CHAPTER 4

ON THE RECEIVING END? EXTERNAL CONDITIONS AND EMERGING MARKET GROWTH BEFORE, DURING, AND AFTER THE GLOBAL FINANCIAL CRISIS

This chapter finds that external factors induce significant fluctuations in emerging market economies' growth, explaining about half the variance in their growth rates. Higher growth in advanced economies benefits emerging markets even though it is accompanied by higher global interest rates. A tighter external financing environment, stemming from a higher risk premium on emerging markets' sovereign debt, reduces their growth. The payoffs from positive demand shocks are greater for economies that have strong trade ties with advanced economies and lesser for economies that are financially open. Adverse external financing shocks hit economies that are financially open, as well as those with limited policy space. China itself has become a key external factor for other emerging markets in the past 15 years—its strong growth provided a buffer during the global financial crisis. China's recent slowdown has, however, weighed on emerging markets' growth. Despite the importance of external factors, how much emerging markets are affected also depends on their internal policy responses. The influence of these internal factors has risen in the past two years, although they appear to be reducing rather than spurring growth in some key economies, including China. The persistent dampening effect from internal factors in recent years suggests that trend growth could be affected as well.

The recent slowdown in emerging market and developing economies has caused much angst in policy circles. These economies grew at a remarkable pace from the late 1990s until the onset of the global financial crisis in 2008–09 (Figure 4.1, panel 1). With a few exceptions—notably in emerging and developing Europe—activity in these economies also rebounded much more strongly in 2009–10 than in advanced economies (panel 2 of the figure). However, economic growth decelerated after this initial rebound, and growth in some major emerging market economies is now significantly below levels recorded before the global financial crisis. Thus, policymakers worry that this slowdown could be a sign of the lasting effects of the crisis—temporarily offset by policy stimulus—and the beginning of worse to come.

Two polar views have been offered to explain emerging markets' growth experience, with quite different implications for their future prospects. Some have argued that the slowdown in these economies is inevitable following years of rapid growth, helped by a favorable—but ultimately transitory—external environment characterized by high commodity prices and cheap external credit (Aslund, 2013; Eichengreen, Park, and Shin, 2011). In contrast, others have argued that their improved performance was underpinned by structural reforms and strong macroeconomic policies (de la Torre, Levy Yeyati, and Pienknagura, 2014; Subramanian, 2013; Abiad and others, 2012). The reality could indeed lie somewhere between these competing views, wherein positive external conditions provided emerging market economies with the opportunity to strengthen their economic policies and reforms, and although growth may soften with the unwinding of these conditions, it will remain strong.

In this light, it is useful to understand how external conditions have typically affected emerging market economies' growth, so as to get a picture of how they will cope with the impending changes in these conditions. Historically, different external factors have probably affected these economies in different ways: for example, recent weak growth in advanced economies was likely unfavorable for emerging market economies' exports and growth, whereas ultralow global interest rates (see Chapter 3), set to support the recovery in advanced economies, may have helped sustain growth by fueling domestic demand. As shown by the black squares in panel 3 of Figure 4.1, domestic demand in some emerging market economies has been growing at a stronger pace than before the global financial crisis. Looking ahead, these global conditions are set to shift: growth in advanced economies should gain speed and support emerging markets' external demand, but global interest rates will also rise as advanced econo-

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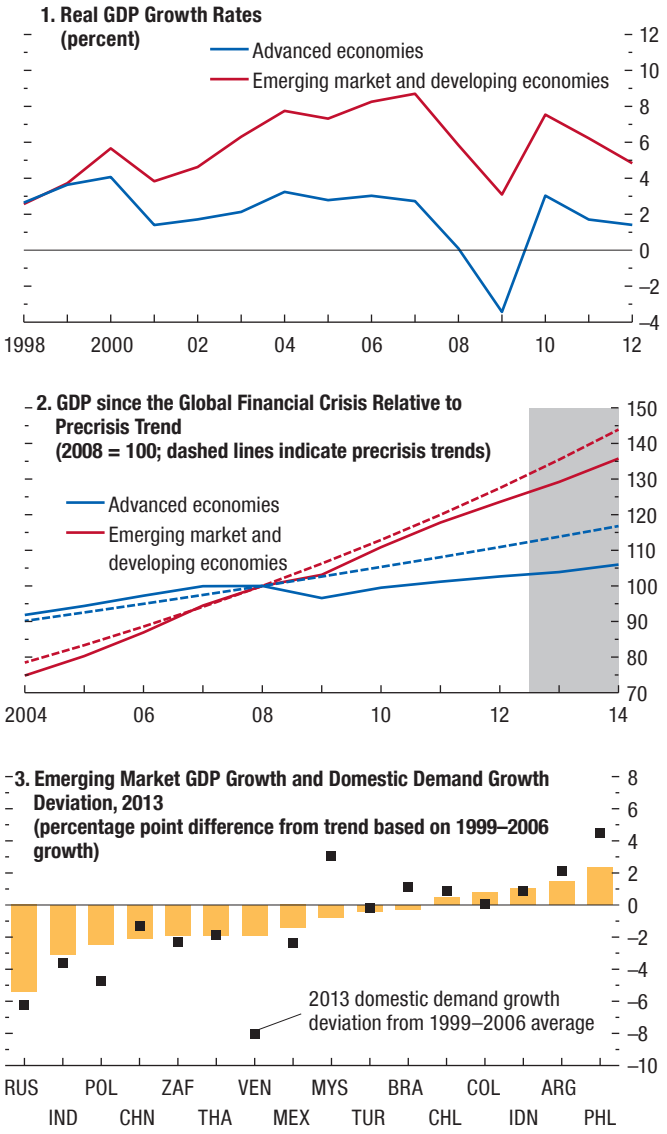
Figure 4.1. Growth Developments in Advanced and Emerging Market and Developing Economies

Emerging market economies grew at a remarkable pace from the late 1990s until the onset of the global financial crisis in 2008–09. With some exceptions, activity in emerging market and developing economies rebounded much more strongly in 2009–10 than in advanced economies. However, economic growth has recently decelerated, with growth in some major emerging markets now significantly below levels recorded prior to the global financial crisis.



Source: IMF staff estimates.
Note: *X*-axis in panel 3 uses International Organization for Standardization (ISO) country codes.

mies' monetary policies normalize (see Chapter 1). Similarly, many emerging market economies, especially commodity exporters, will face weaker terms of trade as commodity price increases are reversed. How these economies perform will depend not only on their exposures to these external factors, but also on whether and how they use policies to respond to the changes.

This chapter analyzes the effect of external factors on emerging market economies' growth in the period before, during, and after the global financial crisis and more recently.[1] Specifically, it addresses the following questions:

- How have external conditions (such as growth in advanced economies, global financing conditions, and terms of trade) typically affected emerging market economies' growth over the past decade and a half?
- Are the effects of external factors similar or different across time? Are all emerging markets equally exposed to external shocks, or are some economies more vulnerable?
- Within emerging market economies, how has China's growth influenced growth in other emerging markets?
- How has the relationship between emerging market economies' growth and the underlying external and internal factors changed since the onset of the global financial crisis?
- What are the prospects for emerging market economies' growth—given the expected changes in the global environment—and what are the policy implications?

The chapter's main findings and conclusions are the following: changes in external conditions have important effects on emerging market economies' growth. Specifically, an unexpected 1 percentage point increase in U.S. growth raises emerging markets' growth by 0.3 percentage point on impact, and the cumulated effects remain positive beyond the short term (more than one to two years). These positive effects incorporate the fact that the 1 percentage point U.S. growth increase also raises the 10-year U.S. Treasury bond rate by close to 10 basis points on impact and 25 basis points after one year.

[1]A related literature analyzes to what extent recent growth changes in emerging market economies are explained by structural versus cyclical factors (see Box 1.2 of the October 2013 *World Economic Outlook*). Although this chapter does not distinguish between structural growth and cyclical growth, it relates to this issue by addressing whether the growth effects of changes in external conditions are persistent or transitory.

Similarly, stronger euro area growth boosts emerging market economies' growth. Conversely, growth is hurt by tighter external financing conditions: a 100 basis point increase in the composite emerging market global sovereign yield reduces growth by ¼ percentage point on impact. On average, in the medium term, external shocks—stemming from external demand, financing costs, and terms of trade—explain about half of the variance in emerging market economies' growth rates.

The incidence of external shocks varies across economies, with stronger growth in advanced economies having a stronger growth effect on emerging market economies that are relatively more exposed to advanced economies in trade and a weaker effect on economies that are more financially open. Similarly, the adverse effects of global financing shocks are higher for emerging market economies that are typically more prone to capital flow volatility or have relatively higher current account deficits and public debt.

External factors have contributed as much as or more than other, mostly internal, factors in explaining emerging markets' growth deviations from the estimated average growth over the past 15 years—although there is considerable heterogeneity across time and across economies. The sharp dip in these economies' growth during the global financial crisis was almost fully accounted for by external factors. Conversely, the pullback in growth for some emerging market economies since 2012 is mostly attributable to internal factors. External factors have generally been much less important compared with internal factors for some relatively large or closed economies, such as China, India, and Indonesia.

China is, in fact, an important contributor to growth for other emerging market economies. China's strong expansion provided emerging markets with an important buffer during the global financial crisis. However, China's recent slowdown has also softened emerging market economies' growth. Specifically, of the 2 percentage point decline in average emerging market economy growth since 2012 compared with 2010–11, China has accounted for close to ½ percentage point, other external factors for 1¼ percentage points, and other, mostly internal, factors for the remaining ¼ percentage point.

Finally, although emerging markets' output and growth outturns since the crisis have been stronger than those observed after most previous global recessions, dynamic forecasts from the empirical model in the analysis, conditional on the path of external factors, show that in some economies—such as China and a few large emerging market economies—growth since 2012 has been systematically lower than expected given external developments. The persistent dampening effects from these factors suggest that growth could remain lower for some time, affecting growth in the rest of the world as well.

Should emerging markets therefore be concerned about their growth prospects as the external environment changes? This chapter's findings suggest that these economies are likely to face a more complex and challenging growth environment than in the period before the global financial crisis, when most external factors were supportive of growth. On the one hand, if external changes are dominated by a strong recovery in advanced economies, this will, overall, benefit emerging markets despite the accompanying higher U.S. interest rates. However, if external financing conditions tighten by more than can be explained by the recovery in advanced economies, as observed for some emerging market economies during the bouts of market turbulence in the summer of 2013 and the beginning of 2014, emerging markets will suffer. Moreover, as the Chinese economy transitions to a more sustainable but slower pace of growth, this will temporarily weigh on growth in other emerging market economies. Finally, growth will decline further if the drag from internal factors, as observed in some emerging market economies since 2012, continues. In this light, the priority is to better understand the role of these internal factors and assess whether there is scope for policies to improve emerging market growth prospects, without generating macroeconomic imbalances.

The rest of the chapter is structured as follows. The next section presents the empirical framework for analyzing the effects of external factors on emerging market economies' growth and maps those factors' contributions over the past decade and a half. It also highlights the heterogeneity across emerging markets in the incidence of shocks. The subsequent section discusses the role of China as an independent external factor, followed by an assessment of the relationship between external factors and medium-term growth. The penultimate section discusses how the relationship between emerging market economies' growth and its underlying external and internal drivers has evolved since the onset of the global financial crisis. The final section draws on the chapter's findings to discuss emerging market economies' growth prospects and the implications for policy.

Effects of External Factors on Emerging Market Growth

Analytical Framework

The analysis draws on a simple organizing framework to consider the relationship between emerging market economies' growth and external conditions. It assumes that most emerging markets are small open economies and that global economic conditions are exogenous to their growth, at least on impact. Thus, the impact of external shocks on a particular economy depends on how exposed the economy is to these shocks via cross-border linkages and on how domestic policy stabilizers are allowed to work. Over time, the cumulated effect on domestic growth may be amplified or dampened as domestic policies respond further to external shocks.

