter*—are sizeable, suggesting the possibility of spillovers from BRICS growth to these countries (Figure 3.7). In contrast, lag correlations with BRICS growth and other countries are generally small.

[5]Business cycle synchronization here is analyzed in terms of output comovement. The results generally extend to consumption and investment as well. Business cycle co-movement could reflect both the greater trade and financial linkages between emerging and frontier markets that are discussed in the previous section and greater co-movement with common external factors.

BOX 3.2 Understanding cross-border growth spillovers

Growth spillovers can operate via trade and financial linkages. The confidence channel—consumer and business sentiment—can also be an important mechanism for cross-border spillovers of growth. The empirical literature finds sizeable spillovers from China for countries with close trade ties, e.g. countries in the EAP region, Japan and Germany among the advanced markets, and commodity exporters. Growth in Russia and Brazil tends to affect growth of their neighbors and those with whom they have strong trade and remittance linkages.

This box discusses cross-border transmission of shocks to growth and examines empirical estimates of the size of these spillovers.

Transmission channels

Trade channel. A growth slowdown can reduce growth in trading partner countries directly by lowering import demand and, indirectly, by lowering growth in third countries or by slowing technological advances and productivity growth intrinsic to imports (Kose, Prasad, and Terrones 2009; Jansen and Stockman 2004).

While this suggests greater spillovers between countries with closer trade ties, in principle, the opposite can arise when mutual trade generates particularly strong specialization. For example, close trade ties can result in heavy specialization in goods in which countries have a comparative advantage. As countries become heavily reliant on individual industries, they may become more sensitive to industry-specific shocks, with less correlation in broader growth between trading partners (Frankel and Rose 1998).[1]

Financial channel. A growth slowdown can reduce portfolio investment and foreign direct investment outflows to other countries. Arbitrage between different global financial systems could quickly propagate shocks from one country to another (Kose, Otrok, and Whiteman 2003; Doyle and Faust 2002). Rising banking sector cross-border exposures also raise the potential for growth spillovers (IMF 2014). Reduced financial flows could set back investment growth and longer-term growth potential in destination countries. International remittances may also transmit spillovers, as they tend to vary with incomes in sending countries. Some low- and lower-middle-income countries that rely heavily on remittance inflows are particularly vulnerable to disruptions in foreign labor markets that reduce remittances (Dabla-Norris, Espinoza, and Jahan 2015).

While this suggests greater spillovers between countries with larger mutual financial flows, the opposite is, in principle, also possible if incentives to diversify risk internationally are sufficiently strong. For example, if investors are concerned about growth setbacks in one country, they may choose to increase their investments in others with better growth prospects. As a result, capital could flow out of countries with negative growth shocks and into less-affected countries where it would lift activity (Canova and Marrinan 1998; Kalemli-Ozcan, Sørensen, and Yosha 2003; Imbs 2004; Heathcote and Perri 2004).

Commodity channel. A growth slowdown in a major commodity-importing country could reduce global commodity demand and reduce global commodity prices. This would set back investment and growth in commodity exporting countries around the world, even those without direct trade relations with the source country of the shock (Kose and Riezman 2001; Eicher, Schubert, and Turnovsky 2008; Broda and Tille 2002; World Bank 2015a).

Confidence channel. Trade, financial, and commodity channels do not appear to explain the unprecedented severity and cross-country synchronization of contractions and slowdowns in the global financial crisis of 2007-09 (Kalemli-Ozcan, Papaioannou, and Perri 2013; Bacchetta and van Wincoop 2014). In addition to direct economic ties, consumer and business sentiment (over and above developments in underlying fundamentals)—i.e., the confidence channel—can be an important transmission mechanism for cross-border spillovers (Levchenko and Pandalai-Nayar 2015).

Identifying the individual effects of each of these transmission channels is empirically challenging, and the literature has mostly focused on aggregate effects. The importance of each transmission channel likely depends on the nature of the underlying shock although the debate on the relative importance of different shocks is not yet settled.[2] This box focuses on the aggregate effects of growth spillovers without dwelling on their fundamental drivers.

Note: This Box was prepared by Raju Huidrom.

[1]For a detailed discussion, see Kose and Terrones (2015).

[2]For instance, Mendoza (1995) and Kose (2002) attribute a sizable portion of output fluctuations to international shocks through the terms of trade, while a part of the real-business-cycle literature focuses on the effects of technology shocks.

BOX 3.2 Understanding cross-border growth spillovers *(continued)*

Empirical estimates of spillovers

Advanced economies. Monfort et al. (2003) find sizeable co-movement in output among the G-7 economies during 1972-2002. Before 1985, a large part of this co-movement can be explained by common shocks (e.g., oil price swings), while in the period after 1985 spillovers, especially from North America to Europe, have become more dominant. Stock and Watson (2005) find sizeable spillovers among G7, accounting for 5-15 percent of the variance of growth depending on the country and the period examined. They, however, find that both overall co -movement and spillovers have declined since 1985, possibly reflecting lower volatility of shocks in the later period (the pre-global crisis "great moderation"). Yilmaz (2009) finds sizeable spillovers from the United States to other advanced economies, especially during the global financial crisis. Financial shocks from the United States appear to be transmitted particularly rapidly to the Euro Area (Dees et al. 2007).

Emerging markets. The literature has focused on spillovers from large EM, often with a regional perspective (Annex 3.3). For the EAP region, spillovers from China are significant, especially for EAP countries integrated into Chinese supply chains (Japan, Singapore, Malaysia and Thailand), and for commodity exporters that are less diversified, e.g. Indonesia (Duval et al. 2014; Inoue, Kaya, and Ohshige 2015; Ahuja and Nabar 2012). Beyond EAP, growth spillovers from China are also significant for Latin American countries, especially for commodity exporters (World Bank 2015a). The spillover implications of China for advanced markets and global growth are generally found to be modest (Ahuja and Nabar 2012; IMF 2014b). Among the advanced economies, Germany and Japan are most affected (Ahuja and Nabar 2012).

In the ECA region, Russia seems to influence regional growth mainly through the remittance and—albeit decreasingly—through the trade channel and somewhat less through the financial channel. Russian growth shocks are associated with sizable effects on Belarus, Kazakhstan, Kyrgyz Republic, Tajikistan, and, to some extent, Georgia (Alturki, Espinosa-Bowen, and Ilahi 2009). That said, growth spillovers from the rest of the world to ECA countries tend to be larger than those from Russia, reflecting declining trade and financial integration with Russia and increased ties to the European Union (Andrle, Garcia-Saltos, and G. Ho 2013; Ayvazyan and Dabán 2015; Obiora 2009).

South African growth has a substantial positive impact on *long-run* growth in the rest of Africa (Arora and Vamvakidis 2005). *Short-run* spillovers from South Africa, however, are not significant, even to neighboring countries (IMF 2012a). South Africa's trade with the rest of the continent has been limited despite some increase since 1994, in part reflecting trade patterns that prevailed under the apartheid regime that ruled South Africa until 1994. There are significant growth spillovers effect to African economies from both the Euro Area and the BRICS (Gurara and Ncube 2013), with spillovers from the Euro Area exceeding those from the BRICS.

Latin America is characterized by the presence of two large countries (Brazil and Mexico) that may affect smaller neighboring economies significantly (IMF 2012b). Spillovers from Brazil to some of its neighbors can be considerable, both by transmitting Brazil-specific shocks and by amplifying global shocks. Southern Cone countries (Argentina, Bolivia, Chile, Paraguay, and Uruguay), given their sizeable export linkages, are particularly vulnerable to spillovers from Brazil. In the Andean region, however, trade linkages with Brazil are generally weak. Likewise, reflecting Central America's modest trade linkages with Mexico, growth spillovers from Mexico are modest (Adler and Sosa 2014).

Low income countries (LIC) have become increasingly integrated with emerging markets, through stronger trade links, rising cross-border financial asset holdings and capital flows, and higher remittance flows (Dabla-Norris, Espinoza, and Jahan 2015).[3] In particular, emerging markets are an important source of remittances for LIC, especially within their own region – e.g. India for LIC in Asia, Russia for LIC in ECA, and Saudi Arabia for LIC in MNA. This was most evident in the aftermath of the global financial crisis, when recovery in many LIC mirrored the economic rebound in emerging market trading partners (IMF 2010).

[3]Informal sector trading links are also important for LIC as a channel of transmission (IMF 2012a).

Lower growth during slowdowns in BRICS. An event study suggests that slowdowns in BRICS have been accompanied by lower growth in other emerging markets and frontier markets and, to a much lesser extent, in advanced markets. There were seven slowdown episodes which are defined as troughs in BRICS growth over five-quarter rolling windows from 1997Q2-2015Q1.[6] During these episodes, BRICS growth was, on average, about 2 percent, compared with the long-run average of 5 percent. Although there is wide variation, median emerging-frontier market growth fell by almost a percentage point during these BRICS slowdowns, and median advanced market growth eased by about one-quarter percentage point (Figure 3.8). BRICS growth shocks appear to have been at least partly transmitted through declining imports. Commodity prices—especially energy prices—decelerated sharply, and emerging-frontier market export growth slowed during these episodes.

These findings together point to the possibility of significant growth spillovers from the BRICS to other emerging and frontier markets. However, the growth slowdowns in other emerging markets and frontier markets during episodes of lower growth in BRICS may have been pure coincidence, or the result of a common external adverse shock. The next section presents a formal econometric analysis of growth spillovers from BRICS that addresses these concerns.

How large are the spillovers from the major emerging markets?

In order to quantify growth spillovers from BRICS to the global economy and to other emerging markets and frontier markets, a structural vector autoregression (VAR) model, with a recursive identification scheme, is estimated for 1998Q1–2015Q2. The model includes growth in G7 countries as a measure of activity in advanced markets; proxies for global financial conditions (U.S. 10-year sovereign bond yield and EM Bond Index EMBI); growth in BRICS; oil prices; growth in emerging markets excluding BRICS; and growth in frontier markets.[7] Spillovers are inferred by tracing out the responses to a one-off exogenous shock to BRICS growth that reduces it by 1 percentage point on impact.[8]

Spillovers from BRICS. A growth slowdown in BRICS could reduce global growth and, especially, growth in other emerging markets and in frontier markets. On average, a 1 percentage point decline in BRICS growth could, over the following two years, reduce global growth by 0.4 percentage point, growth in other emerging markets by 0.8 percentage point and growth in frontier markets by 1.5 percentage points (Figure 3.9).[9] The stronger response of frontier markets to BRICS growth fluctuations may reflect the smaller size and greater openness of most frontier markets than emerging markets.[10]

In contrast, the estimated impact on G7 growth is, on average, modest and statistically insignificant in the structural VAR model. This may reflect both pro-active countercyclical policy in G7 countries and their net oil-importing status. G7 central banks tend to respond to external shocks, including those from BRICS, with accommodative monetary policy. To the extent that this is not fully controlled for, measured spillovers are small (Bodenstein, Erceg, and Guerrieiri 2009). Furthermore, as net oil importers, G7 economies tend to benefit from the

[6]The seven episodes identified are 1998Q1, 2000Q4, 2003Q1, 2004Q4, 2006Q2, 2008Q4, and 2011Q3. For instance, the 1998 episode corresponds to the Russian crisis; 2008 to the global financial crisis; and 2011 to the recent growth slowdown episode.

[7]The VAR methodology follows World Bank (2015a, 2015b). Technical details of the VAR model are provided in Annex 3.2. The recursive identification scheme requires quarterly data and hence spillover analysis in this chapter is limited to those countries for which quarterly data is available. The list of countries and their categorization is provided in Annex 3.1. As is usual in standard (linear) VARs, these estimates do not capture highly disruptive shocks that trigger confidence effects, financial market swings, or policy responses to amplify growth impacts.

[8]The shock is quite persistent. BRICS growth declines by about 2.5 percentage points in cumulative terms at the end of two years due to the impact of the shock.

[9]Using a panel regression framework, Akin and Kose (2008) also find intensive intra-group growth spillovers among emerging markets.

[10]The group of frontier markets in this sample is dominated by one commodity importer (Romania) which accounts for about 45 percent of frontier market GDP.

lower oil prices induced by a BRICS slowdown. That said, slowdowns in BRICS can weigh on growth in individual advanced markets that have strong trade links with the BRICS, notably Germany and Japan. Confidence effects—although not explicitly captured econometrically here—could also amplify spillovers as discussed in detail later.

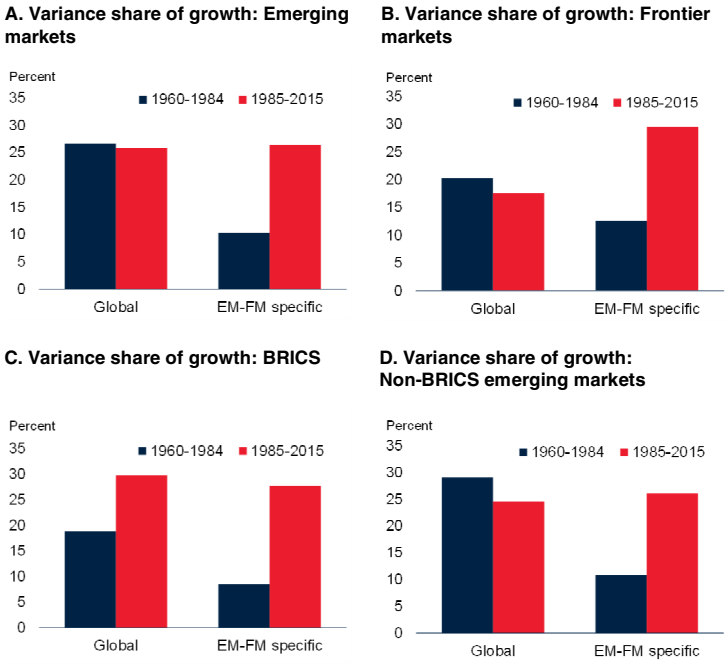
While rapid growth in BRICS has buttressed global growth, its synchronous deceleration since 2010 (India recently being the exception) has contributed to the slowdown in other emerging markets and frontier markets. In China, policies have helped rein in growth in excess capacity sectors. Geopolitical tensions, sanctions, and falling oil prices in Russia and falling commodity prices and political tensions in Brazil have weakened investor sentiment. In South Africa, energy bottlenecks and labor unrest have weighed on growth. The associated slowdowns (China, South Africa) and recessions (Brazil, Russia) have dampened imports (including commodity imports) from trading partners, remittances to Central Asia, and FDI flows from major emerging markets. In a decomposition of historical contributions to growth, the BRICS slowdown since 2010 appear to have accounted for the bulk of the growth slowdown in other emerging markets and frontier markets between 2010 and 2015.[11]

Spillovers from G7. Spillovers from BRICS remain smaller than those from advanced markets (Figure 3.10). After two years, a decline in G7 growth reduces emerging market growth by one-

[11]Because of lack of sufficiently long time series of quarterly data for low-income countries, the estimations here are restricted to emerging and frontier markets. Other studies have estimated spillovers based on annual data—in which shocks are less clearly defined—and found that growth shocks in major emerging markets can have a similarly large impact on low- and lower-middle-income country growth. During 1980-2010, a 1 percentage point decline in growth in BRICS, Mexico, Saudi Arabia and Turkey may have reduced growth in low- and lower-middle-income countries in Sub-Saharan Africa, the Middle East and North Africa, and in Europe and Central Asia by 0.5-1 percentage point in the same year (Dabla-Norris, Espinoza and Jahan 2015). During 1970-2008, a 1 percentage point decline in BRIC growth may have reduced growth in oil-exporting low- and lower-middle-income countries by about 0.7-1.4 percentage points over the following two years and in oil-importing ones by about 0.2-0.6 percentage point (Samake and Yang 2014).