However, such a framework does not fully consider the potential implications of the rising importance of emerging market economies. Emerging market and developing economies now account for more than one-third of world output at market exchange rates—up from less than 20 percent in the 1990s. Thus, global economic conditions could be treated as endogenous to shocks emanating from emerging market economies as a group. Emerging market and advanced economies could also be driven by common shocks. The analysis in this chapter assumes that any such contemporaneous feedback effects from emerging market economies' domestic conditions within a quarter are small enough to be ignored, but allows for these domestic conditions to affect global conditions with a lag.[2] The chapter also considers the effects of China's growth—as an external factor distinct from other traditional external factors—on growth in other emerging market economies. With this in mind, this chapter adds to the related literature in three ways:[3]

- First, by focusing on the past decade and a half, during which emerging market economies' performance and policies improved remarkably, as evidenced by their resilience to the deepest global recession in recent history, it analyzes whether the role of external conditions in determining emerging market economies' growth has fundamentally changed in recent years.
- Second, it documents how the heterogeneity in the incidence of external shocks across emerging market economies relates to differences in their structural characteristics and policies.
- Third, it addresses whether and how the emergence of China as a systemically important component of the global economy has reshaped the impact of external factors on emerging market economies' growth.[4]

The analysis uses a standard structural vector autoregression (VAR) model to quantify the growth effects of external shocks. The baseline model comprises nine variables, each placed into either an external or an internal block. The external variables (the "external block") include U.S. real GDP growth, U.S. inflation as measured by the consumer price index, the 10-year U.S. Treasury bond rate, the composite emerging market economy bond yield (from the J.P. Morgan Emerging Market Bond Index (EMBI) Global), and economy-specific terms-of-trade growth. In expanded versions of the baseline specification, the external block is augmented by additional proxies for global financing conditions, such as the U.S. high-yield spread, as well as proxies for global demand, such as growth in China and the euro area. The domestic variables (the "internal block") include domestic real GDP growth, domestic consumer price inflation, the rate of appreciation of the economy's real exchange rate against the U.S. dollar, and the domestic short-term interest rate. The external block is assumed to be contemporaneously exogenous to the internal block—that is, external variables are not affected by internal variables within a quarter.

Within the external block, the structural shocks are identified using a recursive scheme, based on the above order. In other words, U.S. growth shocks are able to affect all other variables within a quarter, whereas shocks to other variables can affect U.S. growth only with a lag of at least one quarter. U.S. inflation shocks are able to affect all the variables ordered below U.S. inflation within a quarter, whereas shocks to the

[2]Given these restrictions, one caveat is that the analysis could overstate the effects of external shocks. It is, however, reassuring that the chapter's estimates for the magnitude of the effects of external conditions are similar to estimates from other recent studies. See note 21 for details.

[3]Other studies analyzing the role of external conditions in emerging markets' growth include Calvo, Leiderman, and Reinhart (1993), Canova (2005), Swiston and Bayoumi (2008), and Österholm and Zettelmeyer (2007) for Latin America; Utlaut and van Roye (2010) for Asia; and Adler and Tovar (2012), Erten (2012), and Mackowiak (2007) for a more diverse group of emerging market economies. Most, if not all, find that external shocks—however identified—are important for emerging markets' growth, explaining about half of its variance.

[4]Utlaut and van Roye (2010) ask a similar question for emerging Asia, as do Cesa-Bianchi and others (2011) for Latin America.

variables below U.S. inflation can affect it only with a lag. A similar logic then applies to variables lower in the external block. Within the internal block, structural shocks are not explicitly ordered and therefore are not identified.[5]

Taken together, the U.S. variables in the external block proxy for advanced economy economic conditions: U.S. growth captures advanced economy demand shocks; after U.S. growth is controlled for, U.S. inflation captures advanced economy supply shocks; and the 10-year U.S. Treasury bond rate captures the stance of advanced economy monetary policy.[6] Changes in emerging market financing conditions arising from factors other than external demand conditions are incorporated through the EMBI Global yield. Similarly, changes in terms-of-trade growth represent factors other than changes in external demand or financing conditions.

The model is estimated individually for each economy in the sample using quarterly data from the first quarter of 1998 through the latest available quarter in 2013. The focus is on the period after the 1990s, given the significant shifts in policies in these economies during this time (Abiad and others, 2012). These include, for example, the adoption of flexible exchange rate regimes, inflation targeting, and the reduction of debt levels. Furthermore, the first quarter of 1998 was the earliest common starting point for all the economies based on data availability at a quarterly frequency. The number of variables and lags chosen for the specification results in a generous parameterization relative to the short sample length. As a result, degrees of freedom are limited such that standard VAR techniques may yield imprecisely estimated relationships that closely fit the data—a problem referred to as "overfitting." A Bayesian approach, as advocated by Litterman (1986), is adopted to overcome this problem. It allows previous information about the model's parameters to be combined with information contained within the data to provide more accurate estimates. Given the observed persistence in emerging market economy growth (see Chapter 4 of the October 2012 *World Economic Outlook,* WEO), it is assumed that all variables follow a first-order autoregressive (AR(1)) process, with the AR coefficient of 0.8 in the priors.[7]

In view of the short sample length, and given the need to focus on a select few measures for external conditions, a number of robustness checks on the main analysis have been performed, as reported in Appendix 4.2.[8] Overall, the main results are found to be largely unaffected by changes in the underlying specification of the model, addition of new variables, changes in the assumptions about the priors (for example, white noise around the unconditional means instead of AR(1) processes), or even changes in the statistical methodology (for example, pooling across economies in a panel VAR and discarding the Bayesian approach).

The sample comprises 16 of the largest emerging market economies, spanning a broad spectrum of economic and structural characteristics (Figure 4.2).[9] Together, they account for three-quarters of the output of all emerging market and developing economies in purchasing-power-parity terms. Malaysia, the Philippines, and Thailand are relatively more integrated with global trade and financial markets (panels 1 and 3 of Figure 4.2). Malaysia, Mexico, and Poland are relatively more exposed to advanced economies in goods trade (panel 2). Chile is also financially highly integrated but not that vulnerable to capital flow volatility (panels 3 and 4). Brazil and India have low levels of goods trade exposure to advanced economies

[5]See Appendix 4.1 for a description of the data and Appendix 4.2 for additional details regarding the recursive identification.

[6]With the federal funds rate constant at near zero since 2008 and the Federal Reserve's focus on lowering U.S. interest rates at the long end, the 10-year Treasury bond rate is likely a better proxy for U.S. monetary policy for the analysis. That said, none of the main results of the analysis would be affected if the federal funds rate were used instead (see Appendix 4.2 for details).

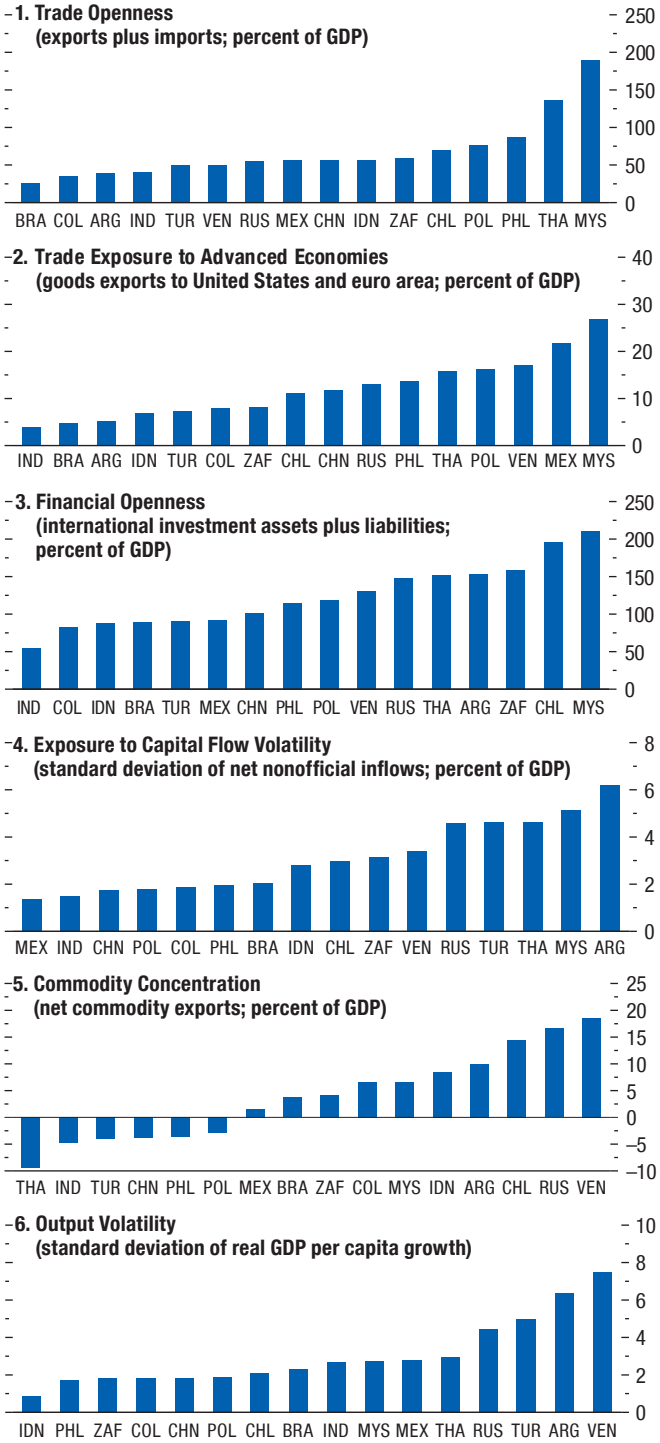
[7]A more persistent growth process in the prior in part recognizes that growth could in fact be drifting away from its mean for a prolonged period during the sample period. This is possible for a number of the economies in the sample, as observed in their actual growth movements in the past 15 years (see Appendix 4.1).

[8]The Bayesian methodology is particularly helpful given the relatively short estimation period. With 60 to 62 observations for each economy-specific regression and 37 coefficients to estimate, the prior gets a weight of slightly less than 25 percent in the baseline specification. The weight does increase with the alternative specifications, rising to 50 percent for the short sample regressions in the penultimate section. However, alternative methodologies that do not rely on Bayesian techniques yield broadly similar results: Box 4.1 sheds light on the medium-term relationship between growth and external factors, whereby growth is averaged over a five-year period to remove any effects from business cycles. Appendix 4.2 also discusses the results of the main analysis for a smaller sample of economies for which data are available back to the mid-1990s, which, therefore, does not use Bayesian methods. Finally, it also outlines additional robustness checks using panel VARs.

[9]The sample is Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Malaysia, Mexico, Philippines, Poland, Russia, South Africa, Thailand, Turkey, Venezuela.

Figure 4.2. Average Country Rankings, 2000–12

The sample of 16 of the largest emerging market economies covers a broad spectrum of economic and structural characteristics.



Sources: IMF, Balance of Payments Statistics database; IMF, Direction of Trade Statistics database; IMF, International Financial Statistics database; IMF, April 2012 *World Economic Outlook*, Chapter 4; and IMF staff calculations.
Note: *X*-axis in panels uses International Organization for Standardization (ISO) country codes.

and are relatively less open among the sample economies. Argentina and Venezuela experience large output fluctuations—likely reflecting their narrow export bases (panel 5), but also domestic policies—as do Russia and Turkey (panel 6).

The discussion of the results focuses on the findings for emerging market economies that enjoyed strong macroeconomic performance during the past 15 years but are now slowing. Although the impulse responses to alternative shocks show the mean group estimates based on all the economies in the sample, the average response for a smaller subsample of emerging market economies, excluding economies that experienced high macroeconomic volatility or recent crises (specifically, Argentina, Russia, and Venezuela), is also presented.

Key Findings

Stronger external demand has a lasting positive effect on emerging market economies' growth despite the attendant rise in the 10-year U.S. Treasury bond rate (Table 4.1, Figure 4.3). A 1 percentage point increase in U.S. growth typically raises emerging markets' growth by 0.3 percentage point on impact; the incremental effects remain positive for six quarters (panels 1 and 2 of the figure), and the cumulative effects remain positive beyond the short term (more than one to two years), as shown by the black squares in panel 2 of the figure. Positive spillovers are also transmitted through a small boost to emerging market economies' terms-of-trade growth (Table 4.1). The impact effect tends to be stronger for economies that are relatively more exposed to advanced economies in trade (for example, Malaysia and Mexico), but also stands out for some others (for example, India and Turkey).[10] As shown in Table 4.1, the increase in U.S. growth induces an increase in the 10-year U.S. Treasury bond rate by close to 10 basis points on impact and further through the first two years (see the estimates in the third grouping within the first data column of the table).[11]

[10]The relatively high impact elasticity of India's growth to U.S. growth could reflect the fact that the Indian economy is more closely integrated with that of the United States than is implied by a measure of integration based on the share of India's goods trade to advanced economies, as in Figure 4.2, panel 2, notably through its sizable service sector exports (for example, outsourcing). Even the data suggest a relatively strong correlation between India's growth and advanced economy growth in the past 15 years (see Appendix 4.1).