FIGURE 3.6 Emergence of emerging and frontier market business cycle

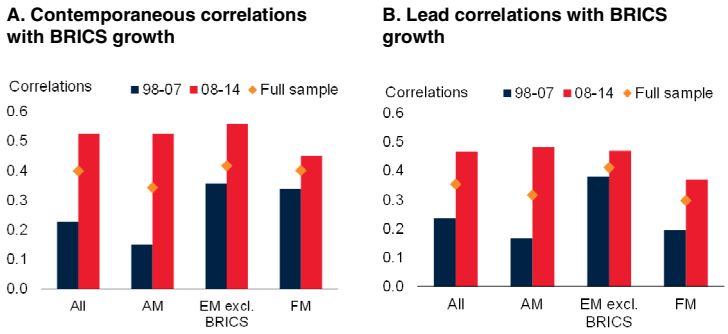
Business cycles among emerging and frontier markets have become increasingly synchronous, reflecting the increased integration of these economies into global and regional trade and financial flows. A significant portion of this synchronicity is explained by an emerging and frontier market (EM-FM) specific factor.



Source: World Bank staff estimates.
Note: A dynamic factor model is separately estimated over the two periods, 1960-1984 and 1985-2015, using a sample of 106 countries grouped into three regions: advanced markets (AM), emerging and frontier markets (EM-FM), and other developing countries. Variance decompositions are computed for each country and, within each country, for output in each of these two periods. Each bar then represents the cross-sectional mean of the variance share attributable to the global factor and the EM-FM-specific factor among the emerging markets (EM) and frontier markets (FM).

FIGURE 3.7 Role of BRICS in business cycle synchronization

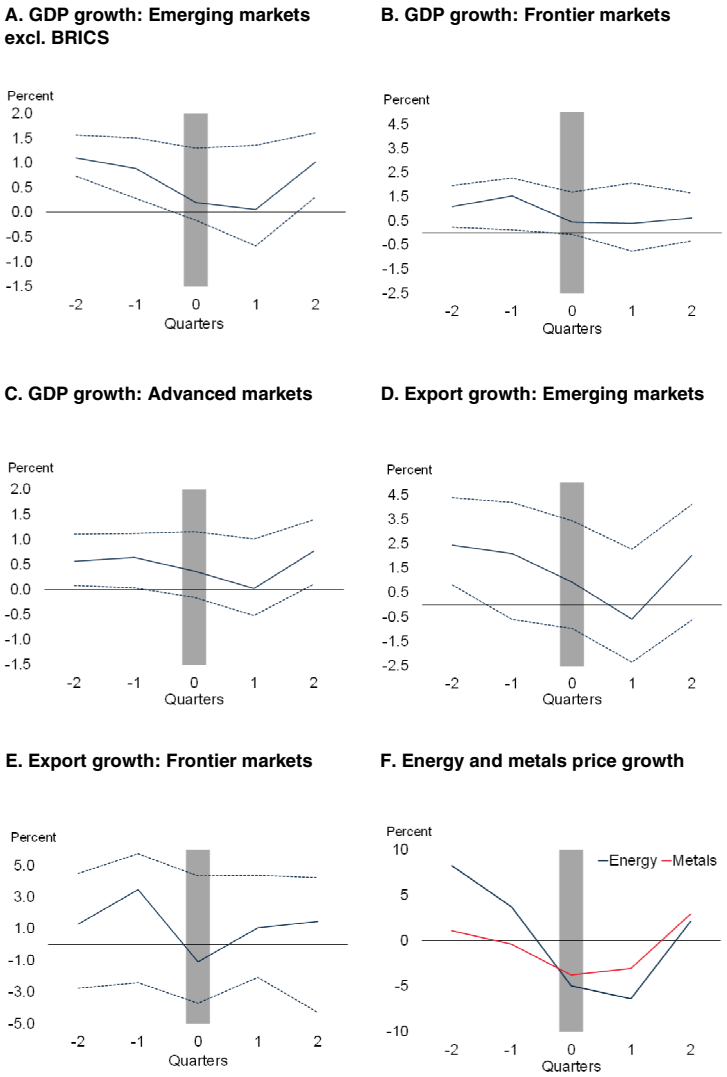
BRICS growth tends to lead growth in other emerging and frontier markets, suggesting the possibility of spillovers from BRICS to these countries.



Sources: Haver Analytics; World Bank staff estimates.
Note: EM stands for emerging markets, FM stands for frontier markets, AM stands for advanced markets. For each group, the figures refer to the cross-sectional average correlation coefficient between BRICS growth and individual countries in that group. Lead correlations refer to correlations with BRICS growth and growth in the rest of the countries in the subsequent quarter. Estimates are based on quarterly data for 1997Q2-2015Q1 for 56 countries.

FIGURE 3.8 Growth slowdown in BRICS

Growth slowdowns in BRICS are associated with slowdowns in the other EM, FM, and to a lesser extent, AM. Such slowdowns are also associated with falling exports and commodity prices.



Sources: Haver Analytics; World Bank staff estimates.
Note: The graphs show GDP, export, and commodity prices growth in the quarters around a growth slowdown event in BRICS (t=0) indicated by the solid bar. Slowdown events are defined as troughs in BRICS growth over a 5-quarter rolling window. There are seven GDP slowdown events during 1997Q2-2015Q1. They are 1998Q1, 2000Q4, 2003Q1, 2004Q4, 2006Q2, 2008Q4, 2011Q3. The solid line refers to cross-sectional mean growth and the dotted lines refer to the 25th and 75th percentiles. There is one slowdown event during the global financial crisis of 2008-09; results are generally robust when that event is excluded.

third more and frontier market growth by one-half more than a similarly sized growth slowdown in BRICS. Over the sample period, G7 growth shocks explain about 30 percent of the variation in emerging and frontier market growth at the two-year horizon, compared with 10 percent and 7 percent, respectively, explained by BRICS growth shocks. This is true for both aggregate emerging market growth (excluding BRICS) and frontier market growth as well as for growth in most individual emerging and frontier markets in the sample used here.

Stronger spillovers from G7 countries reflect their larger economic size. While the BRICS account for one-fifth of global GDP, G7 countries account for almost half of global GDP. In addition, G7 countries account for a larger share of global trade and play a central role in global finance.[12] Financial flows can quickly transmit shocks originating in G7 economies around the world.

Spillovers from individual BRICS. In order to analyze spillovers from individual BRICS, the VAR model is re-estimated by replacing aggregate BRICS growth with growth in each BRICS economy, one at a time. The magnitude of spillovers varies across the BRICS (Figure 3.11).[13] A 1 percentage point decline in China's growth could reduce growth in non-BRICS emerging markets by 0.5 percentage point and in frontier markets by 1 percentage point over two years whereas a similar shock in Russia would reduce growth in other emerging markets by 0.3 percentage point. Spillovers from a growth shock in Brazil to other emerging markets would be much smaller and to frontier markets, statistically insignificant. In general, spillovers from India and South Africa to other emerging markets and frontier markets would be much smaller and/or statistically insignificant.[14]

The magnitude and reach of spillovers from major emerging markets reflect their size and integration. In current dollar terms, China's economy is more than four times the size of the next-largest BRICS economy (Brazil); its imports are six times the size of those of Russia; and its demand for primary energy and metals is four to ten times the size of that of India.

[12]At end-2014, more than half of global banking assets and liabilities were on G7 country banks' balance sheets. The G7 accounted for one-third of global foreign direct investment flows and almost half of global portfolio investment. The IMF (2011) argues that the largest spillovers arise from U.S. growth shocks although the U.S. economy is similarly sized to the Euro Area's which has been attributed to the predominance of the United States in global finance.

[13]Details of this version of the model are presented in Annex 3.2.

[14]These estimates are generally in line with the literature (Box 3.2).

In order to analyze the regional implications of spillovers from individual BRICS, country-specific VAR models are estimated for each spillover destination country (Annex 3.2). Whereas growth fluctuations in China would have global repercussions, those in other BRICS tend to radiate more narrowly. A growth impulse in China changes growth in other emerging markets in East Asia by about as much as growth in other emerging markets around the world. On the other hand, a 1 percentage point growth slowdown in Russia reduces growth in other emerging markets in Europe by 0.4 percentage point over two years but its impact on growth outside the region is negligible. Brazil has a small impact even on its own region.[15] A sufficiently long time series of quarterly GDP data for a strict comparison is unavailable for other emerging markets in South Asia and Sub-Saharan Africa, but there are indications that spillovers from South Africa and India to their respective regions are modest (Box 3.3).

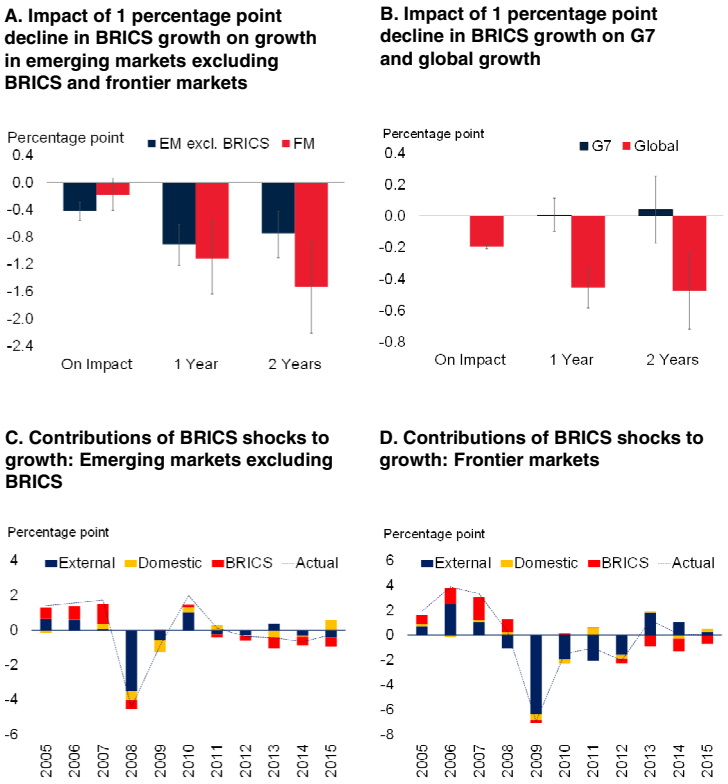
Transmission channels of spillovers. Commodity markets are a key transmission channel of spillovers (Box 3.2). China accounts for 30 percent or more of global demand for copper, iron ore, nickel, aluminum and soybeans and 10 percent of global demand for coal. Among the largest producers of these commodities are Brazil, Chile, Colombia, Indonesia, Peru, Philippines, and Poland (World Bank 2015d). This is reflected in country-specific VAR model estimates (Figure 3.12).[16] As a result of these commodity price declines, growth in commodity exporters could slow by somewhat more than growth in commodity importers.[17]

Another important channel of spillover transmission is trade. China's rapid trade integration since its WTO accession in 2001 has increased the potential for global spillovers from growth shocks. In addition to emerging and frontier markets, several advanced markets are also among China's closest trading partners, including Germany and Japan. A Global Vector Autoregressive (GVAR) model is employed to estimate spillovers to a large number of advanced, emerging, and frontier markets from a growth slowdown in China, specifically through the trade channel.

To examine the implications of the growing trade presence of China, two sets of estimates are

FIGURE 3.9 Spillovers from BRICS

A growth slowdown in BRICS can have a significant adverse effect on global growth, especially in other emerging and frontier markets. The effect on advanced markets is estimated to be modest. The slowdowns in BRICS since 2010 has weighed on growth in other emerging and frontier market.



Source: World Bank staff estimates.
A. B. Cumulated impulse responses for different horizons due to a 1 percentage point decline in BRICS growth on impact. Global is GDP-weighted average of BRICS, emerging and frontier markets, and G7 responses. Bars represent medians, and error bars 16-84 percent confidence bands.
C. D. Historical decomposition of demeaned emerging market (C) and frontier market (D) growth. Domestic shock in Figure C (D) refers to the shock to emerging market (frontier market) growth. External shock refers to the combined contributions from shocks to G7 growth, U.S. interest rates, EMBI, frontier market (emerging market) growth, and the oil price. Annual figures are obtained by summing across quarters in a given year.