[11]The effects of the increase in U.S. growth remain strong at about the same level even after growth in other advanced economies is

Table 4.1. Impulse Responses to Shocks within the External Block: Baseline Model
(Percentage points)

		Shock				
	Response[1]	U.S. Real GDP Growth	U.S. Inflation	Ten-Year U.S. Treasury Bond Rate	EMBI Yield	Terms-of-Trade Growth[2]
U.S. Real GDP Growth	On Impact	1.00	0.00	0.00	0.00	0.00
	End of First Year	3.20	–0.63	0.10	–0.09	0.02
	End of Second Year	3.86	–2.44	–0.72	0.72	0.06
	End of Third Year	3.28	–2.04	–2.72	1.61	0.09
U.S. Inflation	On Impact	0.11	1.00	0.00	0.00	0.00
	End of First Year	0.66	1.96	0.21	–0.31	0.01
	End of Second Year	1.50	0.66	1.21	–0.42	0.02
	End of Third Year	1.56	0.70	0.91	–0.18	0.05
Ten-Year U.S. Treasury Bond Rate	On Impact	0.07	0.07	1.00	0.00	0.00
	End of First Year	0.26	–0.07	3.08	–0.01	0.01
	End of Second Year	0.65	–0.07	4.96	0.21	0.01
	End of Third Year	1.00	–0.14	6.21	0.49	0.02
EMBI Yield	On Impact	–0.31	–0.17	0.22	1.00	0.00
	End of First Year	–0.85	0.14	0.96	2.83	0.00
	End of Second Year	–1.00	0.51	2.56	4.13	–0.02
	End of Third Year	–0.67	0.44	4.76	4.98	–0.04
Terms-of-Trade Growth[2]	On Impact	0.09	1.43	0.29	–0.28	1.00
	End of First Year	1.22	0.45	1.86	–1.47	2.23
	End of Second Year	1.10	–2.79	1.89	–0.76	1.88
	End of Third Year	–0.39	–0.83	–0.44	–0.35	2.04

Source: IMF staff calculations.
Note: EMBI = J.P. Morgan Emerging Markets Bond Index.
[1]All responses are cumulated for the end of the period and normalized for a 1 percentage point shock.
[2]Averaged across country-specific shocks and responses.

Growth boosts from other advanced economies—proxied by euro area growth in addition to U.S. growth in an alternative specification—are also substantial on impact for emerging market growth (panel 3 in Figure 4.3), even though the positive effects do not endure for as long as those from the U.S. growth shock. This emphasizes the broader sensitivity of growth in emerging market economies to external demand shocks from advanced economies beyond simply the United States. Given the prevailing downside risks to growth prospects in the euro area (see Chapter 1), the risk of adverse spillovers to emerging market growth from Europe also remains strong.

Tighter external financing conditions result in a decline in emerging market economies' growth within the same quarter (Figures 4.4 and 4.5). A 100 basis point increase in the composite EMBI yield (a risk premium shock) reduces emerging market economies' growth by ¼ percentage point on impact, and the cumulated effects remain negative even after two years for a majority of the economies. The real exchange rate tends to depreciate, and domestic short-term rates are typically raised in response, possibly reflecting the capital outflows associated with such shocks. The net effect partly depends on the extent to which a weaker currency is able to support export growth.

Shocks to other proxies for emerging markets' external financing conditions yield results similar to those for shocks to the EMBI yield. Since EMBI yields also fluctuate with domestic developments within emerging markets, the composite index, rather than the country-specific yields, is used as the proxy for external financing conditions. In this index, country-specific factors should be less important. That said, it is possible that changes in the composite EMBI yield could still reflect changes in market sentiment toward underlying domestic developments in emerging markets. Therefore, in an alternative specification, the U.S. corporate high-yield spread is used as an additional proxy for external financing conditions.[12] An increase in the U.S.

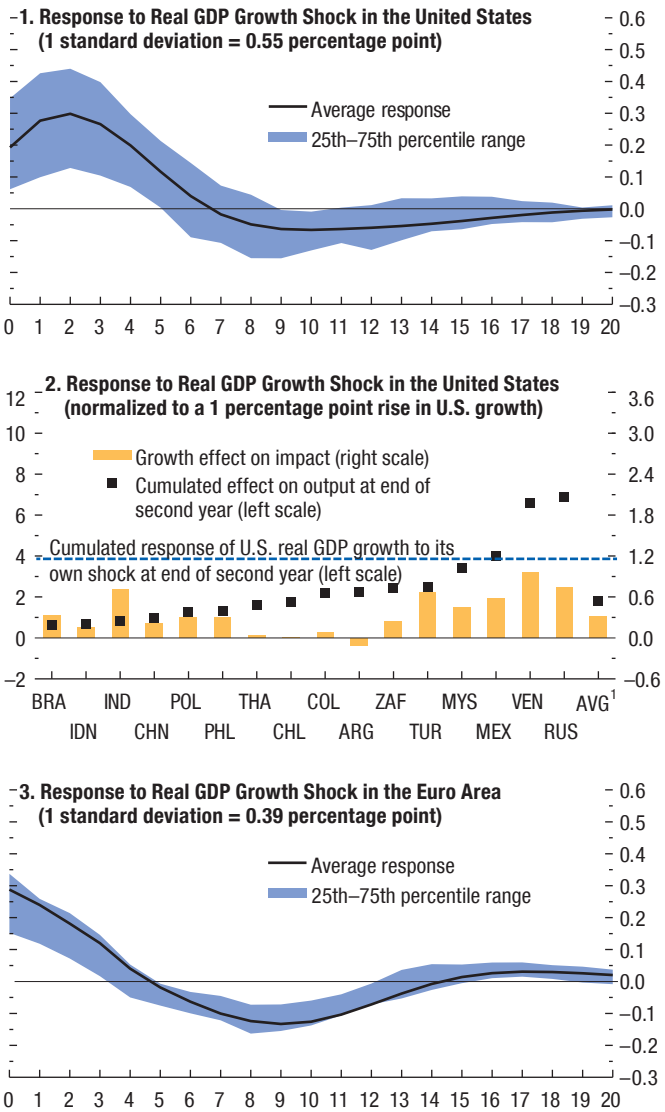
controlled for. These findings are in line with the related literature (see Österholm and Zettelmeyer, 2007). See Appendix 4.2 for details.

[12]The U.S. high-yield spread is placed before the EMBI yield, and after all other U.S. variables, in the external block.

Figure 4.3. Impulse Responses of Domestic Real GDP Growth to External Demand Shocks

(Percentage points)

Stronger external demand, proxied by a rise in real GDP growth in advanced economies, has a lasting positive effect on emerging market economies' growth.

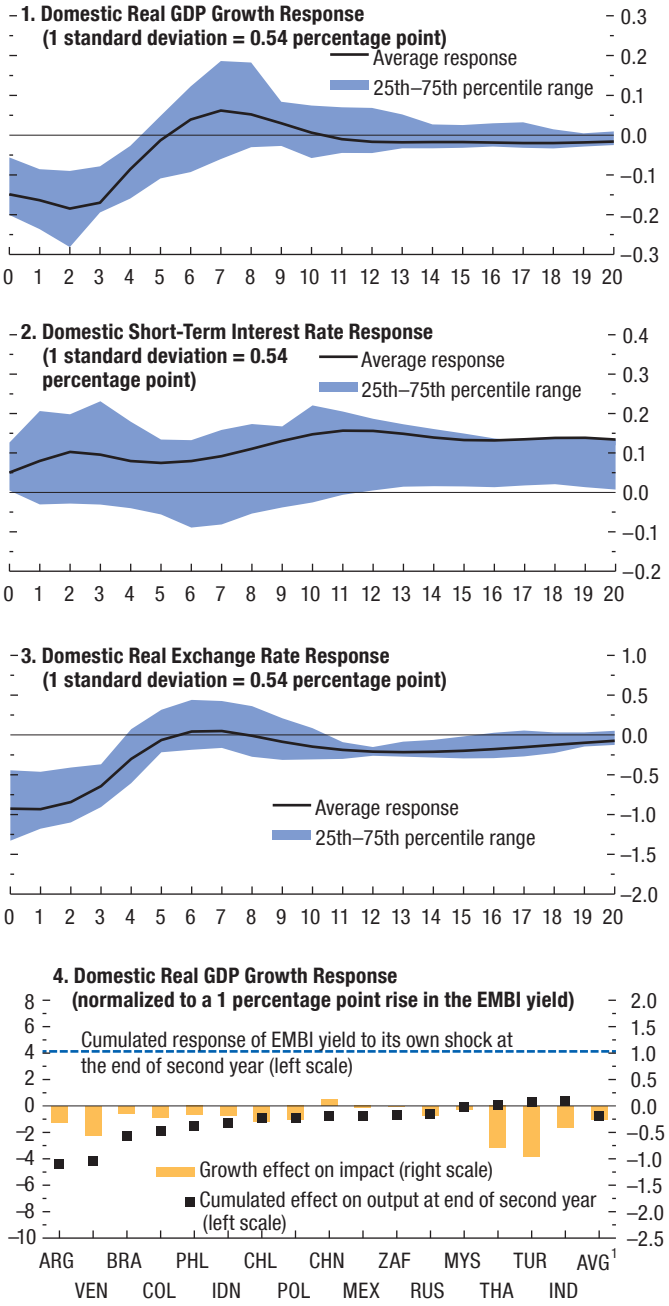


Source: IMF staff calculations.
Note: *X*-axis units in panels 1 and 3 are quarters; $t = 0$ denotes the quarter of the shock. *X*-axis in panel 2 uses International Organization for Standardization (ISO) country codes.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

Figure 4.4. Impulse Responses to External Financing Shock

(Percentage points)

A higher risk premium on emerging market economies' sovereign debt reduces their growth.



Sources: Federal Reserve Economic Data; Haver Analytics; IMF, International Financial Statistics database; Thomson Reuters Datastream; and IMF staff calculations.
Note: *X*-axis units in panels 1–3 are quarters; $t = 0$ denotes the quarter of the shock. *X*-axis in panel 4 uses International Organization for Standardization (ISO) country codes. EMBI = J.P. Morgan Emerging Markets Bond Index.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

high-yield spread has an even stronger negative growth effect, with a 100 basis point increase in the spread reducing emerging markets' growth by 0.4 percentage point on impact (Figure 4.5).

Effects of changes in U.S. monetary policy, as proxied by the 10-year U.S. Treasury bond rate in the baseline specification, are also considered. The rise in the U.S. 10-year rate has a negative effect on emerging market growth after a lag of five to six quarters. This may reflect the fact that changes in the U.S. 10-year rates (that are unrelated to U.S. GDP growth and inflation) can still embody many other factors unrelated to the U.S. monetary policy stance, such as expectations about the path of the U.S. economy, or even changes to risk appetite in international investors because of non-U.S. factors as observed through safe haven flows to U.S. Treasury bonds during crises. The details are discussed in Appendix 4.2. Similar results—a lagged negative growth response to a U.S. interest rate increase after the early 1990s—have also been found by others (Mackowiak, 2007; Österholm and Zettelmeyer, 2007; Ilzetzki and Jin, 2013).[13]

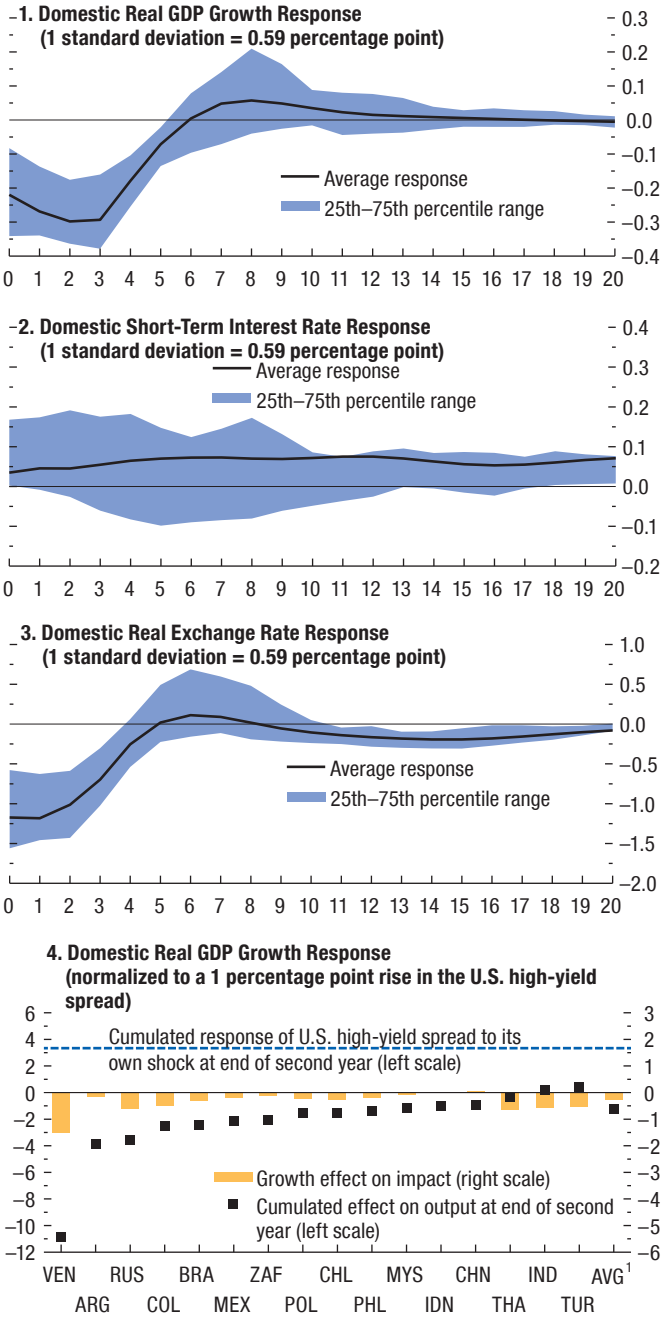
Simple associations linking economies' growth responses to external shocks with their structural and macroeconomic characteristics are examined by way of bivariate scatter plots (Figure 4.6). With 16 observations for each correlation in this figure, the statistical relationships are suggestive at best. Notable observations include the following:

- Higher advanced economy growth imparts stronger growth spillovers for emerging markets that trade relatively more with advanced economies (for example, Mexico; see panel 1 of the figure) but weaker spillovers for those that are financially more open (for example, Chile; see panel 2). Countries exposed to greater capital flow volatility in general (for example, Thailand; see panel 3) also benefit less. It is possible that stronger growth in advanced economies (and the attendant rise in their interest rates) results in greater capital outflows

[13]Other proxies for U.S. monetary policy (besides the 10-year U.S. Treasury bond rate in the baseline specification) that are considered include the effective federal funds or policy rate, the ex ante real federal funds rate, the change in the policy rate, the term spread (the 10-year Treasury bond rate minus the effective federal funds rate), and measures of pure monetary policy shocks (such as those in Kuttner, 2001, and Romer and Romer, 2004). For each of these proxies, the 10-year rate is replaced with the proxy in alternative specifications. Shocks to most of these proxies result in a lagged negative effect on emerging markets' growth. Only increases in the term spread have an immediate negative effect (see Appendix 4.2 for details).