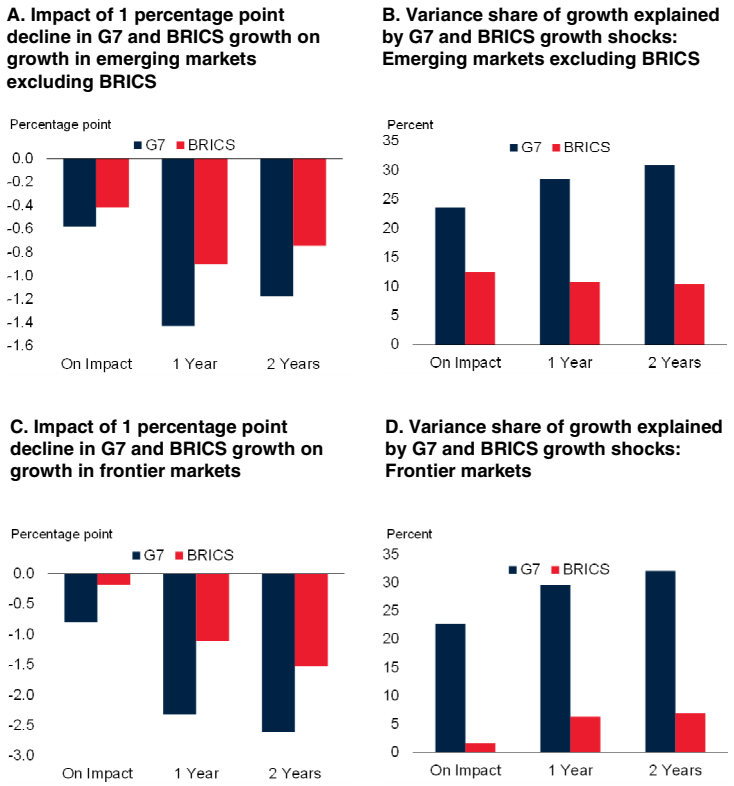
[15]This weaker result than found by other authors (e.g. IMF 2014b) partly reflects that the sample here excludes the Tequila crisis.

[16]These are based on country-specific VAR models. Commodity prices here refer to trade-weighted commodity prices. To provide some perspective on the size of the response of commodity prices due to a growth shock, the standard deviation of commodity prices in the sample is about 9 percent. The magnitude of the response of commodity prices is generally in line with the literature (e.g. IMF 2014b).

[17]These findings are broadly in line with the literature (World Bank 2015c; Inoue, Kaya, and Ohshige, 2015; Ludovic and Cyril 2013). For commodity importers, the commodity channel would mitigate the adverse spillover effects from a slowdown in major emerging markets.

FIGURE 3.10 Spillovers from BRICS and advanced markets

Spillovers from advanced market growth slowdown to emerging and frontier market growth are typically larger than those originating from BRICS.



Source: World Bank staff estimates.
A. C. Cumulated impulse responses of emerging (A) and frontier market (C) growth, at different horizons, due to a 1 percentage point decline in G7 and BRICS growth.
B. D. Variance share of emerging (B) and frontier market (D) growth explained by G7 and BRICS growth shocks.

derived. The first assumes bilateral trade links as in 1998-2000 (when China accounted for 3 percent of global trade). The second assumes trade links as in 2010-12 (when China accounted for over 8 percent of global trade).[18] For the majority of countries, and especially Brazil among emerging markets and the United States, Japan, and Canada among advanced markets, stronger trade linkages have raised the estimated spillovers.[19]

The magnitude of spillovers from BRICS could be more pronounced if shocks are amplified via the confidence channel (Box 3.2). A sharp slowdown in a large BRICS economy could lead to general reassessment of investor risk sentiment. This could trigger a plunge in prices of emerging market assets, currency depreciations, equity market drops, and bond yield spikes across emerging markets. In the analysis here, such spillovers are only partially captured through the impact of a BRICS shock on the EMBI which then feeds into growth elsewhere. In the event of a severe adverse shock to BRICS, however, the EMBI could spike more sharply and the distress spread through a greater range of financial markets than suggested by these, essentially linear, response estimates.

Synchronous slowdown in BRICS. A synchronous slowdown in BRICS would have considerable global growth effects (Figure 3.13).[20] A synchronous BRICS slowdown is defined as one in which BRICS growth declines by the same amount as an isolated decline in growth in China. Activity in China's trading partners that are also closely linked to their regional BRICS would be doubly hit. As a result, emerging market, frontier market, and global growth could decline by around 0.1-0.2 of a percentage point more, over two years, in a synchronous BRICS slowdown than in an isolated slowdown in China.

With every year of slowing BRICS growth, the probability increases that the slowdown turns into an outright recession, as household, corporate, and government buffers erode and expectations of future growth prospects shift downwards (Didier et al. 2015). A synchronous, steepening BRICS growth slowdown could considerably depress emerging and frontier market growth and weigh on advanced market and global growth as well (Figure 3.14). If, for example, BRICS growth persisted at its current weak levels (3.2 percent annualized) through 2017 instead of the currently projected pickup, the rest of emerging market growth could slow by about 0.4 percentage point from the baseline forecast in 2016 and about 1

[18]In addition to these direct trade links, commodity exporters are also affected by the impact of growth fluctuations in China on global commodity markets.

[19]Among the advanced economies, other studies have also found that spillovers from China to Japan can be quite significant (IMF 2014b; Inoue, Kaya, and Ohshige 2015).

[20]This compares the results of two different regressions: one in which BRICS as a whole are included; and another in which China is included.

percentage point in 2017.[21] The impact would be considerably larger if BRICS growth were to slide below current levels. For instance, if BRICS growth slowed by as much as the average forecast downgrade during 2010-14 (0.2 percent), growth in the rest of emerging markets and in frontier markets could fall 1-1.3 and 0.5-1.5 percentage points below the baseline forecasts in 2016-17, respectively. Growth in G7 countries would fall considerably less, by about 0.3-0.6 percentage point during 2016-17. Overall, global growth would decline by about 0.7-1.1 percentage points below the baseline forecasts in 2016-17.

A perfect storm: BRICS weakness combined with financial turmoil. The current BRICS growth slowdown coincides with tightening global financial conditions. In December 2015, the U.S. Federal Reserve increased monetary policy rates for the first time since the global financial crisis and is expected to continue to gradually raise policy rates. In all likelihood, this tightening cycle will proceed smoothly as it has long been anticipated, and would have only a modest impact on emerging and frontier markets.

However, the tightening cycle carries significant risks of financial market turmoil. This could be accompanied by a broad-based repricing of emerging and frontier market assets and sizeable declines in capital inflows to emerging and frontier markets (Arteta et al. 2015). Investor sentiment could deteriorate sharply on weakening emerging and frontier market growth prospects. As a result, risk spreads for emerging and frontier market assets could widen steeply and raise overall financing costs for emerging and frontier markets, further dampening growth. An increase in financing costs can also reduce policy space, in particular fiscal space, limiting the firepower that countries need to respond to slowing growth (World Bank 2015c).

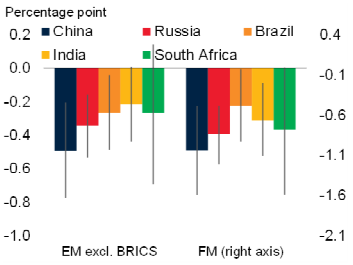
A synchronous BRICS slowdown could have much more pronounced spillover effects if it is combined with a tightening of risk spreads. When combined with tightening financial conditions, e.g. EMBI increasing by 100 basis points from the current level in 2015 (an increase comparable to the taper tantrum), the BRICS slowdown could cut growth in other emerging markets by about 1.3-1.5 percentage points and in frontier markets by 1-1.8 from the baseline forecasts in 2016-17 (Figure 3.14). Global growth would decline about 0.9-1.2 percentage points in 2016-17 below the baseline forecast. Financial tightening could reduce growth particularly sharply in frontier markets, with their less liquid, more volatile and fragile financial markets.

[21]The baseline forecasts for emerging markets, frontier markets, and the G7 are constructed by aggregating the country level forecasts presented in Chapter 1 across countries in each group. Global in this exercise refers to the combined set of BRICS, emerging markets excluding BRICS, frontier markets, and the G7 used in the VAR estimation.

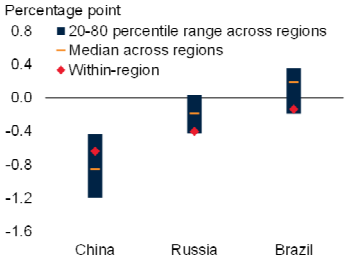
FIGURE 3.11 Spillovers from individual BRICS

The magnitude and reach of spillovers from individual BRICS differ. Spillovers from China are significant for countries in the EAP and ECA regions as well as some commodity exporters in Latin America. While spillovers from the rest of BRICS countries generally tend to be small, spillovers from Russia within the ECA region can be sizeable.

A. Impact of 1 percentage point decline in individual BRICS growth on growth in emerging markets excluding BRICS and frontier markets



B. Impact of 1 percentage point decline in China, Russia, and Brazil growth on emerging and frontier market growth



Source: World Bank staff estimates.
A. Cumulated impulse responses at the end of two years. Shocks are scaled such that China's growth declines by 1 percentage point on impact. Shock sizes for the rest of BRICS countries are calibrated such that their growth declines by exactly the same amount as China at the end of two years. These results are from the aggregate VAR model. Bars represent the median and the error bands denote the 16-84 percent confidence bands.
B. Cumulated impulse responses at the end of two years due to a 1 percentage point decline on impact in China, Russia, and Brazil growth. For each spillover source country, the bar denotes the 20 -80 percentile range of the responses of all countries in all regions (excluding the spillover source country) and the orange dash denotes the respective cross-sectional median response. The red diamond denotes the cross-sectional average response across countries in the specific region as the spillover source country (excluding itself). These results are from country-specific VAR models. ECA results exclude Turkey, for which estimated spillovers are negligible. Positive estimates for shocks from Brazil are statistically insignificant.

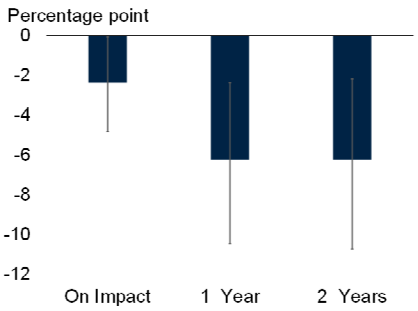
What are the policy implications?

Emerging and frontier market policies can play an important role in mitigating the persistence and depth of spillovers from slowing BRICS growth. The appropriate policy response depends on the nature of the shock and the spillovers:

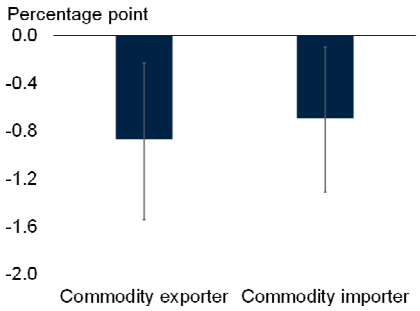
FIGURE 3.12 Channels of spillovers

Among emerging markets, spillovers from China to commodity exporters are larger than to commodity importers, suggesting a role of the commodity channel in the transmission of shocks from BRICS.

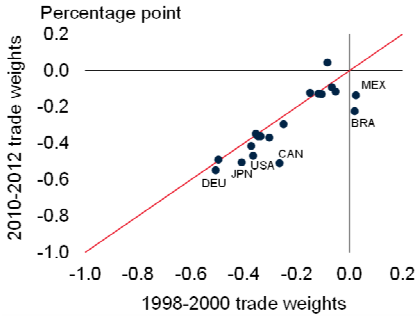
A. Impact of 1 percentage point decline in China's growth on commodity price growth



B. Impact of 1 percentage point decline in China's growth on growth in emerging and frontier market commodity exporters and importers



C. Impact of 1 percentage point decline in China's growth on growth in other countries

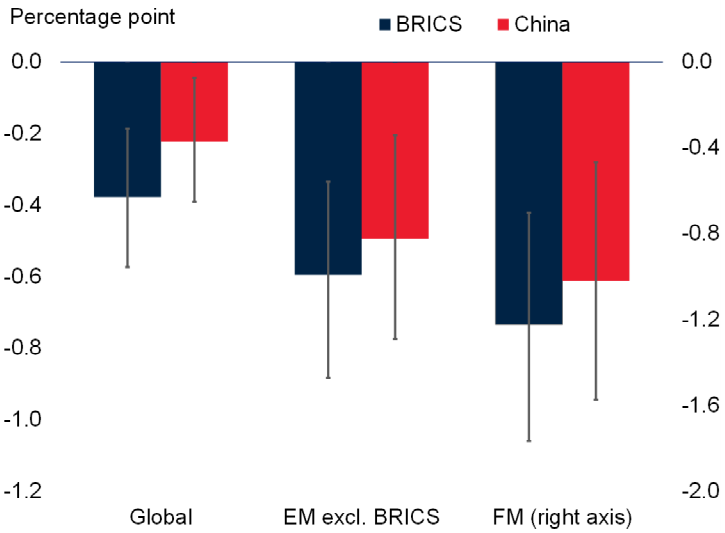


Source: World Bank staff estimates.
A. Cumulated impulse responses of trade-weighted commodity prices of commodity exporters, for different horizons, due to a 1 percentage point decline in China growth. Solid bars denote the median and the error bars denote the 16-84 percent confidence bands. The average quarterly growth rate of commodity prices is about 0.9 percent in the sample. Commodity exporters include Chile, Malaysia, Paraguay, and Peru.
B. Cumulated impulse responses of GDP growth, at the two year horizon, due to a 1 percentage point decline in China's growth. For each group, the figures refer to the cross-sectional average response across all the countries in that group. Commodity exporters include Chile, Malaysia, Paraguay, and Peru. Commodity importers include Bulgaria, Croatia, Hong Kong SAR, China, Hungary, Jordan, Mexico, Poland, Republic of Korea, Romania, Singapore, Thailand, and Turkey.
C. Based on the GVAR model described in Annex 3.2. This excludes Chile, India, Republic of Korea, Malaysia, and Turkey. Model is estimated twice, using average trade weights for 2010-12 and average trade weights for 1998-2000.

FIGURE 3.13 Spillovers from a synchronous slowdown in BRICS

A synchronous slowdown in BRICS would have larger adverse spillover effects on other emerging and frontier markets than just a slowdown in China.

Impact of a decline in China's and BRICS growth on global growth, growth in emerging markets excluding BRICS and in frontier markets



Source: World Bank staff estimates.
Note: Cumulated impulse responses of EM and global growth at the two-year horizon. The shock size is such that China's growth declines by 1 percentage point on impact. The shock size for BRICS is calibrated such that its growth declines by exactly the same amount as that of China at the end of two years. Solid bars denote the median and the error bars denote the 16-84 percent confidence bands.

- A cyclical downturn in BRICS would generate temporary adverse spillovers that could be mitigated by counter-cyclical fiscal and monetary policies;
- A structural downturn in potential growth in BRICS would require structural reforms in other emerging markets to adjust to a "new normal" of lower growth in core trading partners and sources of remittances.

About one-third of the growth slowdown in emerging markets, including BRICS, is structural and the remainder is a cyclical downturn from the immediate post-crisis rebound of 2010 (Didier et al. 2015). However, this assessment of the relative strength of cyclical and structural factors is subject to considerable uncertainty. Hence, the optimal policy mix, even in countries where spillovers from external shocks are considered temporary, includes structural policies to improve medium- and long-term growth prospects.

In addition, counter-cyclical fiscal and monetary policies can be used effectively when there is sufficient policy space (see discussion below). Many emerging and frontier markets used up

much of their policy space during the global stimulus of 2009 and have yet to rebuild it (World Bank 2015a). They may therefore not be in a position to implement effective counter-cyclical stimulus. Faced with this predicament, structural reforms to lift long-term growth could help, bolster investor sentiment in the short run, help lift domestic demand to the extent they encourage investment, and support capital flows even amidst financial market tightening.

The appropriate policy response also depends on the source of the external shock. A growth shock may be more appropriately addressed with fiscal policy and structural reforms whereas a financial shock may be more effectively mitigated by monetary, exchange rate, or financial policies. The boundaries between these shocks and policies, however, may at times be blurred. This argues, again, for a policy mix of fiscal, monetary, and exchange rate policy coupled with structural reforms.

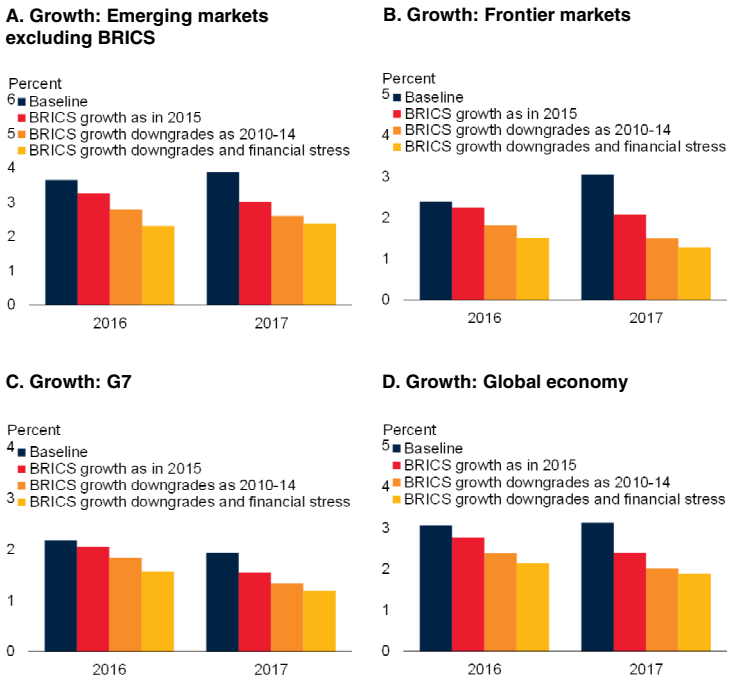
Fiscal policy. Fiscal stimulus could help stabilize a cyclical slowdown in activity. Fiscal multipliers—the change in real GDP generated by a 1 dollar increase in fiscal spending—for emerging markets are up to 0.6 in the short-term and up to 0.9 in the medium-term (World Bank 2015a). Fiscal multipliers tend to be larger during recessions than expansions, in countries with ample fiscal space, in less open economies, and for stimulus conducted through expenditure increases, especially public investment, rather than tax cuts (World Bank 2015a; Ilzetzki, Mendoza, and Vegh 2013).

A spillover-induced, cyclical slowdown in activity may be an opportunity to address sizeable infrastructure needs in emerging markets, since infrastructure investment can be a particularly effective form of fiscal stimulus.[22] While some of the largest infrastructure deficits have been identified for low-income countries and frontier markets, emerging markets also lag by global comparison.

However, most emerging markets do not have the policy room to sustain fiscal stimulus over anything other than the briefest period.

FIGURE 3.14 Growth slowdown in BRICS combined with financial stress

A combination of continued weak BRICS growth and rising emerging market risk premia could considerably reduce growth in other countries.



Source: World Bank staff estimates.
Note: EMBI = Emerging Markets Bond Index. Conditional forecasts of emerging markets excluding BRICS, frontier markets, G7, and global growth, with conditions imposed on future BRICS growth and EMBI. The conditions are: (i) BRICS growing at the curent rate in 2015: BRICS continue to grow at its current 2015 level (annualized rate of 3.2 percent) during the forecast horizon; (ii) BRICS growth with forecast downgrades as during 2010-14: BRICS continue to grow during the forecast horizon at its current 2015 level minus the average forecast downgrades it saw during 2010-14. The forecast downgrades are based on the World Bank forecasts. In these two scenarios, EMBI is restricted to equal the unconditional forecasts from the aggregate VAR model during the forecast horizon; (iii) BRICS growth with forecast downgrades and financial stress: The second scenario is combined with EMBI rising by 100bp during the forecast horizon. Global growth is the GDP-weighted average of BRICS, emerging markets excl. BRICS, frontier markets, and G7 growth. The baseline forecasts are a GDP-weighted average of growth forecasts presented in Chapter 1 for the sample of countries used here. Conditional forecasts are based on the aggregate VAR model.

[22]Multipliers from public investment have been estimated to range from 0.25 to 1 in emerging markets over the medium-term (IMF 2014c). Multipliers from increases in economy-wide physical capital stock have been estimated to range from 1 to 2 in Sub-Saharan Africa and Latin America and the Caribbean (Calderón and Servén 2008, 2010). Estimates of longer-term output effects of public investment vary widely but are generally positive (Bom and Ligthart 2014). In addition to raising overall growth in the country investing in public infrastructure, infrastructure investment may also foster trade (and thus growth of partner countries), reduce income inequality, and boost employment. Infrastructure investment needs, however, have to be assessed against financing cost and implementation capacity (Kraay and Servén 2013). Because of less economic slack and lower efficiency of investment in emerging and frontier markets than advanced markets, growth benefits in the former are smaller, subject to significant uncertainty, and raise public debt (IMF 2014a; Gupta et al. 2014).

BOX 3.3 Within-region spillovers

Most countries are predominantly linked to major advanced markets in close proximity. Within-region ties are closest in Europe and Central Asia (ECA) and East Asia and Pacific (EAP), and particularly pronounced in trade and remittance flows. The largest within-region spillovers originate from China, Russia, and Brazil while those from other large emerging markets are limited.

While spillovers from BRICS are often large, those from other large emerging markets (EM) and frontier markets (FM) may also be strong within regions and especially to neighboring countries.

This box adds granularity, and expands the coverage of Chapter 3, in the following directions.

- How do within-region and global linkages compare across regions?
- How do within-region spillovers compare across regions?

How do within-region and global linkages compare across regions?

Global integration. Several developing country regions are highly open to global trade (Figure 3.3.1). Exposures to global financial investment, however, tend to be lower—indeed, for several regions, remittances have been as large a source of inflows as foreign direct, portfolio, or bank investment flows. The relative importance of these links differs across regions.

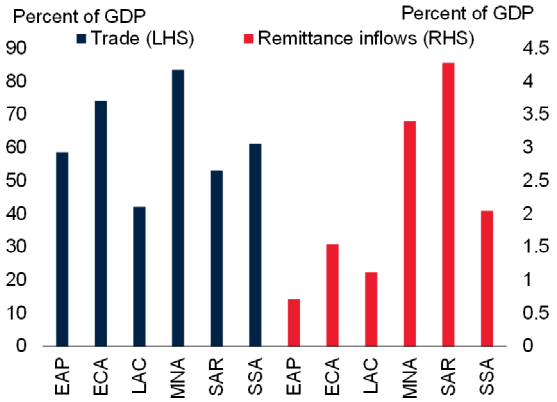
- EAP and ECA consist of countries that are highly open to trade and receive sizeable amounts of foreign direct investment (FDI) and portfolio investment but limited remittance inflows from outside the region.
- Large oil exporters in the Middle East and North Africa (MNA) are deeply integrated into global trade, and some are a large source of remittances. Following a sharp slowdown since 2005, the region now receives modest FDI inflows and little portfolio investment.

Latin America and the Caribbean (LAC) and South Asia (SAR) are generally less open to trade than other regions.[1] However, LAC has received sizeable FDI. SAR receives large remittance inflows from outside the region but limited FDI and portfolio investment (World Bank 2015e).

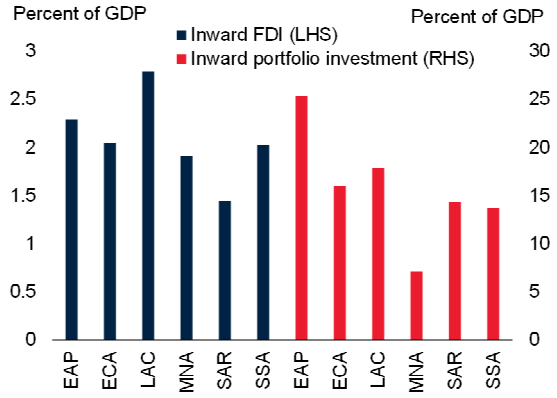
FIGURE 3.3.1 Openness

Most regions are highly open to global trade. Remittances inflows are of similar or greater magnitude to FDI for several regions. Over time, portfolio inflows have led to the accumulation of some sizable liability positions, especially in LAC.

A. Trade and remittance inflows, 2014



B. FDI inflows and stock of portfolio investment liabilities, 2014



Sources: WDI; World Bank; UNCTAD; CPIS database.
Note: In percent of each region's GDP. Regions are defined as all non-advanced market countries in each region. EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; MNA = Middle East and North Africa; SAR = South Asia; SSA = Sub-Saharan Africa.

Emerging and frontier markets in SSA are, on average, well integrated into global trade and receive considerable FDI and remittance inflows.

Integration with large advanced markets. Most regions tend to be closely linked to a neighboring major economy. For LAC, the United States is the single largest trading

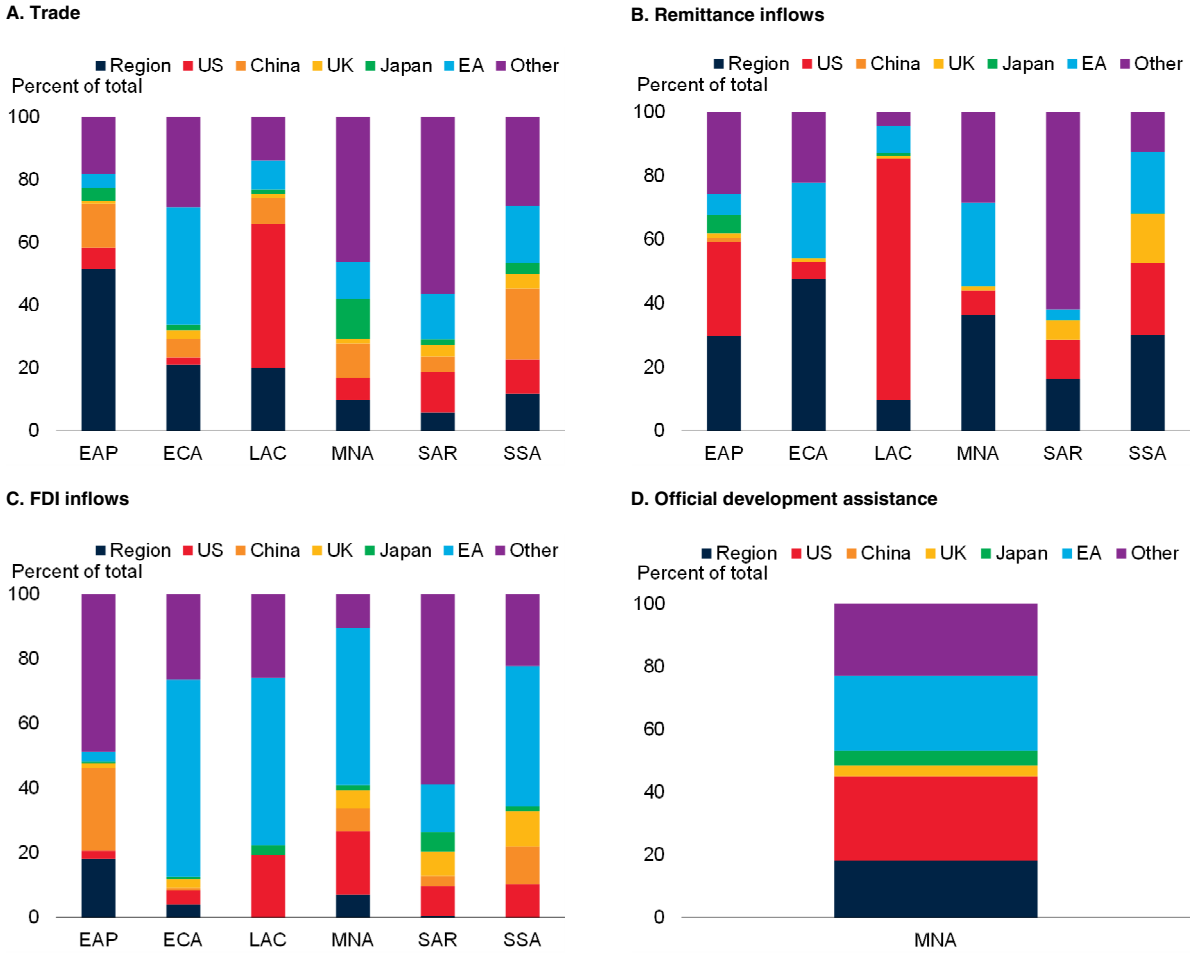
Note: This Box was prepared by Jesper Hanson, Raju Huidrom, and Franziska Ohnsorge.

[1]LAC is generally less open to trade than other regions, although there is considerable heterogeneity across the region.

BOX 3.3 Within-region spillovers *(continued)*

FIGURE 3.3.2 Within-region integration

Within-region trade links are strongest in EAP, ECA, and LAC. Remittances from inside the region are sizeable, except for the LAC region. Except in EAP, internal FDI flows are generally quite low compared to those from the rest of the world. MNA has considerable within-region ODA flows.