Figure 4.5. Impulse Responses to U.S. High-Yield Spread Shock
(Percentage points)

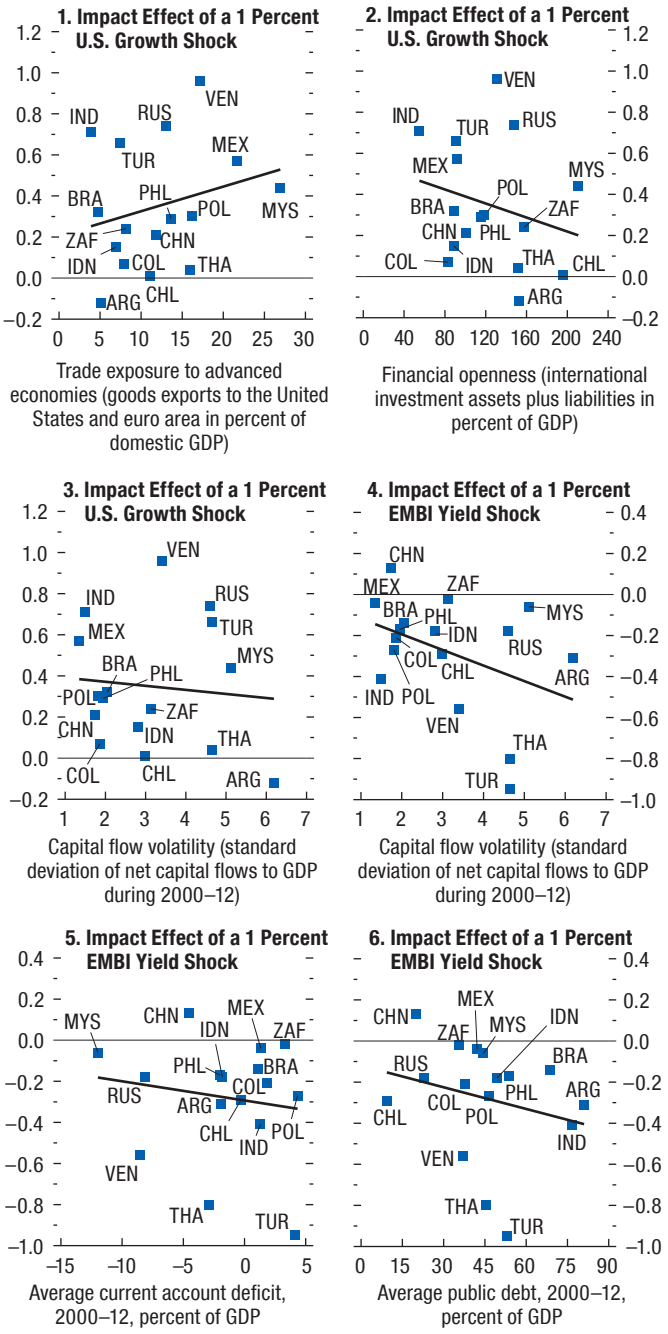
A rise in the U.S. high-yield spread also has a strong negative effect on emerging market economies' growth.



Sources: Federal Reserve Economic Data; Haver Analytics; IMF, International Financial Statistics database; Thomson Reuters Datastream; and IMF staff calculations.
Note: *X*-axis units in panels 1–3 are quarters; $t = 0$ denotes the quarter of the shock. *X*-axis in panel 4 uses International Organization for Standardization (ISO) country codes.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

Figure 4.6. Correlations between Growth Responses to External Shocks and Country-Specific Characteristics
(Percentage points)

Stronger external demand is more beneficial to economies that have stronger trade links with advanced economies and less beneficial to economies that are financially very open. External financing shocks more severely affect economies that are more exposed to capital flow volatility and those with relatively less policy space.



Sources: IMF, Balance of Payments Statistics database; IMF, Direction of Trade Statistics database; IMF, International Financial Statistics database; IMF, April 2012 *World Economic Outlook,* Chapter 4; and IMF staff calculations.
Note: EMBI = J.P. Morgan Emerging Markets Bond Index. Data labels in the figure use International Organization for Standardization (ISO) country codes.

from financially integrated economies, partly or fully offsetting the beneficial effects of the external demand increase, especially for economies that do not have strong trade ties with advanced economies.

- Adverse external financing shocks hurt economies more when they tend to be more exposed to capital flow volatility (for example, Thailand and Turkey; see panel 4) or when they have relatively higher external current account deficits and public debt (see panels 5 and 6). The effects are less acute for some economies despite their financial openness, which could be attributable to relatively strong macroeconomic positions (for example, Malaysia). Chile and Malaysia are among the few economies in the sample that have tended to hold their domestic interest rates steady or have even cut them in response to higher EMBI yields. For some others, inadequate policy space may have limited the scope for countercyclical policies to cushion the growth effects of higher EMBI yields.

These results resonate well with policies observed in the second half of 2013 and so far in 2014 in response to financial market volatility. Many emerging market economies have resorted to raising domestic interest rates as external financing conditions have tightened and have allowed their exchange rates to adjust. The findings in this chapter suggest that how these economies will be affected will depend on whether their external financial conditions tighten by more than what can be explained by a growth recovery in advanced economies, as well as on their domestic policy response. If financing conditions are tighter, and emerging market economies are forced to limit capital outflows by raising domestic rates, growth will decline, with the decline offset, in part, by exchange rate depreciation. Growth will be further hit in economies that are more exposed to capital flow volatility or those with limited policy space to respond countercyclically to these shocks.

Increases in emerging market economies' terms-of-trade growth that are not accounted for by external demand have a small positive effect on growth that lasts about one year (Figure 4.7). The relatively muted response (compared with responses to other shocks) may reflect the fact that these terms-of-trade changes are driven by supply shocks.[14]

[14]As shown in Appendix 4.2, an alternative specification that considers the global commodity price index, as an additional proxy for emerging market economies' terms of trade, yields broadly similar results for the effects of shocks from global commodity price growth on emerging market economies' real GDP growth.

External versus Internal Factors' Contributions in Historical Growth Dynamics

The analysis so far has confirmed that shocks stemming from external demand and financing conditions have significant repercussions for emerging markets' growth. However, the combination of domestic structures and policies has helped offset the shocks in some cases, whereas it has amplified them in others. In this light, this section looks back historically to assess the extent to which emerging market economies' growth performance relative to their estimated average growth over the sample period is explained by external factors.

External factors tended to explain one-half or more of the deviation in emerging market economies' growth from the estimated sample mean during 1998–2013 (Figure 4.8, panel 1).[15] The higher contribution of external factors is particularly noticeable during the last two recessions originating in advanced economies—in the early 2000s and during the global financial crisis. However, the other, mostly internal factors contributed more during the onset of emerging markets' rapid expansion in the period before the global financial crisis, as well as during the slowdown beginning in 2012.

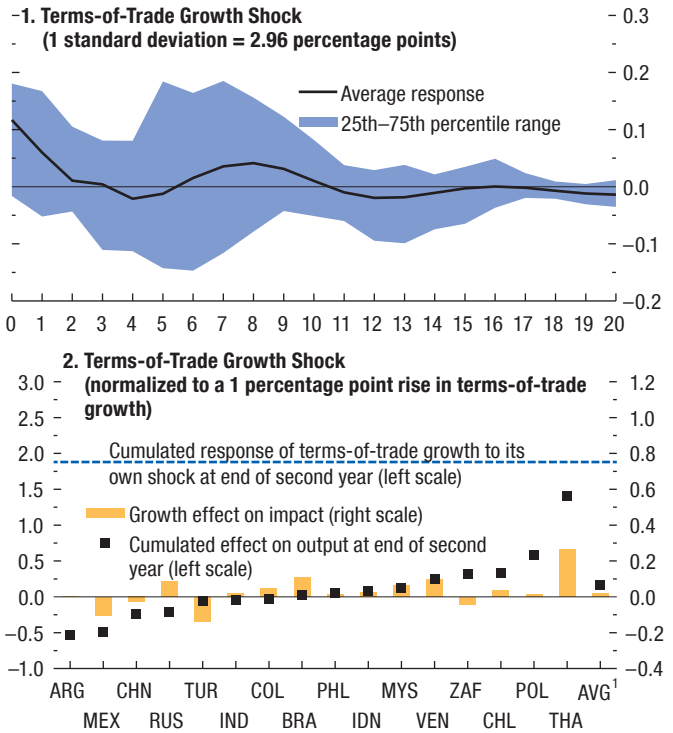
Internal factors played a more important role, however, in relatively closed or large economies for the entire sample period (Figure 4.8, panels 2–7). Note that in Figure 4.8, the increase or decline in the contribution of a factor is measured by the change in its level relative to the previous quarter. In China, internal factors started contributing less to deviations from average growth beginning in early 2007. The negative contribution of internal factors increased at the onset of the crisis, peaking in the first quarter of 2009, after which a large-scale fiscal stimulus package was deployed (see Dreger and Zhang, 2011). The contribution of internal factors started rising in mid-2009, turning positive in the fourth quarter of 2009 and peaking in 2010. Similarly, in India, internal factors began dampening growth in early 2008, likely as the result of tensions from growing bottlenecks in infrastructure after a period of rapid growth (see IMF, 2008a). Their negative incidence continued until mid-2009, when internal factors started contributing more to growth again. In contrast, the sharp dip in growth in Brazil and Indonesia during the global financial crisis was almost fully driven by external factors. In Russia and South Africa, external factors dominated growth dynamics during the global financial crisis, but internal factors also played a role, possibly reflecting problems related to domestic overheating (in Russia; see IMF, 2008b) or supply-side constraints (in South Africa; see IMF, 2008c).

[15]Given the estimates from the reduced-form VAR, growth for each economy at any point in history can be expressed as the sum of initial conditions and all the structural shocks in the model. The sum of the shocks from the identified external factors—advanced economy indicators, EMBI yield, and terms-of-trade growth—provides the contribution of all external factors. The remaining shocks likely stem from domestic variables (such as domestic inflation, real exchange rates, and short-term interest rates in the model) and are termed internal. That said, these unidentified residual shocks could also partly embody other factors, such as common or exogenous shocks (for example, natural disasters).

Figure 4.7. Impulse Responses of Domestic Real GDP Growth to Terms-of-Trade Growth Shock

(Percentage points)

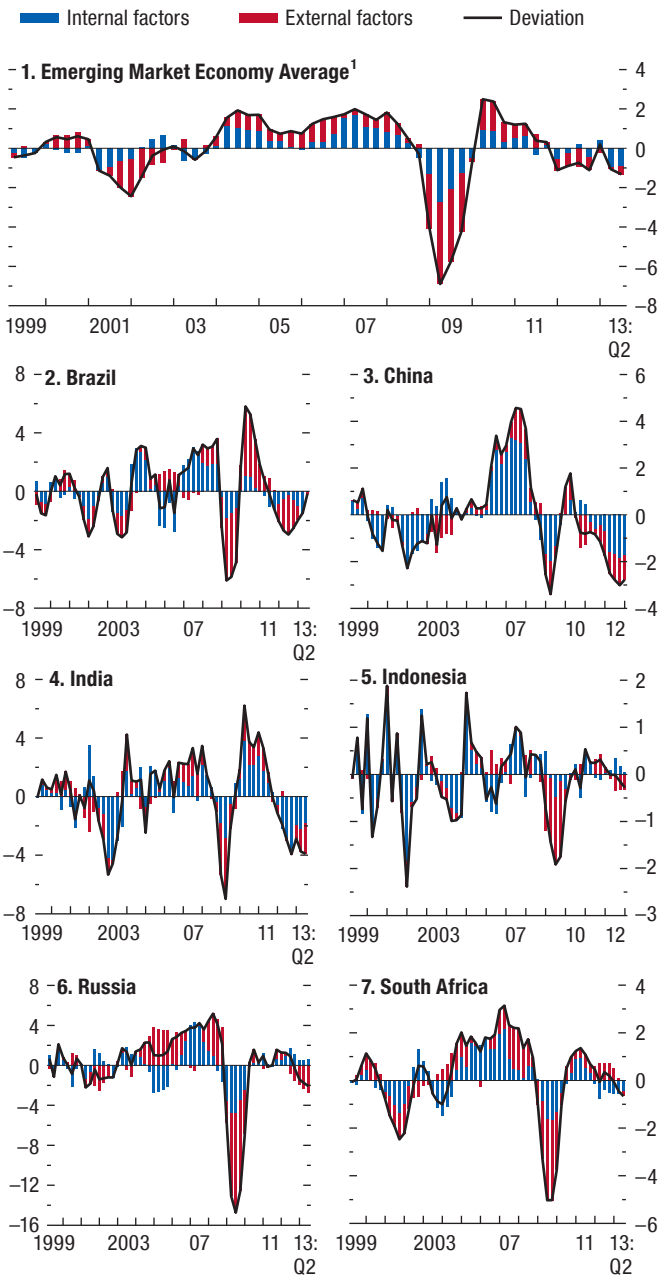
Increases in emerging market economies' terms-of-trade growth that are not accounted for by external demand have a small positive effect on growth that lasts for about one year.



Sources: Haver Analytics; IMF, International Financial Statistics database; Organization for Economic Cooperation and Development; and IMF staff calculations.
Note: *X*-axis units in panel 1 are quarters; $t = 0$ denotes the quarter of the shock. *X*-axis in panel 2 uses International Organization for Standardization (ISO) country codes. Average response to terms-of-trade growth shock is calculated as the average of the responses of emerging market economies' growth to their country-specific terms-of-trade growth shock.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

Figure 4.8. Historical Decompositions of Real GDP Growth into Internal and External Factors
(Percentage points)

External factors tended to explain one-half or more of emerging market economies' growth deviation relative to the estimated sample mean during 1998–2013. The roles of external versus internal factors, however, varied across economies, with internal factors playing a more important role in relatively closed or large economies throughout the sample period.



Sources: Haver Analytics; Thomson Reuters Datastream; and IMF staff calculations.
Note: The underlying vector autoregression model includes U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, J.P. Morgan Emerging Markets Bond Index yield, and terms-of-trade growth in the external block.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

Internal factors appear to have been pulling down growth in some economies in recent years, although their contribution to growth changes over time has differed across countries. In China, these factors were largely depressing growth after late 2010, but there is a small uptick in their contribution in the last quarter of 2012. A similar picture emerges for India, wherein internal factors reduced growth from 2011 until the third quarter of 2012, but there is an increase in their contribution since late 2012. A more nuanced picture emerges for Brazil and South Africa, but in both economies, after a drag from internal factors in the second half of 2012, these factors contributed more to growth in the first half of 2013.

Global Chain or Global China? Quantifying China's Impact

China's dramatic expansion during the past several decades has garnered much policy attention. The economy's rising weight in international trade has offered many emerging market economies the scope to diversify their exports away from advanced economies toward China. A number of recent studies have found significant implications of changes in China's real activity for growth in the rest of the world (Arora and Vamvakidis, 2010; Ahuja and Nabar, 2012; Cesa-Bianchi and others, 2011; IMF, 2012, 2013a; and the Spillover Feature in Chapter 2). Moreover, China itself has become more resilient to changes in advanced economies' economic developments, as documented in the previous section.

Accordingly, this section analyzes the implications of China as a distinct external factor for other emerging markets' growth since the late 1990s. How China influences growth beyond its borders will, of course, depend on the nature of its cross-country linkages. One prominent channel is the global supply chain, through which China imports intermediate inputs from elsewhere—especially emerging Asia—to produce final goods for advanced economy markets. In this role, changes in China's growth are largely endogenous to changes in demand conditions in advanced economies. Another channel arises from China's own demand. China's investment-oriented growth can boost commodity-exporting emerging market economies via higher commodity demand and prices. Further demand rebalancing toward private consumption will also benefit those exporting final goods to China (see

Box 1.2). Finally, China can also support growth elsewhere through higher foreign direct investment flows into those economies (Dabla-Norris, Espinoza, and Jahan, 2012). To identify China's economic impact on others, its growth is placed in the external block for the other 15 emerging market economies in the sample.[16]

The results confirm China's systemic importance in emerging markets' growth (Figure 4.9). A 1 percentage point rise in China's growth—which is not explained by U.S. growth—increases other emerging market economies' growth by about 0.1 percentage point on impact. The positive effect tends to build over time as emerging markets' terms of trade get a further boost, highlighting China's relevance for global commodity markets (see Table 4.2).[17] The impact elasticity is high for some economies in Asia, such as Thailand, but also for commodity exporters such as Russia.[18] Growth shocks from China also feed back into the global economy. A 1 percentage point growth shock 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 (see Table 4.2 and panel 2 of Figure 4.9). However, the effect reverses fully within three years.

Emerging markets' economic integration with China has provided an offset to other external factors at key moments (Figure 4.10). Note once again that the increase or decline in the contribution of a factor is measured by the change in its level relative to the previous quarter. China's growth contributed positively to other emerging markets' growth from mid-2001 until early 2002, helping to ameliorate the negative effects of other external factors in the aftermath of the advanced economy recession. Also, after the onset of the global financial crisis, recovering Chinese growth—boosted by

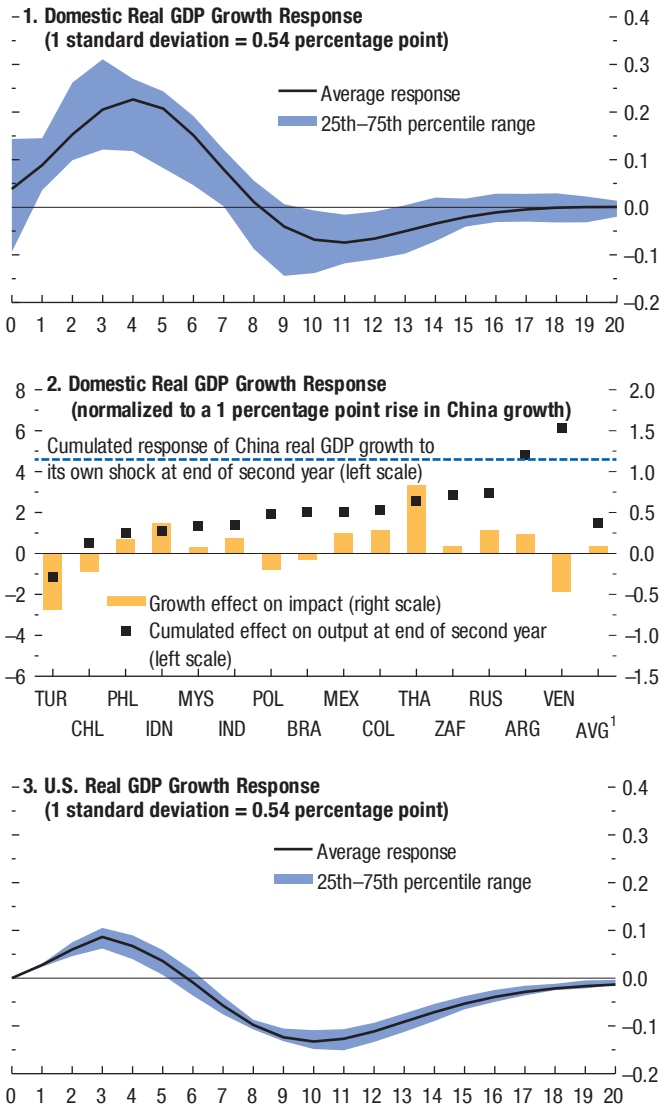
[16]In this specification, the U.S.-specific variables control for advanced economy growth influences on emerging market economies through the global supply chain and are placed before China's growth in the recursive ordering. In an alternative specification with both China and euro area growth, the euro area's growth is placed after U.S. growth in the recursive ordering, whereas China's growth still comes after all advanced economy indicators. However, switching the place of China's growth in the external block (either after U.S. or euro area growth or after all advanced economy indicators) does not materially affect the main results.

[17]The effects of changes in China's real investment growth on domestic growth follow a similar pattern but are smaller in magnitude (see Appendix 4.2 for details).

[18]For some commodity exporters, the positive effects build over time and peak at the end of the second year (for example, Brazil and Chile).

Figure 4.9. Impulse Responses to Real GDP Growth Shock in China
(Percentage points)

A 1 percentage point rise in China's growth increases emerging market economies' growth by 0.1 percentage point on impact, on average. The positive effect builds over time as emerging market economies' terms-of-trade growth gets a further boost, highlighting China's relevance for global commodity markets.



Source: IMF staff calculations.
Note: *X*-axis units in panels 1 and 3 are quarters; $t = 0$ denotes the quarter of the shock. *X*-axis in panel 2 uses International Organization for Standardization (ISO) country codes.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

Table 4.2. Impulse Responses to Shocks within the External Block: Modified Baseline Model with China Real GDP Growth
(Percentage points)

		Shock					
	Response[1]	U.S. Real GDP Growth	U.S. Inflation	Ten-Year U.S. Treasury Bond Rate	China Real GDP Growth	EMBI Yield	Terms-of-Trade Growth[2]
U.S. Real GDP Growth	On Impact	1.00	0.00	0.00	0.00	0.00	0.00
	End of First Year	3.18	–0.55	0.28	0.32	–0.04	0.01
	End of Second Year	3.88	–2.31	–0.35	0.39	0.56	0.06
	End of Third Year	3.40	–1.99	–2.47	–0.50	1.04	0.08
U.S. Inflation	On Impact	0.12	1.00	0.00	0.00	0.00	0.00
	End of First Year	0.66	2.08	0.28	0.19	–0.20	0.01
	End of Second Year	1.42	0.91	1.46	0.68	–0.16	0.01
	End of Third Year	1.51	0.89	1.46	0.67	0.01	0.05
Ten-Year U.S. Treasury Bond Rate	On Impact	0.07	0.07	1.00	0.00	0.00	0.00
	End of First Year	0.25	–0.08	3.11	0.08	0.03	0.01
	End of Second Year	0.64	–0.12	5.02	0.29	0.31	0.02
	End of Third Year	1.00	–0.18	6.31	0.45	0.62	0.03
China Real GDP Growth	On Impact	0.27	0.28	0.94	1.00	0.00	0.00
	End of First Year	0.70	–0.19	3.44	3.24	–0.27	0.04
	End of Second Year	0.83	–0.15	6.33	4.59	–0.60	0.11
	End of Third Year	1.11	0.23	8.00	5.13	–0.88	0.16
EMBI Yield	On Impact	–0.30	–0.15	0.22	–0.02	1.00	0.00
	End of First Year	–0.81	0.12	0.87	–0.21	2.84	0.00
	End of Second Year	–0.91	0.51	2.27	–0.42	4.13	–0.01
	End of Third Year	–0.57	0.42	4.22	–0.34	5.02	–0.03
Terms-of-Trade Growth[2]	On Impact	0.22	1.63	0.48	0.69	–0.24	1.00
	End of First Year	1.50	1.05	2.36	2.10	–1.11	2.28
	End of Second Year	1.43	–2.47	3.20	2.67	–0.38	1.97
	End of Third Year	–0.20	–0.35	1.20	1.64	–0.22	2.03

Source: IMF staff calculations.
Note: EMBI = J.P. Morgan Emerging Markets Bond Index.
[1]All responses are cumulated for the end of the period and normalized for a 1 percentage point shock.
[2]Averaged across country-specific shocks and responses.

China's large fiscal stimulus—increased its contribution to emerging market economies' growth from the third quarter of 2009 until 2010.[19] Of the 3¾ percentage point improvement in emerging market economies' quarterly (year-over-year) growth in 2010–11 relative to 2008–09, China accounted for ½ percentage point, other external factors 2¼ percentage points, and internal factors the remaining 1 percentage point.