Sources: WITS; Bilateral Remittances Database; CDIS database; CPIS database.
Note: In percent of each region's total. Regions include countries of all income categories, except for United States, Canada, Euro Area, and Japan. EA = Euro Area.
A. 2011-14 average. B. 2014 C. 2011-13 average.

partner and source of remittances and other financial flows. The Euro Area and China play similar roles for ECA and EAP, respectively. Partly reflecting greater geographical distance to the world's largest economies, MNA, SAR, and SSA are more diversified in their trade and financial ties.

Within-region integration. Several regions have strong within-region trade and remittance links (Figure 3.3.2). In EAP, ECA, and LAC, within-region trade accounts for 20 percent or more of the total. In MNA, limited within-region trade reflects similar export specialization, especially of oil-exporting countries. Remittance inflows from countries within the region represent more than 30 percent of the total for EAP, ECA, MNA, and SSA. Intra-region FDI, in contrast, is low, with the exception of EAP where both Japan and China are important sources for FDI to support supply chain integration. Likewise for official development assistance, with the exception of MNA.

How do within-region spillovers compare across regions?

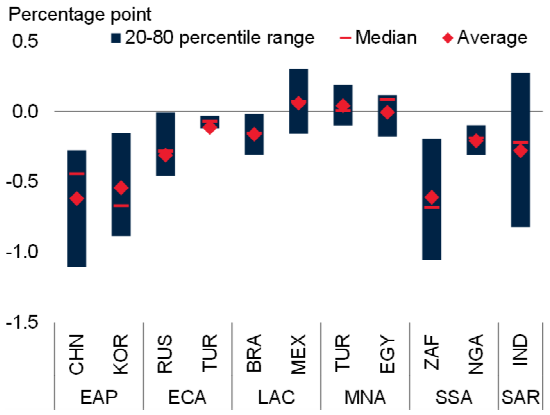
The differences in within-region economic links are reflected in spillovers from shocks in large emerging and

BOX 3.3 Within-region spillovers *(continued)*

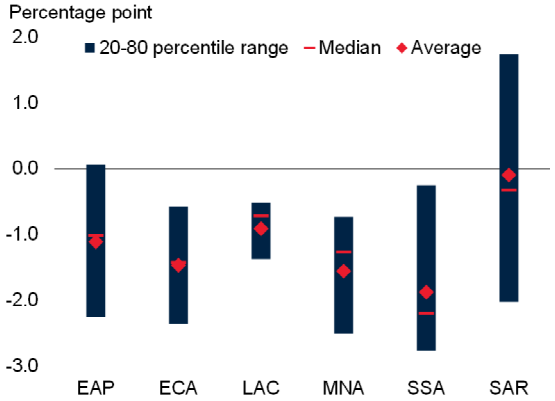
FIGURE 3.3.3 Spillovers from large emerging markets in each region

Strong within-region trade and remittance links are reflected in sizeable spillovers in ECA to a growth decline in Russia and, in EAP, to a growth decline in China. Other within-region spillovers tend to be modest.

A. Impact on growth of 1 percentage point decline in growth in large emerging markets within the region



B. Impact on growth of 1 percentage point decline in G7 growth



Source: World Bank staff estimates.
Note. Based on country-specific structural vector autoregressions (VARs) using the earliest possible data from 1998Q1 to 2015Q2 for 7 countries in EAP, 20 countries in ECA, 15 countries in LAC, 8 countries in MNA, 3 countries in SAR, and 4 countries in SSA. Estimation sample for the SSA region starts in 2007 and within-region spillovers in SSA are statistically insignificant. Details of the model are provided in Boxes 2.1-2.6.
B. For EAP, the shock refers to growth in G7 excluding Japan; and for SSA and ECA, the shock refers to growth in the rest of the world.

frontier markets (Figure 3.3.3). These large emerging and frontier markets include BRICS, along with Egypt, Korea, Mexico, Nigeria, and Turkey. Similar to the estimation of spillovers from BRICS, spillovers are estimated in country-specific structural vector autoregressions, including the second large emerging market source country of shocks in each region.[2] Since the BRICS are typically the largest countries in their regions, shocks in these economies have the strongest spillovers inside their respective region.

- Strong within-region trade and remittance links are reflected in sizeable and often statistically significant spillovers – for example, in ECA to a growth decline in Russia and in EAP to a growth decline in China (Boxes 2.1, 2.2).[3]

- In other regions, spillovers are typically statistically insignificant. In SAR, a growth shock in India would have a marginal impact on growth in Pakistan and Sri Lanka, which have limited trade links with India (Box 2.5). In SSA, spillovers from growth shocks in South Africa and Nigeria are generally insignificant. In MNA, growth spillovers from Egypt and Turkey are negligible, despite the size of these two economies, because of their limited ties to other countries in the region (Box 2.3).[4] Similarly, growth spillovers in Mexico and Brazil on countries in LAC are, on average, modest although they can be sizeable for a few neighboring countries of Brazil with strong trade ties (Box 2.4).[5]

All regions are more vulnerable to growth shocks originating outside their region than shocks originating within their regions. The discrepancy is most pronounced for the highly open regions such as EAP, ECA, MNA, and SSA.

Conclusion

The emerging market and developing economy regions are generally much more vulnerable to external growth shocks than to shocks originating within each region. The within-region spillovers are limited in scope, and tend to be concentrated among neighboring countries, reflecting modest within-region trade and financial links. However, a few countries in EAP and ECA are vulnerable to a growth slowdown in large neighboring emerging and frontier markets.

[2]For the SAR region, only spillovers from India are considered.

[3]Other studies have also found significant spillovers from Russia to ECA (e.g., Alturki, Espinosa-Bowen, and Ilahi 2009; Ratha et al. 2015) and from China to EAP (e.g., Ahuja and Nabar 2012; Inoue, Kaya, and Ohshige 2015).

[4]For lack of a sufficiently long quarterly data series, Gulf Cooperation Council countries could not be included in the analysis.

[5]For instance, Southern Cone countries (Argentina, Bolivia, Chile, Paraguay, and Uruguay), given their sizeable export linkages, are subject to spillovers from Brazil (Adler and Sosa 2014).

- Oil exporters that have entered the oil price slump of 2014 with large surpluses and low debt (Oman, Qatar, Saudi Arabia, and United Arab Emirates) can still smooth the adjustment to external shocks. However, in most oil-exporting emerging markets, surpluses have already turned into sizeable deficits and rising debt.

- In several non-oil commodity-exporting emerging markets, deficits have widened by more than a percentage point from a less favorable starting position (Brazil, Chile, Peru) and debt has risen above 50 percent of GDP in 2015 (Brazil, Colombia). Further deterioration in fiscal sustainability could weaken investor sentiment.

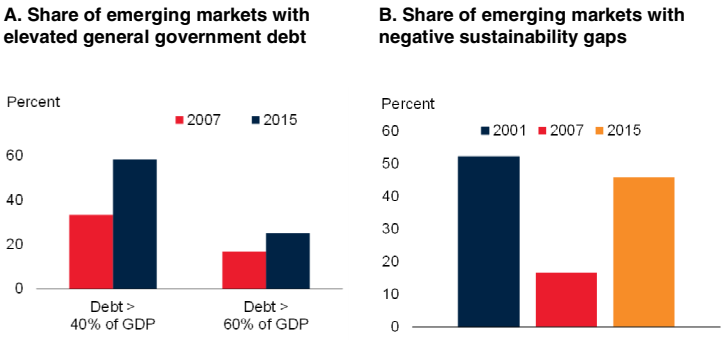
- Similarly, several commodity-importing economies entered the emerging market growth slowdown in 2010 with deficits above 4 percent of GDP and debt above 50 percent of GDP (Egypt, Hungary, India, and Poland), and deficits remain elevated despite consolidation efforts (Figure 3.15).

Monetary policy. Like fiscal policy, monetary policy could boost growth amidst a temporary slowdown in activity.[23] Effective monetary policy stimulus, however, relies on well-functioning financial markets (Lane 2003; Chinn 2014); limited balance sheet exposures to exchange rate and interest rate risk; well-anchored inflation expectations; and policy credibility in the eyes of investors.

However, room for monetary policy stimulus has narrowed in many emerging markets. To contain inflation and financial stability risks resulting from sharp depreciations, several commodity-*exporting* emerging markets have been forced to tighten monetary policy despite faltering growth (Figure 3.16). Most have limited monetary policy room to support activity in the event of further external shocks. Some commodity-*importing* emerging markets with low inflation, in contrast, may have some room to dampen external shocks with further interest rate cuts. However, once oil prices stabilize and inflation begins to rise, this room may diminish.

FIGURE 3.15 Fiscal policy and fiscal space

Fiscal space is necessary to ensure that fiscal policy is effective. Among emerging and frontier markets, fiscal space has shrunk significantly since the financial crisis as government debt and fiscal deficits have increased—and sharply in some countries. This has also been reflected in deteriorating credit ratings.



Sources: World Bank (2015a); Haver Analytics.
B. Sustainability gap is defined as the difference between the actual overall balance and the debt-stabilizing overall balance at current growth rates. A negative sustainability gap indicates an unsustainable stock of debt and deficit.

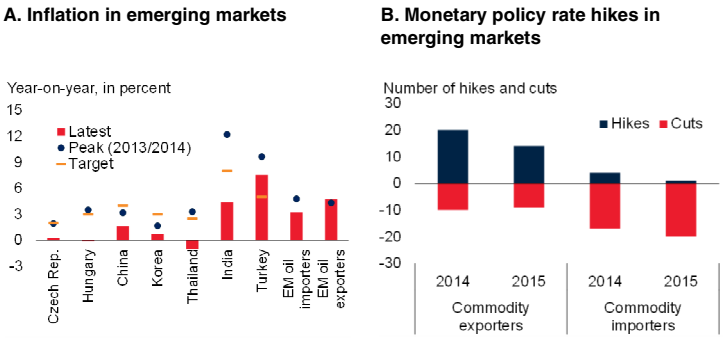
Structural policies. The BRICS slowdown may turn out to be a sustained, structural decline in growth potential rather than a temporary cyclical downturn. This would generate spillovers that force other emerging markets to face an era of lower growth in key trading partners and sources of finance. The potential for spillovers will increase as BRICS integrate further into the global economy and as BRICS growth continues to outpace advanced market growth (notwithstanding the recent slowdown). While at times politically challenging to implement, structural reform measures can help emerging markets adjust to this new era.

Structural reforms have collateral benefits of buttressing investor confidence and lifting domestic demand—whether in the event of cyclical or structural external shocks. By lifting investor confidence in growth prospects, they can support capital inflows amidst financial market

[23]Monetary easing works through a number of channels: by reducing interest rates on government securities, interbank borrowing and bank lending; by depreciating the exchange rate; by increasing asset prices (especially equity and house prices) and thus by inflating the value of collateral for borrowing.

FIGURE 3.16 Monetary policy room

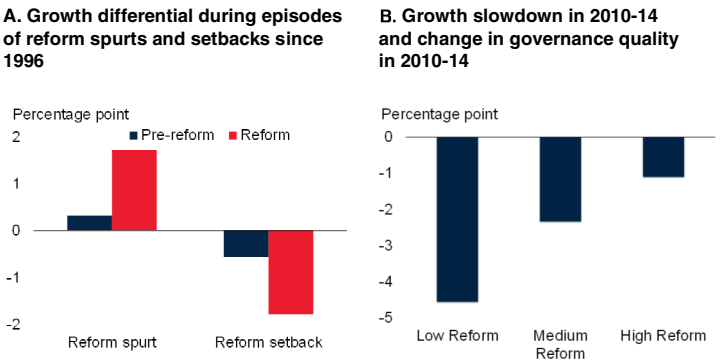
Among oil-importers, the oil price drop has reduced inflation below target levels and created policy options. Among oil exporters, currency depreciation has raised inflation and added to pressures on central banks to raise policy rates. In contrast, central banks in oil importers have been able to reduce policy rates.



Sources: Hammond (2012); World Bank; Haver Analytics; Didier et al. (2015).
A. Latest observation is October 2015. Includes both formal and informal inflation targets.
B. Latest data for December 2015. Hikes and cuts refer to central bank rate decisions, including base rate, policy rate, repo rate, Selic rate, discount rate, reference rate, lending rate, refinancing rate and benchmark rate. The number of countries implementing rate cuts is shown with a negative sign. There are 11 commodity exporters and 13 commodity importers.

FIGURE 3.17 Growth slowdown and structural reforms

Significant reforms in governance are positively associated with growth performance. During the most recent slowdown (2010-14), economies that demonstrated the highest rise in governance quality experienced milder slowdowns.



Sources: World Bank's World Governance Indicators (WGI); Didier et al. (2015).
A. The columns show the cumulative growth differential of economies during and prior to a reform spurt or setback episode, relative to those that experienced neither spurts nor setbacks. Spurt (setback) is defined by a two-year increase (decrease) by two standard deviations in one or more of the following four measures of the WGI index: regulatory quality, government effectiveness, rule of law, and control of corruption. Differentials are based on estimates from a panel data regression with time and country fixed effects. The sample spans 64 EM and FM over 1996-2014. Annex 3.2 provides additional details about the empirical exercise.

turmoil. To the extent structural reforms are associated with investment—especially in the presence of economic slack—or with increased labor force participation, they can also increase domestic demand (World Bank 2015a).

Gains in long-term growth from structural reforms could be particularly large in emerging and frontier markets because they tend to display elevated inter-sectoral dispersion in productivity and because some struggle with pervasive misallocation of capital and labor.[24] A growing literature has documented the long-term benefits from structural reforms in emerging and frontier markets, especially of reforms that improve governance and business environments. These include growth spurts triggered by reforms (Figure 3.17, Didier et al. 2015), amplification of the growth dividend from public investment, greater job creation and formal sector activity. For example, the growth slowdown in 2010-14 was least pronounced in the quartile of countries with the strongest governance environment reforms and most pronounced in those with the weakest governance environment reforms (Figure 3.17).

Conclusion

Over the next few years, growth in BRICS is likely to face persistent headwinds from low commodity prices, weak trade, and higher borrowing costs. Meanwhile, productivity growth is likely to remain weak as populations age in large emerging markets, and investment weakness slows the adoption of new technologies. A weaker external environment, and slowing growth, may further erode policy buffers and constrain the use of counter-cyclical stimulus to support activity. The strengthening recovery in advanced markets is expected to only partially offset these risks.

The results presented in this chapter suggest that continued weakness or a further slowdown in BRICS growth could add to the challenges faced by emerging and frontier markets from a deteriorating external environment. It would

[24]Dabla-Norris et al. (2013); Hsieh and Klenow (2009); IADB (2013).

weigh on growth in other emerging markets—as it has done already since 2010—and frontier markets. Activity in close trading partners of BRICS and in commodity exporters would be particularly susceptible to a setback.

In response to a 1 percentage point decline in BRICS growth, growth in other emerging markets and in frontier markets could slow by 0.8 and 1.5 percentage points, respectively, over two years. This would set back global growth by 0.4 percentage point, over two years.

There is a risk that growth weakness in BRICS will be accompanied by bouts of financial market volatility through the U.S. monetary policy tightening cycle, or in some cases domestic factors. If, instead of the projected pickup, BRICS growth slows further—by as much as the average growth disappointment over 2010-14—and if financial conditions tightened moderately—such as during the financial market turmoil of the summer of 2015—global growth could be cut by one-third in 2016.

Policy makers in emerging markets may need to support activity with fiscal and policy stimulus, at least where policy buffers are sufficient. In all cases, countries could derive substantial gains from well-designed, credible structural reforms that retain investor confidence and capital flows in the short-run, and that lift growth prospects for the long-run.

Annex 3.1 Data

Country classification

Emerging markets (EM) generally include (non-advanced) high-income and middle-income countries with a record of significant access to international financial markets. Frontier markets (FM) include, generally middle-income, countries that are usually smaller and less financially developed than emerging markets, and have more limited access to international capital markets.

For this Chapter, emerging markets are countries that are classified as such in at least two of the three following stock indexes: S&P, FTSE, and MSCI. Frontier markets are countries that are classified as such by at least two of the same three indexes. For countries not covered by all of these three indexes, we also include those that are classified as emerging/frontier markets by Bloomberg, Citi, and JP Morgan bond indexes, even though these latter lists do not have a break down between emerging markets and frontier markets.

Data used in modelling

The structural vector autoregressions, the correlation analysis, and the event study use quarterly real GDP data from Haver, OECD, and IMF World Economic Outlook with a maximum coverage from 1997Q2 to 2015Q2. The sample includes 24 advanced markets (Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Greece; Hong Kong SAR, China; Iceland; Ireland; Italy; Japan; Netherlands; New Zealand; Norway; Portugal; Singapore; Spain; Sweden; Switzerland; United Kingdom; United States), 16 emerging markets (Brazil; Chile; China; Czech Republic; Hungary; India; Indonesia; Malaysia; Mexico; Peru; Philippines; Poland; Russian Federation; South Africa; Thailand; Turkey), six frontier markets (Bulgaria; Costa Rica; Croatia; Jordan; Paraguay; Romania), and eight other economies (Cyprus; Estonia; Israel; Latvia; Lithuania; Slovak Republic; Slovenia; Taiwan, China).

The dynamic factor model uses annual growth in GDP, private consumption, and private investment for 106 countries from IMF World Economic Outlook database during 1960-2015. The sample includes 23 advanced markets (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States), 17 emerging markets (Brazil, Chile, China, Colombia, Arab Republic of Egypt, India, Indonesia, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Republic of Korea, South Africa, Thailand, Turkey), 25 frontier markets (Argentina, Bangladesh, Bolivia, Botswana, Costa Rica, Cote d'Ivoire, Ecuador, El Salvador, Gabon, Ghana, Guatemala, Honduras, Jamaica, Jordan, Kenya, Mauritius, Nigeria, Panama, Paraguay, Senegal, Sri Lanka, Tunisia, Uruguay, República Bolivariana de Venezuela, Zambia) and 41 other developing countries.

Emerging markets		Frontier markets			Advanced markets	
Brazil	Morocco	Argentina	Ghana	Panama	Australia	Ireland
Chile	Pakistan	Azerbaijan	Guatemala	Paraguay	Austria	Iceland
China	Peru	Bahrain	Honduras	Romania	Belgium	Italy
Colombia	Philippines	Bangladesh	Jamaica	Senegal	Canada	Japan
Czech Republic	Poland	Bolivia	Jordan	Serbia	Switzerland	Luxembourg
Egypt, Arab Rep.	Qatar	Botswana	Kazakhstan	Sri Lanka	Germany	Malta
Hungary	Russia	Bulgaria	Kenya	Tunisia	Denmark	Netherlands
India	Saudi Arabia	Costa Rica	Kuwait	Ukraine	Spain	Norway
Indonesia	South Africa	Côte d'Ivoire	Lebanon	Uruguay	Finland	New Zealand
Korea, Rep.	Thailand	Croatia	Mauritius	Venezuela, RB	France	Portugal
Malaysia	Turkey	Ecuador	Mongolia	Vietnam	United Kingdom	Singapore
Mexico	United Arab Emirates	El Salvador	Namibia	Zambia	Greece	Sweden
		Gabon	Nigeria		Hong Kong SAR, China	United States
		Georgia	Oman			

Annex 3.2 Methodology

A. VAR models

The chapter uses a structural vector autoregression model to quantify growth spillovers from BRICS to other countries, in particular emerging markets (EM) excluding BRICS and frontier markets (FM). Exogenous shocks to BRICS growth are identified using a recursive scheme, and then the spillover effects of those shocks are traced out. The recursive identification scheme requires quarterly data, and hence spillover analysis in this chapter is limited to those countries for which quarterly data is available.[1] In the baseline (aggregate) model, the variables included are, in this order: G7 growth, the U.S. interest rate, Emerging Market Bond Index (EMBI), BRICS growth, oil price, emerging market (excluding BRICS) growth, and frontier market growth.[2] The ordering is based on the presumed exogeneity, or predetermination, of variables where more exogenous variables are ordered first. For instance, it assumes that G7 growth is exogenous to emerging market growth: G7 growth shocks affect emerging market growth within a quarter, whereas shocks to emerging market growth can affect G7 growth only with a lag of at least one quarter. By ordering oil price after BRICS growth, the chapter implicitly assumes that oil prices are relatively endogenous to BRICS growth.

G7 growth, taken to be the proxy for growth in the advanced economies, is constructed as the weighted average of the growth of individual G7 economies, the weights being their respective average GDP shares during the estimation period, 1998Q1-2015Q2. BRICS growth is similarly constructed as the weighted average of growth of individual BRICS countries. Emerging market and frontier market growth are constructed as the weighted average of growth of individual emerging markets minus BRICS and frontier markets respectively.[3] The U.S. interest rate (the yield on 10-year U.S. treasury bills) and the EMBI serve as proxies for global financial conditions. The model is estimated using Bayesian techniques and inferences are made using 2000 Monte Carlo draws. A lag length of four quarters is used, which is standard for VAR models estimated with quarterly data.

To evaluate growth spillovers from each of the individual BRICS countries, the model above is re-estimated by replacing aggregate BRICS with the individual BRICS country in question as the spillover source. For instance, to obtain growth spillovers from Brazil, the model is re-estimated by including Brazil's growth instead of aggregate BRICS growth. Positive or negative correlations between growth of individual BRICS could bias the estimates upwards or downwards.

While the baseline model is used to infer spillover implications for aggregate global, emerging market, and frontier market growth, an alternative (country) specification is deployed to evaluate spillover effects for each emerging market and frontier market. This specification is used in the chapter to understand the intra- and inter-regional spillover effects from a growth slowdown in BRICS countries. Among the BRICS countries, Brazil, Russia, and China matter empirically for spillovers (Figure 3.11). To preserve model parsimony, the alternative specification considers spillovers only from these three countries. The model is estimated for each emerging market and frontier market (as spillover destination country) one at a time with the following variables: G7 growth, EMBI, China's growth, Brazil's growth, Russia's growth, commodity prices, emerging market/frontier market growth, and emerging market/frontier market real effective exchange rate. Simultaneously including all three spillover source countries (China, Brazil, and Russia) in the model allows estimating spillovers from one source

[1]Alternatively, a local projections model could have been used. However, this would have first required identifying exogenous BRICS growth shocks often proxied in the literature by growth forecast errors. A consistent measure of the latter is not available. Simply assuming BRICS growth as exogenous shocks is less plausible for several countries in the sample.

[2]The ordering closely follows World Bank (2015a, 2015b) and IMF (2014b). The main results in the chapter are robust to including VIX instead of EMBI in the model. The list of countries classified as emerging markets and frontier markets are provided in Annex 3.1.

[3]The results are robust when emerging market growth includes growth in Brazil, India, Russia, and South Africa.

country (e.g., Brazil) while explicitly controlling for the rest of the spillover source countries (China and Russia).

Commodity prices are weighted by the average share of exports of each commodity in the commodity export basket of the spillover destination country in question. With respect to the baseline model, including trade-weighted commodity prices (instead of oil prices) and the real effective exchange rate in the model results in a better empirical description of the small open economies in the sample. Finally, again in the interests of parsimony, U.S. interest rates are excluded in the alternative specification. The results are, however, robust to inclusion or exclusion of U.S. interest rates.

The estimation uses a balanced panel of quarterly observations for 57 countries between 1998Q1 and 2015Q2. Real GDP for 29 of these countries is based on the quarterly database in Ilzetzki, Mendoza, and Vegh (2013) which is extended to 2015Q2 by splicing real GDP series from the OECD Quarterly National Accounts and Haver Analytics. Real GDP data for the remainder of the 28 countries are sourced from the OECD Quarterly National Accounts and Haver Analytics. Real effective exchange rates are the narrow (wherever available) and the broad indices from the Bank for International Settlements (BIS) supplemented with the Bruegel database. The EMBI spread series is taken from J.P. Morgan. The U.S. long-term interest rate is the 10-year generic government yields from Bloomberg. Nominal oil prices are obtained from the World Bank Pink Sheet and deflated using seasonally adjusted U.S. CPI series from Haver Analytics.[4]

The trade-weighted commodity prices for each emerging market/frontier market are constructed as follows: nominal monthly prices of 35 commodities are obtained from the World Bank pink sheet.[5] As in the case of oil prices, these nominal commodity prices are deflated by the U.S. CPI. The resulting real prices are converted into indices by setting January 2010 as 100. Then, the monthly indices are converted into quarterly indices by taking averages across the months in a given quarter. Country-specific trade weights are then applied to these real quarterly commodity price indices to yield a trade-weighted real commodity price index for each country. For a given country, the trade weights are the average share of exports of each commodity in the total commodity export basket during the period 2007-2014. Commodity exports are defined in terms of SITC 4th revision at 4 digits from the World Integrated Trade Solution (WITS) database.

While estimating the model, some of the data are transformed to yield stationary series. Thus, real GDP, oil and commodity prices, and real effective exchange rate, originally in levels, are converted into quarter-on-quarter growth rates. Any residual linear trends in those growth rates are removed. The U.S. interest rate and the EMBI are first differenced. The baseline (aggregate) VAR model uses aggregate GDP growth rates for various geographic regions and/or market groups. Those are calculated as the GDP weighted growth rates of all the countries in a given region/group. The GDP weights are calculated using the annual constant GDP (2005 US$) series from the World Bank's World Development Indicators.

B. Dynamic factor model

Dynamic factor models are widely used for identifying common elements in national business cycles (for an extensive discussion see, for instance, Kose, Otrok, and Prasad 2012). This chapter estimates a dynamic factor model that captures common factors in the fluctuations of real output, private consumption, and private investment over the 1960–2015 period in 106 countries using annual data obtained from the World Economic Outlook database. Specifically, the model decomposes fluctuations in these variables into four factors:

- A global factor captures the broad common elements in the fluctuations across countries.
- Group factors capture the common elements

[4]Available at http://www.worldbank.org/commodities.

[5]Commodity prices include aluminum, banana, barley, beef, chicken, coal, cocoa, coconut oil, coffee, copper, copra, cotton, crude oil, gold, ground nut oil, iron ore, lead, maize, natural gas, nickel, orange, palm oil, platinum, rice, rubber, silver, sorghum, soybean oil, soybeans, sugar, tea, tin, tobacco, wheat, and zinc.

in the cyclical fluctuations in the countries in a particular group. In this paper, the world is divided into three regions: advanced markets, emerging and frontier markets, and other developing countries.[6]

- Country-specific factors capture factors common to all variables in a particular country.

- Residual ("idiosyncratic") factors capture elements in the fluctuations of an individual variable that cannot be attributed to the other factors.

Dynamic factor models are designed to extract a small number of unobservable common elements from the covariance or co-movement between (observable) macroeconomic time series across countries. Thus, the model allows for a more parsimonious representation of the data in terms of the unobservable common elements – typically referred to as factors. From a theoretical standpoint, dynamic factor models are appealing because they can be framed as reduced-form solutions to a standard Dynamic Stochastic General Equilibrium (DSGE) model.

The dynamic factor model used in this paper has 106 blocks of equations, one for each country. For instance, the block of equations for an emerging market economy, say Mexico, takes on the following form:

$$Y_t^{MEX} = \beta_{global}^{Y,MEX} f_t^{global} + \beta_{EM}^{Y,MEX} f_t^{EMFM} + \beta_{MEX}^{Y} f_t^{MEX} + \varepsilon_t^{Y,MEX}$$

$$C_t^{MEX} = \beta_{global}^{C,MEX} f_t^{global} + \beta_{EM}^{C,MEX} f_t^{EMFM} + \beta_{MEX}^{C} f_t^{MEX} + \varepsilon_t^{C,MEX}$$

$$I_t^{MEX} = \beta_{global}^{I,MEX} f_t^{global} + \beta_{EM}^{I,MEX} f_t^{EMFM} + \beta_{MEX}^{I} f_t^{MEX} + \varepsilon_t^{I,MEX}$$

where Y, C, and I denote growth in output, consumption, and investment respectively. The global, EMFM (group), and country factors are represented by f_t^{global}, f_t^{EMFM} and $f_t^{country}$ respectively; and the coefficients before them, typically referred to as factor loadings, capture the sensitivities of the macroeconomic series to these factors. The error terms $\varepsilon_t^{i,j,k}$ are assumed to be uncorrelated at all lead and lags and follow an autoregressive process. The same block of equations is repeated for each country in the three regions in the system. The model is estimated using Bayesian techniques as described in Kose, Otrok, and Whiteman (2003).