However, emerging market economies' diversification toward China has also exposed them to adverse shocks from China's growth. Specifically, China's recent slowdown provided an additional setback to their growth: of the 2 percentage point shortfall in emerging market economies' quarterly (year-over-year) growth in 2012–13 relative to 2010–11, China accounted for ½ percentage point, other external factors for 1¼ percentage points, and internal factors for the remaining ¼ percentage point.[20]

Growth Effects: The Long and the Short of It

Besides growth concerns relating to the ongoing cyclical transitions in the global economy, another issue on the minds of policymakers in emerging markets is the trend growth rate of their economies. Many worry that the observed deceleration is due to declining trend growth compared with the levels recorded in the early 2000s and are concerned about the role of external factors in this trend growth. Although this chapter focuses primarily on understanding the links between emerg-

[19]China's fiscal stimulus packages during the global financial crisis are estimated to have been on the order of 3 percent of GDP in 2009 and 2¾ percent of GDP in 2010 (Dreger and Zhang, 2011).

[20]Note that to the extent domestic policies were adopted in response to the global financial crisis and subsequently unwound, they would still be accounted for by external factors rather than independent internal factors.

ing market economies' growth and external factors at shorter horizons, this section considers the potential implications for the medium term.

The analysis in the previous section suggests that the cumulated growth effects from external shocks—especially from external demand and financing conditions—linger well beyond the short term (see Figures 4.3–4.5 and 4.9). Although trend growth is likely determined by a myriad of factors, including domestic macroeconomic and structural policies, external conditions also have a persistent effect. Thus, a stronger recovery in advanced economies will likely influence emerging market economies' trend growth, as will tighter global financing conditions relative to today.

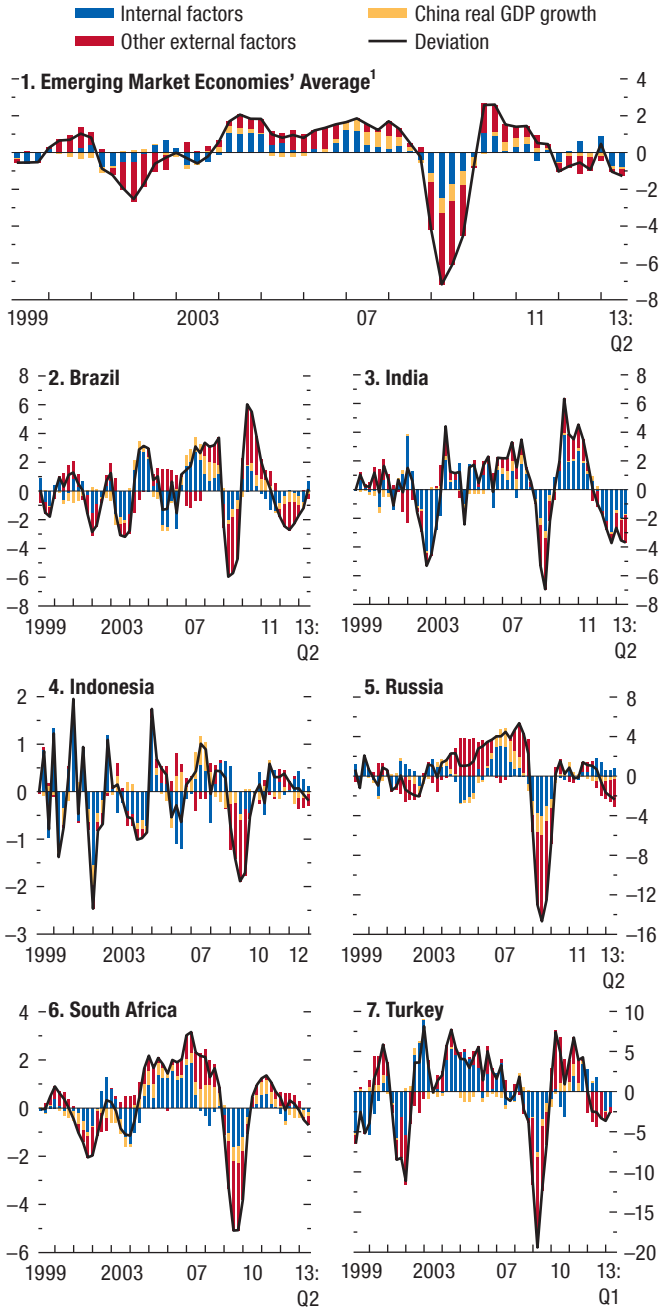
Moreover, external shocks explain about half the variance in emerging market economies' growth in the medium term (Table 4.3). For Malaysia, which is generally more integrated with trade and financial markets, and Mexico, which is integrated with the U.S. economy, these shares are in the range of 60 to 70 percent. Even for the Indian and Indonesian economies, in which variance in growth is predominantly domestically driven, the share of external factors is still in the range of 25 to 30 percent. Given the sizable share of external shocks in explaining the variation in growth over the medium term, it is reasonable to expect these shocks to have persistent effects on trend growth as well.[21]

In this context, Box 4.1 revisits the relationship between external conditions and growth from a medium-term perspective. It estimates growth regressions for a broader group of emerging market economies from 1997 through 2011 to correlate five-year averages of GDP growth per capita with alternative external

[21]These findings compare well with those in the literature, although the estimated effects from this analysis are somewhat lower compared with those in some of the other studies, reflecting differences in the sample, estimation period, and methodology. Österholm and Zettelmeyer (2007) find that external shocks explain 50 to 60 percent of the volatility in growth for Latin American economies over the medium term, and the overall impact of a global or U.S. growth shock on Latin America's growth is roughly one for one over time. In comparison, the findings of this chapter show that a 1 percentage point U.S growth shock is associated with a cumulated 4 percentage point rise in U.S. growth and a corresponding 2 percentage point rise in emerging markets' average growth after two years (see panel 2 of Figure 4.3). This suggests a proportional but less than one-for-one increase in emerging market growth with the increase in U.S. growth over time. The results with regard to shocks to the EMBI yield and the U.S. high-yield spread are very similar to those of Österholm and Zettelmeyer, however. Utlaut and van Roye (2010) and Erten (2012) also find somewhat larger growth effects of real shocks from China, the euro area, and the United States.

Figure 4.10. Historical Decomposition of Real GDP Growth with China as an Explicit External Factor
(Percentage points)

China has been an important offset to other external factors in explaining changes in emerging market growth. During the global financial crisis, China's expansion provided a buffer for emerging market growth. China's recent slowdown, however, has reduced growth in these economies.



Sources: Haver Analytics; Thomson Reuters Datastream; and IMF staff calculations.
Note: The underlying vector autoregression model includes U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, J.P. Morgan Emerging Market Bond Index yield, and terms-of-trade growth in the external block.
[1]Average for all sample economies except Argentina, China, Russia, and Venezuela.

Table 4.3. Share of Output Variance Due to External Factors
(Horizon = five years)

	ARG	BRA	CHL	CHN	COL	IDN	IND	MEX	MYS	PHL	POL	RUS	THL	TUR	VEN	ZAF	Avg.[1]
Baseline Model[2]																	
Total Contribution from External Factors	0.55	0.60	0.37	0.27	0.35	0.25	0.28	0.69	0.61	0.37	0.36	0.72	0.31	0.46	0.34	0.56	0.42
U.S. Factors[3]	0.37	0.43	0.23	0.22	0.25	0.15	0.19	0.61	0.53	0.26	0.21	0.57	0.19	0.37	0.28	0.42	0.31
EMBI Yield	0.12	0.12	0.07	0.04	0.06	0.07	0.06	0.02	0.01	0.09	0.02	0.05	0.05	0.08	0.02	0.03	0.06
Terms-of-Trade Growth	0.06	0.05	0.07	0.02	0.05	0.03	0.03	0.06	0.07	0.02	0.13	0.10	0.07	0.01	0.05	0.11	0.06
Modified Baseline Model[4]																	
Total Contribution from External Factors	0.55	0.61	0.38	. . .	0.33	0.26	0.30	0.69	0.57	0.43	0.48	0.73	0.31	0.44	0.37	0.67	0.46
U.S. Factors[3]	0.35	0.45	0.19	. . .	0.22	0.13	0.20	0.58	0.45	0.29	0.21	0.57	0.17	0.34	0.24	0.35	0.30
China Real GDP Growth	0.06	0.07	0.07	. . .	0.08	0.06	0.02	0.05	0.02	0.09	0.10	0.06	0.06	0.02	0.06	0.23	0.07
EMBI Yield	0.09	0.05	0.04	. . .	0.01	0.05	0.07	0.01	0.01	0.04	0.02	0.02	0.03	0.06	0.01	0.02	0.04
Terms-of-Trade Growth	0.04	0.04	0.09	. . .	0.01	0.02	0.01	0.04	0.09	0.01	0.15	0.08	0.05	0.02	0.06	0.08	0.05
Alternative Model[5]																	
Total Contribution from External Factors	0.50	0.60	0.40	. . .	0.30	0.24	0.34	0.73	0.57	0.41	0.49	0.75	0.27	0.46	0.36	0.68	0.46
U.S. Factors[3]	0.30	0.40	0.14	. . .	0.15	0.10	0.20	0.53	0.40	0.24	0.18	0.52	0.14	0.24	0.18	0.31	0.25
Euro Area Real GDP Growth	0.02	0.07	0.09	. . .	0.06	0.01	0.05	0.09	0.07	0.05	0.06	0.10	0.01	0.13	0.05	0.10	0.07
China Real GDP Growth	0.07	0.07	0.06	. . .	0.06	0.06	0.02	0.03	0.01	0.08	0.09	0.04	0.05	0.02	0.05	0.17	0.06
EMBI Yield	0.07	0.04	0.04	. . .	0.01	0.04	0.06	0.01	0.01	0.03	0.02	0.02	0.03	0.06	0.01	0.02	0.03
Terms-of-Trade Growth	0.03	0.02	0.08	. . .	0.01	0.02	0.01	0.07	0.07	0.01	0.13	0.06	0.04	0.01	0.06	0.08	0.05

Source: IMF staff calculations.
Note: EMBI = J.P. Morgan Emerging Markets Bond Index. Column heads use International Organization for Standardization (ISO) country codes.
[1]The numbers are the average for all sample economies except Argentina, Russia, and Venezuela.
[2]Recursive ordering of external factors is as follows: U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, EMBI yield, and terms-of-trade growth.
[3]U.S. factors include U.S. real GDP growth, U.S. inflation, and 10-year U.S. Treasury bond rate.
[4]Recursive ordering of external factors is as follows: U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, EMBI yield, and terms-of-trade growth.
[5]Recursive ordering of external factors is as follows: U.S. real GDP growth, euro area real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, EMBI yield, and terms-of-trade growth.

conditions and provide a sense of average responses of the group to changes in these conditions. It finds that growth in emerging market economies is significantly associated with growth in their trading partners, including that in other large emerging markets such as the BRICS (Brazil, Russia, India, China, South Africa), and with global financing conditions. It highlights the increasing sensitivity of emerging market economies' growth to changes in these external conditions as these economies have rapidly integrated into the global economy.

In essence, although domestic economic and structural policies remain important determinants of growth over short and long horizons, the analysis in this chapter demonstrates that external conditions also deserve attention. In this regard, if impending changes in the external environment are dominated by an improvement in advanced economies' growth, emerging market economies will benefit in both the short and medium term. Conversely, if external financing conditions tighten by more than what is accounted for by an improving outlook in advanced economies, growth in emerging markets will suffer a relatively lasting effect. However, even if external conditions deteriorate, emerging markets' ability to weather such shocks will be influenced by the domestic policies they deploy to offset those shocks. The priority, now, for policymakers in some of these economies is to assess why these internal factors, cyclical or structural, are currently reducing growth to less than the averages of the past 15 years and what, if anything, can be done to reverse the situation.

Shifting Gears: Have Emerging Markets' Growth Dynamics Changed since the Global Financial Crisis?

This section assesses in what ways, if any, the behavior of growth in emerging market economies and its relationship with its underlying external and internal drivers have shifted since the onset of the global financial crisis. With the recovery in many advanced economies still anemic, it is possible that emerging markets' output and growth have also suffered in an enduring way and that their growth today responds differently to external and internal factors than it did before the crisis. This assess-

ment is an important part of understanding to what extent the past can be a guide for the future relationship between growth and its external drivers.

A number of studies have highlighted the serious real effects of financial crises for both advanced and emerging market economies.[22] Among the economies considered in this chapter, a few (for example, Russia and Venezuela) suffered serious growth setbacks as they experienced financial distress of their own (Figure 4.11, panel 3; see Laeven and Valencia, 2013). Some others experienced sharp downturns as well, likely reflecting their financial linkages to advanced economies that experienced the financial crisis (for example, South Africa). In contrast, a few weathered the crisis reasonably well (for example, Indonesia and the Philippines). What was the overall growth impact on these economies that were not at the epicenter of the global financial crisis? A starting point is an assessment of the severity of the global financial crisis for emerging market economies' growth compared with that of previous global recessions.

The post-global-financial-crisis output dynamics in emerging markets—relative to the precrisis average levels—compare favorably with those following the global recessions in 1975, 1982, and 1991.[23] Panels 1 and 2 of Figure 4.11 show that whereas the global financial crisis inflicted a sharp decline in output for advanced economies in its first year, the average output loss for noncrisis emerging market economies in the sample was less than 1½ percent. Also, unlike in advanced economies, whose four- to five-year output loss widened even more sharply to nearly 9 percent, losses for emerging markets have remained low.

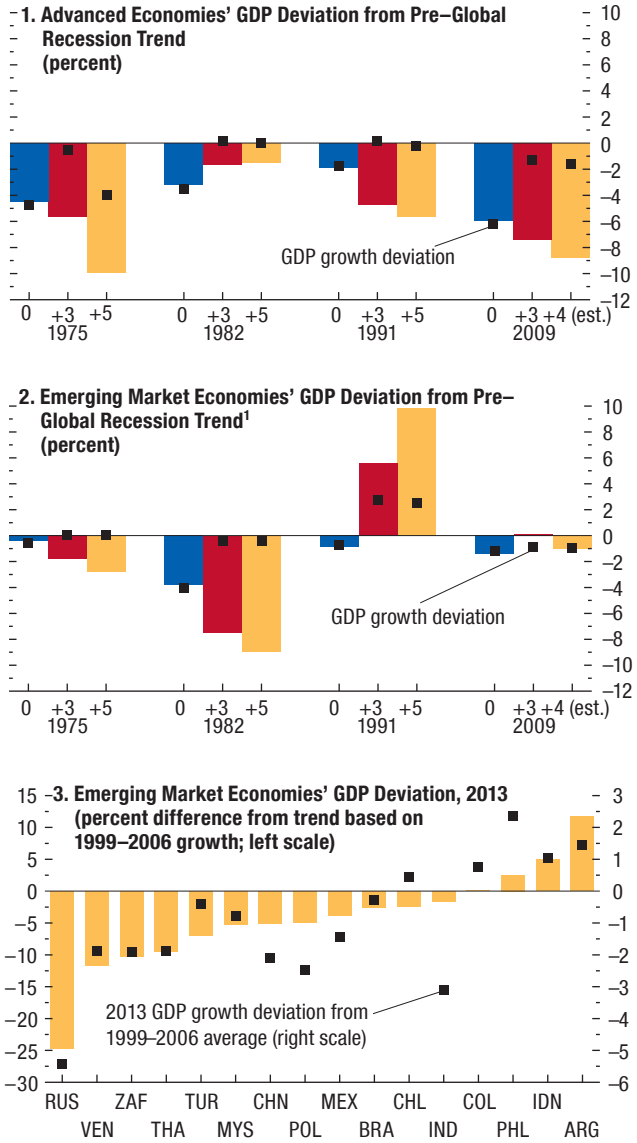
This strong performance after the global financial crisis was surpassed only by emerging markets' experience during the 1991 global recession, when economies in both emerging Asia and Latin America enjoyed rapid growth relative to the pre-1991 growth trends (the black squares in panel 2 of the figure). As for the recent crisis, countercyclical policies, undertaken by both emerging market economies and their advanced

[22]Most of these studies highlight how the path of output tends to be depressed substantially and persistently following crises, for both advanced and emerging market economies undergoing crises, with no rebound, on average, to the precrisis trend in the medium term (Abiad and others, 2014; Cerra and Saxena, 2008; Reinhart and Rogoff, 2009).

[23]The dating of global recessions draws on recent work by Kose, Loungani, and Terrones (2013), whereas the metric to compute precrisis trends draws on Abiad and others (2014).

Figure 4.11. Emerging Markets' Output and Growth Performance after Global Recessions

The output and growth dynamics in emerging market economies after the recent global financial crisis compare favorably relative to those following the global recessions in 1975, 1982, and 1991.



Source: IMF staff calculations.
Note: *X*-axis in panel 3 uses International Organization for Standardization (ISO) country codes.
[1]Average for all sample economies except Argentina, Russia, and Venezuela.

economy trading partners, likely helped maintain their growth rates very close to the precrisis trends. This is remarkable given that precrisis growth was exceptionally strong for these economies (see Figure 4.1, panel 1).

The hypothesis that the relationship between emerging market growth and external and internal factors may have changed substantially in the aftermath of the global financial crisis is examined next. To do this, the conditional out-of-sample growth forecasts of domestic growth are evaluated using the model estimated through the fourth quarter of 2007, taking as given all external variables not specific to emerging market economies.[24] The deviation of the conditional forecast from actual growth is interpreted as reflecting other, mostly internal, factors that have driven growth in these economies since 2008.

On average, the conditional forecasts track actual growth since 2008 reasonably well, suggesting that there were no major aftershocks from the global financial crisis to the relationship between emerging market growth and its underlying external factors (Figures 4.12 and 4.13). The conditional forecasts based on one of the two specifications are able to project a sharp dip during the global financial crisis, the subsequent rebound, and the slowdown since 2012. Also, as Figure 4.13 shows, the forecast errors (actual growth minus conditional forecast growth) for most economies are within 1 to 2 percent of the standard deviation of the economies' growth over the sample period. The notable exceptions are Russia and Venezuela, for which the forecast errors are significantly larger, reflecting in part the lesser suitability of the estimation method—with an underlying assumption of a linear VAR model with stable coefficients—for economies that experienced significant volatility, or many structural shocks, or both, during the sample period.

That said, forecast performances differ across the economies, and two specific periods reveal larger forecast errors for many. First, at the peak of the global financial crisis, actual growth fell more sharply than forecast growth—based on either of the two alternative models—for 7 of the 16 economies: Chile, China, Malaysia, the Philippines, Russia, South Africa, and Thailand (Figure 4.12). This possibly reflects the unusual shock embodied in the global financial crisis, which affected emerging markets' growth more deeply than is captured by the traditional external channels and identified within the linear VAR framework.

Growth since 2012 has also undershot the level predicted given current global economic conditions for 9 of the 16 economies, suggesting again the role of internal factors. This group comprises Brazil, Chile, China, Colombia, India, Russia, South Africa, Turkey, and Venezuela. In fact, for most of these economies, the forecast errors since 2012 are larger than even those for 2008–09 (see Figure 4.13). In some economies, however (for example, Indonesia, Mexico, and the Philippines), actual growth since 2012 has mostly outpaced conditional forecasts, pointing instead to the role of internal factors in boosting growth.

Note that although the forecast underperformance is interpreted here as reflecting the role of internal factors in moderating growth, other possibilities include other unidentified factors, such as common or intra-emerging-market shocks (beyond those related to China), or exogenous factors unrelated to domestic policy shocks, such as natural disasters (for example, see, in Figure 4.12, panel 14, the sharp negative deviation of Thailand's growth from its conditional forecast in the last quarter of 2011, when the country was buffeted by floods of unprecedented magnitude). In economies in which such other unidentified factors may have played a larger role, the analysis could overstate the effects of internal factors. That said, the findings do resonate with recent related work that has also underscored constraints from domestic structural factors as becoming increasingly binding for growth in many of these economies (see IMF, 2013b and 2014, for India; IMF, 2013c, for South Africa; and IMF, 2013d, for Turkey).

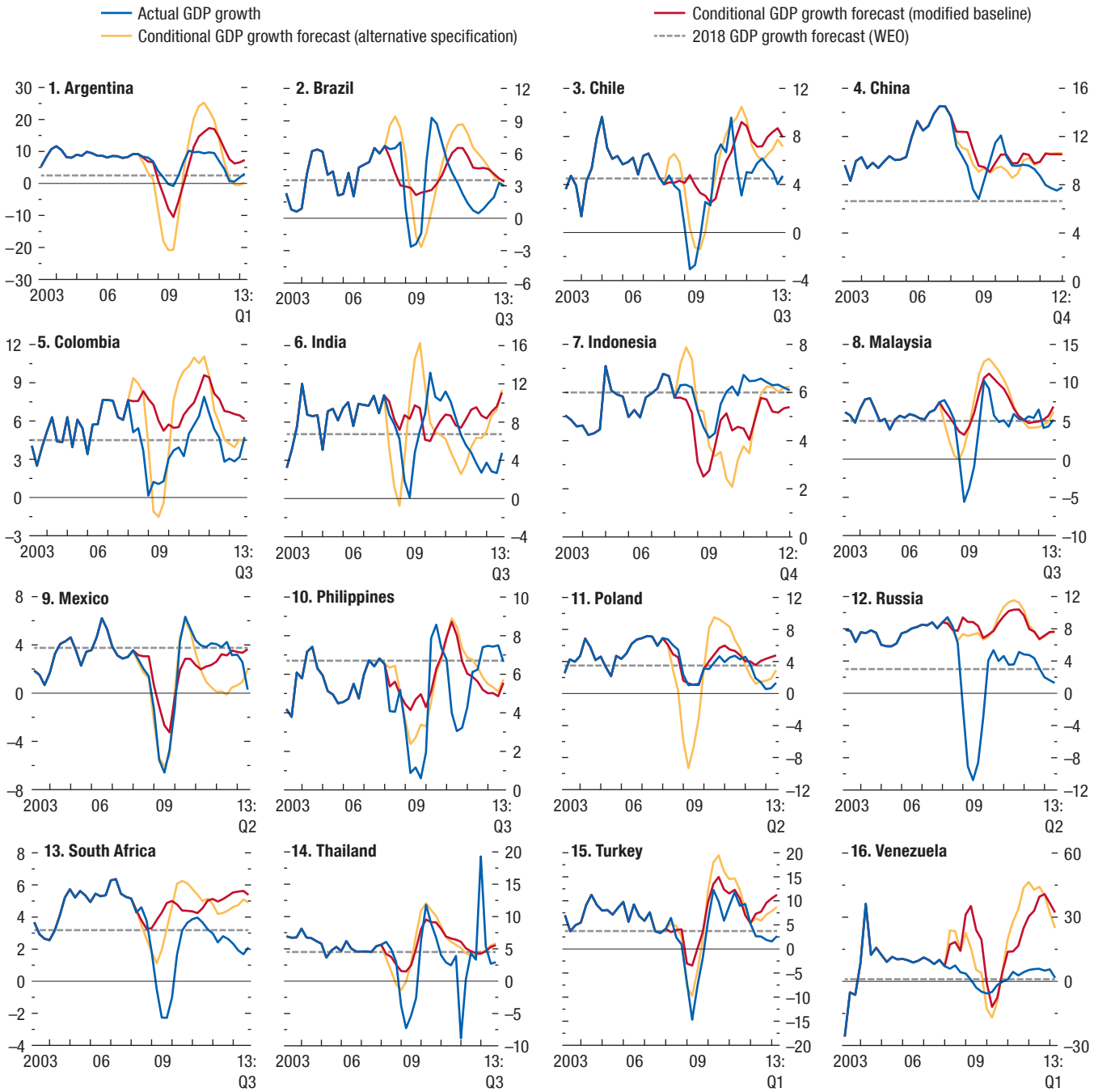
China is prominent among emerging markets for which growth outturns have systematically been below the level indicated by conditional forecasts in recent years. In fact, the widening of the forecast errors for China since 2011 (see Figure 4.13) suggests that the drag from internal factors has remained persistent. Indeed, China's medium-term growth forecast, as projected in the WEO (dashed line in Figure 4.12), is lower than both actual growth and the conditional forecast, reflecting the transition of the economy toward a more moderate pace of growth over the medium term.

In summary, the recent systematic divergence between actual and forecast growth for a few major emerging markets suggests that internal factors may

[24]Two alternative models for the conditional forecasts are considered. The first is based on the modified baseline model that adds China's growth in the external block. An alternative model adds growth in both China and the euro area in the external block. For China, the conditional forecasts are based on the baseline model and an alternative model that includes growth in the euro area in the external block.