To measure the importance of each factor, we compute variance decompositions that decompose the total volatility of output growth into volatility components due to each factor. This is achieved by applying the variance operator to each equation in the system. For the case of output in the example above,

$$\begin{aligned} &Var(Y^{MEX}) \\ &= \left(\beta_{global}^{Y,MEX}\right)^2 Var(f_t^{global}) + \left(\beta_{EM}^{Y,MEX}\right)^2 Var(f_t^{EMFM}) \\ &+ (\beta^{Y,MEX})^2 Var(f_t^{MEX}) + Var(\varepsilon^{Y,MEX}) \end{aligned}$$

Since there are no cross-product terms between the factors because they are orthogonal to each other, the variance in output attributable to the global factor is:

$$\frac{(\beta_{global}^{Y,MEX})^2 Var(f_t^{global})}{Var(Y^{MEX})}$$

The variance share due to the regional and country factors and the idiosyncratic term are calculated using a similar approach.

C. GVAR model

Originally proposed in a seminal paper by Pesaran, Schuermann and Weiner (2004), the GVAR methodology presents a simple and practical alternative to overcome the dimensionality problem ("curse of dimensionality") on the macro-econometric study of global macro-linkages.

The GVAR approach can be briefly described in two steps. In the first step, country-specific small-dimensional VAR models are estimated, which include domestic variables and cross-sectional averages of foreign variables. In the second step, the estimated coefficients from the country-specific models are stacked and solved in one large system, which is used in this report for impulse-responses analysis.

[6]For the list of countries included in each region, see Annex 3.1.

The model

Consider a panel of N countries, each featuring $k_i \times 1$ of endogenous variables observed during the time periods t=1, 2, …, T. Let x_{it} denote a vector of $k_i \times 1$ of endogenous variables specific to country i in time period t, and let $x_{it} = (x'_1, x'_2, \ldots x'_N)'$ denote a $k_i \times 1$ vector of all the variables in the panel, where $k = \sum_{i=0}^{N} k_i$.

A set of small-scale, country-specific conditional models can then be estimated separately. The individual models explain the domestic variables of a given economy, x_{it}, conditional on country-specific cross-section weighted averages of foreign variables, x^*_{it}. The foreign variables' expression is as follows:

$$x^*_{it} = \sum_{i=1}^{N} \omega_{ij}\, x_{jt};\ \text{where } \omega_{ii} = 0,\ \forall\ i = 1,2,\ldots,N.$$

These weights ω_{ij} are constructed using data on bilateral foreign trade. x_{it} is modelled as a VARX* model, namely a VAR model augmented by the vector of the foreign variables x^*_{it} and their lagged values:

$$x_{it} = \sum_{l=1}^{p_i} \Phi_{il}\, x_{t-l} + \Lambda_{i0} x^*_{it} + \sum_{l=1}^{q_i} \Lambda_{il} x^*_{i,t-l} + \varepsilon_{it} \quad (1)$$

for i = 1,2,…N, where Φ_{il}, l = 1,2,…, p_i, Λ_{il}, for l = 1,2,…, q_i, are $k_i \times k_i$ and $k_i \times k^*$ matrices of unknown parameters, respectively, and ε_{it} are $k_i \times 1$ vectors of errors. Foreign variables x^*_{it} in country -specific models are treated as weakly exogenous for the purpose of estimation of unknown coefficients of the conditional country models.

The assumption of weak exogeneity can be easily tested and is often not rejected when the economy under consideration is small relative to the rest of the world and the weights used in the construction of the foreign variables are granular ($\sum_{j=1}^{N} \omega_{ij}^2 \to 0$, as $N \to \infty$).

Common variables in the country models are introduced as dominant variables as defined in Chudik and Pesaran (2013). Thus, (1) becomes:

$$x_{it} = \sum_{l=1}^{p_i} \Phi_{il}\, x_{t-l} + \Lambda_{i0} x^*_{it} + \sum_{l=1}^{q_i} \Lambda_{il} x^*_{i,t-l} + \theta_{i0} d^*_{it} + \sum_{l=1}^{s_i} \theta_{il}\, d^*_{i,t-l} + \varepsilon_{it} \quad (2)$$

For the estimation of the marginal model for the dominant variables, d, feedback effects from x_t are allowed. Thus, we have the following expression for the marginal model:

$$d_{it} = \sum_{l=1}^{p_d} \Phi_{dl}\, d_{i,t-l} + \sum_{l=1}^{q_d} \Lambda_{il}\, x^*_{i,t-l} + \eta_{dt} \quad (3)$$

Following Pesaran et al. (2004) the chapter proceeds to estimate the individual VARX* in equation (2) on a country-by-country basis. The marginal model (3) is also estimated by least squares. Once the estimations have been carried on, we stack together the N models of equation (2) and the models in equation (3) and solve it all as one global system, explicitly taking into account that $x^*_{it} = \sum_{i=1}^{N} \omega_{ij}\, x_{jt}$.

Empirical exercise

The GVAR model is estimated for 32 countries: Australia, Austria, Belgium, Brazil, Canada, Chile, Finland, France, Germany, India, Indonesia, Italy, Japan, Malaysia, Mexico, Netherlands, Norway, New Zealand, Peru, Philippines, Republic of Korea, South Africa, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, and the United States. The estimation period is 1998Q1-2014Q4.

Three endogenous variables are considered: real output, the rate of inflation, and the real effective exchange rate. Due to the limited degrees of freedom, only one country-specific foreign variable is considered and constructed from real output. The fixed trade weights are defined as the average trade flows computed over a given period of time. These weights are used for the estimation of the individual models but also later on for the solution of the GVAR.

Finally, price indices for oil and metals are included in the model as dominant variables.

Generalized impulse-responses

In a single-country VAR, exact identification of shocks is commonly achieved by imposing a few restrictions derived from economic theory. However, in the case of a GVAR, exact identification of shocks would require an

astonishing 192 (based on the number of countries considered in this chapter) restrictions derived from economic theory, $(\sum_{i=1}^{N} k_i \ (k_i - 1))$. Consequently, the generalized impulse responses proposed by Pesaran and Shin (1998) are used, which produce one unique set of responses. Nevertheless, it is important to note that this approach does not attempt to recover any structural shocks. Instead, this methodology describes how the system reacts after a specific historical/observable shock, taking into account the correlation among shocks.

D. The benefits of reform

Values in columns of Figure 3.17A are based on a panel data regression in which the dependent variable is real GDP growth. A reform spurt (setback) is defined as a two-year increase (decrease) by two standard deviations in one or more of the following four measures of the WGI index: regulatory quality, government effectiveness, rule of law, and control of corruption. The WGI indicators are principal components of a wide range of survey-based and other indicators. For each index, the standard deviation is measured as the average of the standard errors of the WGI index in the beginning and at the end of each two-year interval. Episodes in which there were improvements in one measure and simultaneous setbacks in another are excluded. The sample spans 64 EM and FM over 1996-2014. This approach yields 50 episodes of significant reform spurts and 47 episodes of reform setbacks (Didier et al. 2015).

Let t denote the end of a two-year spurt or setback. The coefficients are dummy variables for spurts and setbacks over the [t-3, t+2] window around these episodes. In Figure 3.17A, "Reform" denotes the t=[-1,0] window (i.e. during the two years of improvement/deterioration). "Pre-reform" denotes the t=[-3,-2] window. For each window, each column shows the sum of coefficients. All coefficients show the growth differential of economies during an episode compared to those that experienced neither improvements nor setbacks. All estimates include time fixed effects to control for global common shocks and country fixed effects to control for time-invariant heterogeneity at the country-level. Under robust standard errors, estimates during the reform spurt window are jointly significant at the 10 percent level, and likewise for the reform setback window. The growth differentials during reform spurts associated with IMF programs are jointly significant at the 1 percent level.

Annex 3.3 Empirical estimates of spillovers from emerging markets

Author	Country/data	Methodology	Results
Ahuja and Nabar (2012) Ahuja and Myrvoda (2012)	G20/monthly, 2000-11	Factor Augmented Vector autoregression (FAVAR)	A one percentage point slowdown in investment in China is associated with a reduction of global growth of just under one-tenth of a percentage point. Regional supply chain economies and commodity exporters with relatively less diversified economies, such as Indonesia, are most vulnerable. Economies that lie within the Asian regional supply chain—Korea; Taiwan, China; and Malaysia—would also be adversely affected. Among the advanced economies, spillover effects most significant for Japan and Germany. Commodity prices, especially metal prices, could fall by as much as 0.8–2.2 percent below baseline one year after the shock.
Duval et al. (2014)	63 advanced and emerging markets/ quarterly, 1995-2012	Panel regression	A 1 percentage point decline in China's growth may lower GDP growth in the median Asian economy by about 0.3 percentage point after a year.
Inoue, Kaya, and Ohshige (2015)	26 advanced and emerging markets/ quarterly, 1979-2013	Global VAR (GVAR) with time-varying trade weights	A decline in China's real GDP has a significant impact on neighboring economies, especially on commodity exporters (e.g. Indonesia). Export-dependent countries in the EAP production cycle (Singapore, Malaysia and Thailand) and commodity exporters like Australia are also severely affected. Commodity prices (metals, crude oil and agriculture products) are also affected.
IMF (2014b)	21 advanced and emerging markets/ quarterly, 1979-2009	GVAR with value-added trade	Spillovers to advanced economies are larger than to emerging economies. A one percentage point reduction in China's growth can reduce growth in advanced economies by 0.15 percentage point at the end of one year, with effects most significant for Japan and the Euro Area. The effects on emerging economies is smallest, around 0.06 percentage point.
World Bank (2015a)	LAC region/quarterly, 1992-2014	Bayesian SVAR with Cholesky identification	A 1 percentage point reduction in Chinese growth can reduce growth in the LAC region by 0.6 percentage point at the end of two years, with effects most significant for Peru and Argentina (around one percentage point). Effects on Brazil are around 0.8 percentage point.
World Bank (2015b)	South Africa/quarterly, 2000-2014	Bayesian SVAR with Cholesky identification	A 1 percentage point reduction in Chinese growth can reduce growth in South Africa by 0.4 percentage point at the end of two years.
IMF (2014a)	Emerging markets/ quarterly, 1998-2013	Bayesian SVAR with Cholesky identification	A 1 percentage point rise in China's growth increases other emerging market economies' growth by about 0.1 percentage point on impact. The impact elasticity is high for some economies in Asia, such as Thailand, but also for commodity exporters such as Russia. Growth fluctuations in China also feed back into the global economy. A 1 percentage point growth increase in China boosts U.S. growth with a lag, the cumulative effect rising to 0.4 percentage point for a cumulative rise in China's growth to 4.6 percent after two years.
Arora and Vamvakidis (2011)	Unbalanced panel of 172 economies / annual data, 1960–2007	VARs and error-correction models for short run effects. Panel regressions for long run effects	Spillover effects of China's growth have increased in recent decades. A 1 percentage point impulse to China's GDP growth is followed by a cumulative response in other countries' GDP growth of 0.4 percentage point over five years. The trade channel is significant: about 60 percent of the impact seems to be transmitted through trade channels. Moreover, while China's spillovers initially only mattered for neighboring countries, the importance of distance has diminished over time. Long-term spillover effects are also significant and have extended in recent decades beyond Asia.
Alturki, Espinosa-Bowen, and Ilahi (2009)	Russia and 11 Commonwealth of Independent States (CIS) countries / annual and quarterly, 1997-2008.	Panel regression; Vector autoregression (VAR)	Russia appears to influence regional growth mainly through the remittance channel and somewhat less through the financial channel. There is a shrinking role of the trade (exports to Russia) channel. Russian growth shocks are associated with sizable effects on Belarus, Kazakhstan, Kyrgyz Republic, Tajikistan, and, to some extent, Georgia.

Author	Country/data	Methodology	Results
Obiora (2009)	Baltic countries and Russia / quarterly, 2000-07	VAR model	There are significant cross-country spillovers to the Baltics with those from the European Union outweighing spillovers from Russia. This reflects increasing trade and financial integration of the Baltics with EU and a declining role of Russia as an export destination for the Baltics.
Norges Bank (2014)	European countries and Russia / quarterly, 2003-13	VAR model	Spillovers from Russian GDP growth are largest for Latvia, Lithuania, Slovakia, Slovenia and Finland (i.e. countries with the largest export exposures to Russia). For Europe as a whole, spillover effects from Russia seem limited.
Arora and Vamvakidis (2005)	47 African countries and South Africa/ five-year growth, 1960-99	Growth regressions based on a panel of countries' average growth rates during five-year subperiods	South African growth has a substantial positive impact on growth in the rest of Africa: a 1 percentage point increase in South Africa five-year growth is associated with a 0.5 – 0.75 percentage point increase in five-year growth in rest of Africa.
Dabla-Norris, Espinoza, and Jahan (2015)	Low income countries (LIC) and emerging markets (EM) / annual, 1980/90 - 2008	VAR model and growth regressions	Growth in LIC depends increasingly on external factors with bulk of this attributable to economic ties developed with EM leaders (eight EM that are the largest destination of LIC exports in each region). LIC in SSA and MNA regions are particularly exposed to spillovers from the EM leaders via the trade channel. A 1 percentage point increase in GDP growth in EM leaders raises activity by between 0.5 and one percentage point in SSA LIC.
IMF (2012a)	African countries / annual, 1980/89-2010/11 for growth analysis; quarterly for inflation analysis	Pooled regression and VAR	Growth spillovers from Nigeria to neighboring countries are negligible. Given closely linked food markets, inflation spillovers are significant. There is no clear evidence that growth in South Africa's main partners in sub-Saharan Africa is affected by South African developments or policies. Global developments are, however, an important determinant of growth.
Canales-Kriljenko, Gwenhamo, and Thomas (2013)	BLNS countries (Botstwana, Lesotho, Namibia, and Swaziland) and South Africa / annual, 1986-2010	VAR	South Africa's real GDP growth does not seem to contribute much to GDP growth in BLNS countries. However, spillovers from global growth are significant.
Gurara and Ncube (2013)	46 African countries and 30 developed and emerging markets/ quarterly data (GDP interpolated from annual data), 1980-2011	GVAR	There is a significant growth spillover effect to African economies from both the Euro zone economies and BRICS. In terms of the magnitudes, a percentage decline in Euro zone growth rate could lead to 0.34 to 0.6 percentage point drop in African countries' growth rates while an equivalent shock in BRICS growth could dent African growth rates by 0.09 to 0.23 percentage point. In both cases, spillover effects on fragile and resource-dependent economies are stronger than those on more diversified African countries.
Cashin, Mohaddes, and Raissi (2013)	38 countries that include advanced, emerging, MNA and GCC countries / quarterly, 1979-2011	GVAR	MNA countries are more sensitive to developments in China than to shocks in the Euro Area or the United States, in line with the direction of evolving trade patterns. Outward spillovers from the GCC region and MNA oil exporters are likely to be stronger in their immediate geographical proximity, but also have global implications.

Note: MNA = Middle East and North Africa; GCC = Gulf Cooperation Council; LIC = Low-Income Countries; LAC = Latin America and the Caribbean.

References

Adler, G., and S. Sosa. 2014. "Intraregional Spillovers in South America: Is Brazil Systemic After All?" *The World Economy* 37 (3): 456–80.

Ahmed, S., M. A. Appendino, and M. Ruta. 2015. "Depreciations without Exports? Global Value Chains and the Exchange Rate Elasticity of Exports." Policy Research Working Paper 7390, World Bank, Washington, DC.

Ahuja, A., and A. Myrvoda. 2012. "The Spillover Effects of a Downturn in China's Real Estate Investment." Working Paper 12/226, International Monetary Fund, Washington, DC.

Ahuja, A., and M. Nabar. 2012. "Investment-Led Growth in China: Global Spillovers." Working Paper 12/267, International Monetary Fund, Washington, DC.

Akin, C., and A. Kose. 2008. "Changing Nature of North–South Linkages: Stylized Facts and Explanations." *Journal of Asian Economics* 19 (1): 1-28.

Alturki, F., J. Espinosa-Bowen, and N. Ilahi. 2009. "How Russia Affects the Neighbourhood: Trade, Finance, and Remittance Channels." Working Paper 09/277, International Monetary Fund, Washington, DC.

Andrle, M., R. Garcia-Saltos, and G. Ho. 2013. "The Role of Domestic and External Shocks in Poland: Results from an Agnostic Estimation Procedure." Working Paper 13/220, International Monetary Fund, Washington, DC.

Arora, V., and A. Vamvakidis. 2005. "The Implications of South African Economic Growth for the Rest of Africa." Working Paper 05/58, International Monetary Fund, Washington, DC.

_____. 2011. "China's Economic Growth: International Spillovers." *China and the World Economy* 19(5): 31-46.

Arteta, C., A. Kose, F. Ohnsorge, and M. Stocker. 2015. "The Coming U.S. Interest Rate Tightening Cycle: Smooth Sailing or Stormy Waters?" Policy Research Note 2, World Bank, Washington, DC.

Ayvazyan, K., and T. Dabán. 2015. "Spillovers from Global and Regional Shocks to Armenia." Working Paper 15/241, International Monetary Fund, Washington, DC.

Bacchetta, P., and E. van Wincoop. 2014. "The Great Recession: A Self-Fulfilling Global Panic." Working paper, University of Virginia, Charlottesville, VA.

Baffes, J., A. Kose, F. Ohnsorge, and M. Stocker. 2015. "The Great Plunge in Oil Prices: Causes, Consequences and Policy Responses." Policy Research Note 1, World Bank, Washington, DC.

Bodenstein, M., C. J. Erceg, and L. Guerrieri. 2009. "The Effects of Foreign Shocks when Interest Rates are Zero." Discussion Paper 8006, Center for Economic Policy Research, London.

Bom, P. R. D., and J. E. Ligthart. 2014. "What Have We Learned From Three Decades of Research on the Productivity of Public Capital?" *Journal of Economic Surveys* 28 (5): 889-916.

Broda, C.M. and C. Tille. 2003. "Coping with Terms-of-Trade Shocks in Developing Countries." Current Issues in Economics and Finance. Federal Reserve Bank of New York (November).

Calderón, C., and L. Servén. 2008. "Infrastructure and Economic Development in Sub-Saharan Africa." Policy Research Working Paper 4172, World Bank, Washington, DC.

_____. 2010. "Infrastructure in Latin America" Policy Research Working Paper 5317, World Bank, Washington, DC.

Canales-Kriljenko, J., F. Gwenhamo, and S. Thomas. 2013. "Inward and Outward Spillovers in the SACU Area." Working Paper 13/31, International Monetary Fund, Washington, DC.

Canova, F., and J. Marrinan. 1998. "Sources and

Propagation of International Output Cycles: Common Shocks or Transmission?" *Journal of International Economics* 46 (1): 133–166.

Cashin, P., K. Mohaddes, and M. Raissi. 2013. "The Global Impact of the Systemic Economies and MENA Business Cycles." Working Paper 13/31, International Monetary Fund, Washington, DC.

Chinn, M. 2014. "Central Banking: Perspectives from Emerging Economies." La Follette School of Public Affairs Working Paper Series, 2014-006, University of Wisconsin-Madison, Madison, WI.

Chudik, A., and M. H. Pesaran. 2013. "Econometric Analysis of High Dimensional VARs Featuring a Dominant Unit." *Econometric Reviews* 32 (5-6): 592-649.

Dabla-Norris, E., A. Thomas, R. Garcia-Verdu, and Y. Chen. 2013. "Benchmarking Structural Transformation across the World." Working Paper 13/176, International Monetary Fund, Washington, DC.

Dabla-Norris, E., R. Espinoza, and S. Jahan. 2015. "Spillovers to Low-Income Countries: Importance of Systemic Emerging Markets." Applied Economics 47(53): 5707-5725.

Dees, S., F. Dimauro, H. Pesaran, and V. Smith. 2007. "Exploring the International Linkages of the Euro Area: A Global VAR Analysis." *Journal of Applied Econometrics* 22: 1-38.

Didier, T., A. Kose, F. Ohnsorge, and L. Ye. 2015. "Slowdown in Emerging Markets: Rough Patch or Prolonged Weakness?" Policy Research Note 4, World Bank, Washington, DC.

Doyle, B., and J. Faust. 2002. "An Investigation of Comovements Among the Growth Rates of the G-7 Countries." Federal Reserve Bulletin 427-437, Board of Governors of the Federal Reserve System, Washington, DC.

Duval, R.K. Cheng, K. H. Oh, R. Saraf, and D. Seneviratne. 2014. "Trade Integration and Business Cycle Synchronization: A Reappraisal with Focus on Asia." Working Paper 14/52, International Monetary Fund, Washington, DC.

Eicher, T., S. Schubert, and S. Turnovsky. 2008. "Dynamic Effects of Terms of Trade Shocks: The impact on Debt and Growth." *Journal of International Money and Finance* 27 (6): 876-96.

Frankel, J., and A. Rose. 1998. "The Endogeneity of the Optimum Currency Area Criteria." *The Economic Journal* 108: 1009–1025.

Gupta, S., A. Kangur, C. Papageorgiou, and A. Wane. 2014. "Efficiency-Adjusted Public Capital and Growth." *World Development* 57 (C): 164-78.

Gurara, D. Z., and M. Ncube. 2013. "Global Economic Spillovers to Africa: A GVAR Approach." Working Paper 183, African Development Bank, Abidjan.

Hammond, G. 2012. "State of the Art of Inflation Targeting." Handbook No. 29, Centre for Central Banking Studies, Bank of England, London.

Heathcote, J., and F. Perri. 2004. "Financial Globalization and Real Regionalization." *Journal of Economic Theory* 119 (1): 207-243.

Hsieh, C.T., and P. Klenow. 2009. "Misallocation and Manufacturing TFP in China and India." *Quarterly Journal of Economics* 124 (4): 1403-1448.

Ilzetzki, E., E. G. Mendoza, and C. A. Vegh. 2013. "How Big (Small?) are Fiscal Multipliers?" *Journal of Monetary Economics* 60 (2): 239-254.

Imbs, J. 2004. "Trade, Finance, Specialization and Synchronization." *Review of Economics and Statistics* 86 (3): 723–734.

Inoue, T., D. Kaya, and H. Ohshige. 2015. "The Impact of China's Slowdown on the Asia Pacific Region: An Application of the GVAR Model." Policy Research Working Paper 7442, World Bank, Washington, DC.

Inter-American Development Bank. 2013.

Rethinking Reforms: How Latin America and the Caribbean can Escape Suppressed World Growth. Latin American and Caribbean Macroeconomic Report. Washington, DC: Inter-American Development Bank.

International Monetary Fund. 2010. *Emerging from the Global Crisis: Macroeconomic Challenges Facing Low-Income Countries.* Washington, DC: International Monetary Fund.

_____. 2011. "Article IV Consultation, the United States: 2011 Spillover Report." IMF Country Report No. 11/203, International Monetary Fund, Washington, DC.

_____. 2012a. *Regional Economic Outlook Sub-Saharan Africa October 2012: Maintaining Growth in an Uncertain World.* Washington, DC: International Monetary Fund.

_____. 2012b. *Regional Economic Outlook Western Hemisphere April 2012: Rebuilding Strength and Flexibility.* Washington, DC: International Monetary Fund.

_____. 2014a. *World Economic Outlook: Recovery Strengthens, Remains Uneven*. Washington, DC: International Monetary Fund.

_____. 2014b. "IMF Multilateral Policy Issues Report: 2014 Spillover Report." IMF Policy Paper, International Monetary Fund, Washington, DC.

_____. 2014c. "Is it Time for an Infrastructure Push? The Macroeconomic Effects of Public Investment." In *World Economic Outlook: Legacies, Clouds, Uncertainties.* Washington, DC: International Monetary Fund.

Jansen, W., and A. Stokman. 2004. "Foreign Direct Investment and International Business Cycle Comovement." ECB Working Paper 401, European Central Bank, Frankfurt.

Kalemli-Ozcan, S., E. Papaioannou, and F. Perri. 2013. "Global Banks and Crisis Transmission." *Journal of International Economics* 89(2): 495-510.

Kalemli-Ozcan, S., B. Sørensen, and O. Yosha. 2003. "Risk Sharing and Industrial Specialization: Regional and International Evidence." *American Economic Review* 93 (3): 903–918.

Kose, A. 2002. "Explaining Business Cycles in Small Open Economies: How much do World Prices Matter?" *Journal of International Economics* 56(2): 299–327.

Kose, A., C. Otrok, and E. Prasad. 2012. "Global Business Cycles: Convergence or Decoupling?" *International Economic Review* 53 (2): 511-538.

Kose, A., C. Otrok, and C. Whiteman. 2003. "International Business Cycles: World, Region, and Country Specific Factors." *American Economic Review* 93 (4): 1216-1239.

Kose, A., E. Prasad, and M. Terrones. 2009. "Does Financial Globalization Promote Risk Sharing?" *Journal of Development Economics* 89: 258–270.

Kose, A. and M. Terrones. 2015. Collapse and Revival: Understanding Global Recessions and Recoveries. Washington, DC: International Monetary Fund.

Kose, A., and R. Riezman. 2001. "Trade Shocks and Macroeconomic Fluctuations in Africa." *Journal of Development Economics* 65(1): 55–80.

Kraay, A., and L. Servén. 2013. "Fiscal Policy as a Tool for Stabilization in Developing Countries." Background Note for *World Development Report 2014: Risk and Opportunity –Managing Risk for Development*, Washington, DC: World Bank.

Lane, P. 2003. "Business Cycles and Macroeconomic Policy in Emerging Economies." *International Finance* 6 (1): 89-108.

Levchenko A., and N. Pandalai-Nayar. 2015. "TFP, News, and "Sentiments": The International Transmission of Business Cycles." NBER Working Paper 21010, National Bureau of Economic Research, Cambridge, MA.

Litterman, R. 1986. "Forecasting with Bayesian

Vector Autoregression – Five Years of Experience." *Journal of Business Economic Statistics* 4 (1): 25–38.

Ludovic, G., and R. Cyril. 2013. "Towards Recoupling? Assessing the Impact of a Chinese Hard Landing on Commodity Exporters: Results from Conditional Forecast in a GVAR Model." MPRA Paper 65457, University Library of Munich, Munich.

Mendoza, E. 1995. "The Terms of Trade, the Real Exchange Rate, and Economic Fluctuations." *International Economic Review* 36 (1): 101-37

Monfort, A., J. Renne, R. Rüffer, and G. Vitale. 2003. "Is Economic Activity in the G-7 Synchronized? Common Shocks versus Spillover Effects." Discussion Paper 4119, Center for Economic Policy Research, Washington, DC.

Norges Bank. 2014. "Spillovers to Europe from the Crisis in Russia and Ukraine." Economic Commentaries No. 6, Norges Bank, Oslo.

Obiora, K. 2009. "Decoupling from the East toward the West? Analyses of Spillovers to the Baltic countries." IMF Working Paper 09/129. International Monetary Fund, Washington, DC.

Pesaran, M. H., T. Schuermann, and S. M. Weiner. 2004. "Modelling Regional Interdependencies Using a Global Error-correcting Macroeconometric Model." *Journal of Business Economics and Statistics* 2: 126-162.

Pesaran, M., and Y. Shin. 1998. "Generalized Impulse Response Analysis in Linear Multivariate Models." *Economics Letters* 58 (1): 17-29.

Ratha, D., S. De, S. Plaza, K. Schuettler, W. Shaw, H. Wyss, S. Yi, and S. Yousefi. 2015. Migration and Development Brief 25, World Bank, Washington, DC.

Samake, I. and Y. Yang. 2014. "Low-income Countries' Linkages to BRICS: Are There Growth Spillovers?" *Journal of Asian Economics* 30: 1–14.

Stock, J., and M. Watson. 2005. "Understanding Changes in International Business Cycle Dynamics," *Journal of the European Economic Association* 3 (5): 968-1006.

World Bank. 2015a. *Global Economic Prospects, January 2015: Having Fiscal Space and Using It.* Washington, DC: World Bank.

_____. 2015b. *Global Economic Prospects, June 2015: The Global Economy in Transition.* Washington, DC: World Bank.

_____. 2015c. *Commodity Markets Outlook July 2015.* Washington, DC: World Bank.

_____. 2015d. *Commodity Markets Outlook October 2015.* Washington, DC: World Bank.

_____. 2015e. *Migration and Development Brief 25*. Washington, DC: World Bank.

Yilmaz, K. 2009. "International Business Cycle Spillovers." Tusiad-Koc University Economic Research ForumWorking Paper 0903, Koc University, Istanbul.