Figure 4.12. Out-of-Sample Growth Forecasts Conditional on External Factors, by Country
(Percent)

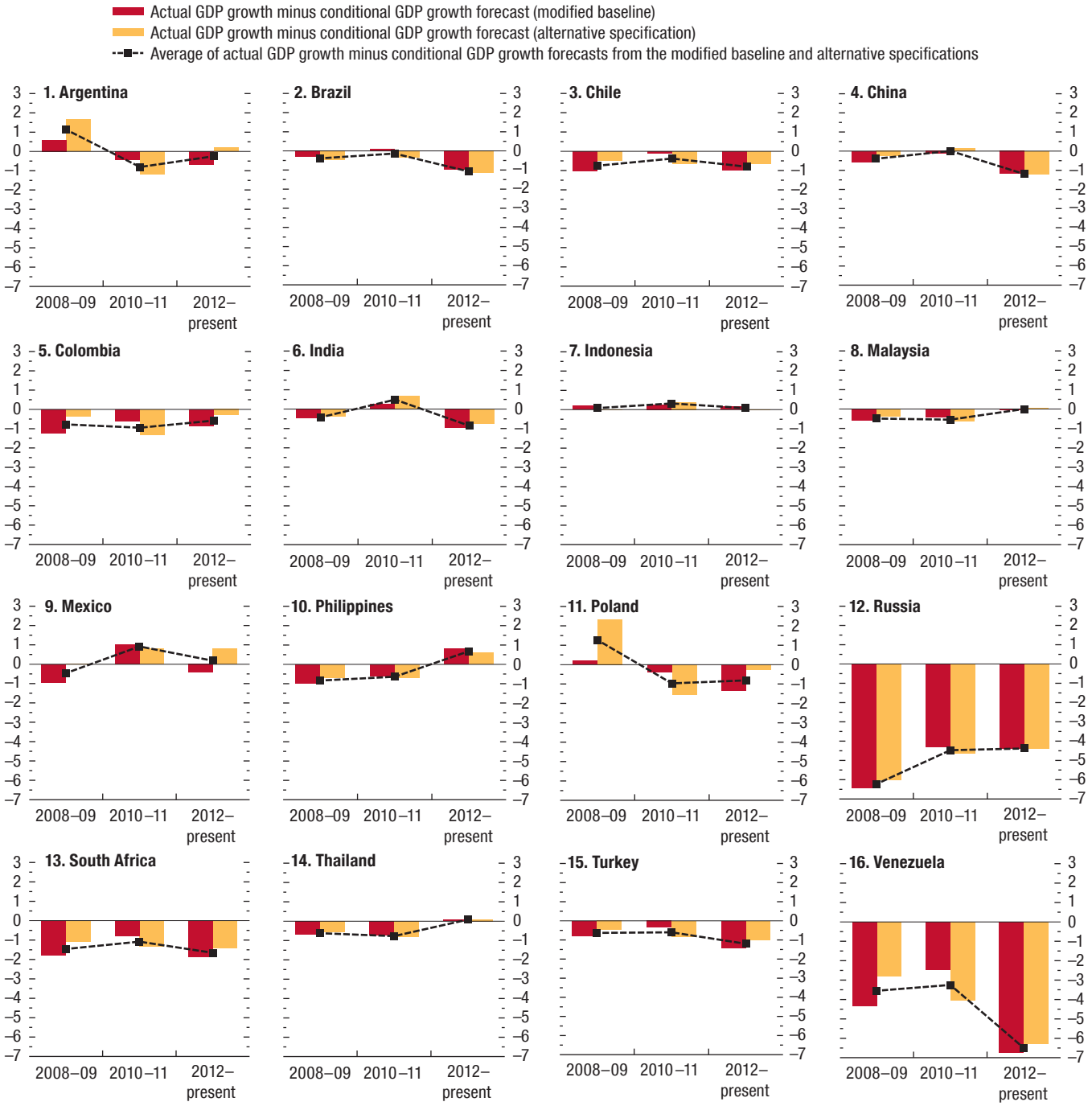
Although forecast performances differ across emerging market economies, two specific periods reveal larger forecast errors for many economies: first, during the peak of the global financial crisis, from the final quarter of 2008 until mid-2009; and second, since 2012.



Sources: Haver Analytics; Thomson Reuters Datastream; and IMF staff calculations.
Note: For all economies except China, the modified baseline vector autoregression model includes U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, J.P. Morgan Emerging Markets Bond Index (EMBI) yield, and terms-of-trade growth in the external block; the alternative specification includes U.S. real GDP growth, euro area real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, EMBI yield, and terms-of-trade growth in the external block. For China, the modified baseline vector autoregression model includes U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, EMBI yield, and terms-of-trade growth in the external block; the alternative specification includes U.S. real GDP growth, euro area real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, EMBI yield, and terms-of-trade growth in the external block.

Figure 4.13. Conditional Forecast and Actual Growth since the Global Financial Crisis, by Country
(Percentage points)

Differences between actual growth and forecast growth conditional on external conditions are not that large for most sample economies.



Sources: Haver Analytics; Thomson Reuters Datastream; and IMF staff calculations.
Note: For all economies except China, the modified baseline vector autoregression model includes U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, J.P. Morgan Emerging Markets Bond Index (EMBI) yield, and terms-of-trade growth in the external block; the alternative specification includes U.S. real GDP growth, euro area real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, China real GDP growth, EMBI yield, and terms-of-trade growth in the external block. For China, the modified baseline vector autoregression model includes U.S. real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, EMBI yield, and terms-of-trade growth in the external block; the alternative specification includes U.S. real GDP growth, euro area real GDP growth, U.S. inflation, 10-year U.S. Treasury bond rate, EMBI yield, and terms-of-trade growth in the external block. All values have been normalized using the standard deviation of country-specific real GDP growth between the first quarter of 1998 and the fourth quarter of 2007.

have become more important in determining growth for these economies. In many cases, these factors have pulled growth below the level expected under current global economic conditions. Given their persistence, these factors are likely to affect trend growth as well. Even for emerging market economies in which growth is still broadly tracking the path determined by global economic conditions, what happens to their growth will depend in large part on how growth evolves in larger economies, particularly China.

Policy Implications and Conclusions

The deceleration of emerging markets' growth in the past two years following a prolonged period of rapid growth has raised many concerns about these economies' future prospects: for instance, will growth suffer as advanced economies gain momentum and begin to raise their interest rates? What are the likely effects of a slower pace of expansion in China? Are emerging markets helplessly on the receiving end of these shocks? Has the global financial crisis changed the relationship between growth and its drivers, and has trend growth shifted to a lower plane?

This chapter sheds light on some of these concerns by analyzing the external drivers of emerging market economies' growth and assessing how this relationship has endured both before and since the global financial crisis. The findings suggest that emerging markets are facing a more complex growth environment than in the period before the crisis and provide the following broad lessons.

First, if growth in advanced economies strengthens as expected in the current WEO baseline forecasts, this, by itself, should entail net gains for emerging markets, despite the attendant higher global interest rates. Stronger growth in advanced economies will improve emerging market economies' external demand both directly and by boosting their terms of trade. Conversely, if downside risks to growth prospects in some major advanced economies were to materialize, the adverse spillovers to emerging market growth would be large. The payoffs from higher growth in advanced economies will be relatively higher for economies that are more open to advanced economies in trade and lower for economies that are financially very open.

Second, if external financing conditions tighten by more than what advanced economy growth can account for, as seen in recent bouts of sharp increases in sovereign bond yields for some emerging market economies, their growth will decline. Mounting external financing pressure without any improvement in global economic growth will harm emerging markets' growth as they attempt to stem capital outflows with higher domestic interest rates, although exchange rate flexibility will provide a buffer. Economies that are naturally prone to greater capital flow volatility and those with relatively limited policy space are likely to be affected most.

Third, China's transition into a slower, if more sustainable, pace of growth will also reduce growth in many other emerging market economies, at least temporarily. The analysis also suggests that external shocks have relatively lasting effects on emerging market economies, implying that their trend growth can be affected by the ongoing external developments as well.

Finally, although external factors have typically played an important role in emerging markets' growth, the extent to which growth has been affected has also depended on their domestic policy responses and internal factors. More recently, the influence of these internal factors in determining changes in growth has risen. However, these factors are currently more of a challenge than a boon for a number of economies. The persistence of the dampening effects of these internal factors suggests that trend growth is affected as well. Therefore, policymakers in these economies need to better understand why these factors are suppressing growth and whether growth can be strengthened without inducing imbalances. At the same time, the global economy will need to be prepared for the ripple effects from the medium-term growth transitions in these emerging markets.

Appendix 4.1. Data Definitions, Sources, and Descriptions

The chapter primarily uses the World Economic Outlook (WEO) database from October 2013. Additional data sources are listed in Table 4.4. Data are collected for all variables on a quarterly basis from the first quarter of 1998 to the latest available quarter.

Economy Characteristics

Table 4.5 lists the 16 emerging market economies included in the data set. These economies represent

Table 4.4. Data Sources

Variable	Sources	Calculations and Transformations
Ten-Year U.S. Treasury Bond Rate	Haver Analytics	
Thirty-Day Federal Funds Futures	CME Group, Thomson Reuters Datastream	
Capital Flow Volatility	IMF, Balance of Payments and International Investment Position (IIP) Statistics Database and IMF Staff Calculations	Standard deviation of net nonofficial inflows in percent of GDP, 2000–12. See Appendix 4.1 of the April 2011 *World Economic Outlook* for the methodology
China Real Investment Growth	IMF Staff Calculations	
CPI Inflation	World Economic Outlook Database	
EMBI Global Bond Spread	Thomson Reuters Datastream	
EMBI Global Bond Yield	Thomson Reuters Datastream	
Financial Openness	IMF Staff Calculations	Sum of international investment position assets and international investment position liabilities in percent of GDP (U.S. dollars), 2000–12
Global Commodity Price Index	IMF Staff Calculations	
IIP Assets and Liabilities	IMF, Balance of Payments and IIP Statistics Database	
Nominal Exchange Rate versus U.S. Dollar	IMF, International Financial Statistics Database	
Nominal Exports	World Economic Outlook Database, Direction of Trade Statistics Database	
Nominal GDP	World Economic Outlook Database	
Nominal GDP in U.S. Dollars	World Economic Outlook Database	
Nominal Imports	World Economic Outlook Database	
Nominal Short-Term Interest Rate	Thomson Reuters Datastream, Haver Analytics, Federal Reserve Economic Data (FRED, Federal Reserve Bank of St. Louis)	
Nonfuel Commodity Terms of Trade	IMF Staff Calculations	
Per Capita Output Volatility	IMF, World Economic Outlook Database	Standard deviation of per capita real GDP growth, 2000–12
Real Exchange Rate versus U.S. Dollar	IMF Staff Calculations	Nominal exchange rate versus U.S. dollar divided by the ratio of local consumer price index (CPI) inflation to U.S. CPI inflation
Real GDP	IMF, World Economic Outlook Database	
Share of Net Commodity Exports in GDP	IMF Staff Calculations	See Appendix 4.2 of the April 2012 *World Economic Outlook* for the methodology
Terms-of-Trade Growth	Haver Analytics; IMF, International Financial Statistics Database; Organization for Economic Cooperation and Development; World Bank, World Development Indicators database; and IMF Staff Calculations	China terms of trade: quarterly terms of trade for China are interpolated using a Chow-Lin procedure applied to annual terms-of-trade data (from the World Bank's World Development Indicators database) and three quarterly explanatory variables: Hong Kong import unit value, Hong Kong export unit value, and China producer price index; Venezuela terms of trade: quarterly terms of trade for Venezuela are estimated using the commodity oil price (as a proxy for export prices) and unit import values (from the IMF's International Financial Statistics database)
Trade Exposure to Advanced Economies	IMF, Direction of Trade Statistics Database and World Economic Outlook Database	Sum of exports of goods to the United States and the euro area expressed as a percent of GDP, 2000–12
Trade Openness	IMF, World Economic Outlook Database	Nominal exports plus nominal imports in percent of GDP, 2000–12
U.S. Effective Federal Funds Rate	Haver Analytics	
U.S. High-Yield Spread	Bank of America Merrill Lynch and Haver Analytics	U.S. investment grade corporate yield minus U.S. (junk bond) high yield
U.S. Inflation Expectations	Federal Reserve Bank of Philadelphia, *Survey of Professional Forecasters*	
U.S. Real Short-Term Interest Rate	Haver Analytics, Federal Reserve Bank of Philadelphia, and IMF Staff Calculations	U.S. effective federal funds rate minus U.S. inflation expectations
U.S. Term Spread	Haver Analytics and IMF Staff Calculations	Ten-year U.S. Treasury bond rate minus U.S. effective federal funds rate

Source: IMF staff compilation.
Note: EMBI = J.P. Morgan Emerging Markets Bond Index.

Table 4.5. Sample of Emerging Market Economies and International Organization for Standardization Country Codes

Africa	Asia	Europe	Latin America
South Africa (ZAF)	China (CHN) India (IND) Indonesia (IDN) Malaysia (MYS) Philippines (PHL) Thailand (THA)	Poland (POL) Russia (RUS) Turkey (TUR)	Argentina (ARG) Brazil (BRA) Chile (CHL) Colombia (COL) Mexico (MEX) Venezuela (VEN)

Source: IMF staff compilation.

75 percent of 2013 GDP (in purchasing-power-parity terms) for the group of emerging market and developing economies. China alone accounts for 31 percent, and the other 15 economies close to 45 percent. Among these, 10 economies—that is, all except China, India, the Philippines, Poland, Thailand, and Turkey—were net commodity exporters during the sample period. However, only four economies in the sample are heavily concentrated in commodities, with net commodity exports as a percentage of GDP—averaged over 2000–10—greater than or equal to 10 percent (Argentina, Chile, Russia, Venezuela). The share for Indonesia is also high, at 8.5 percent.

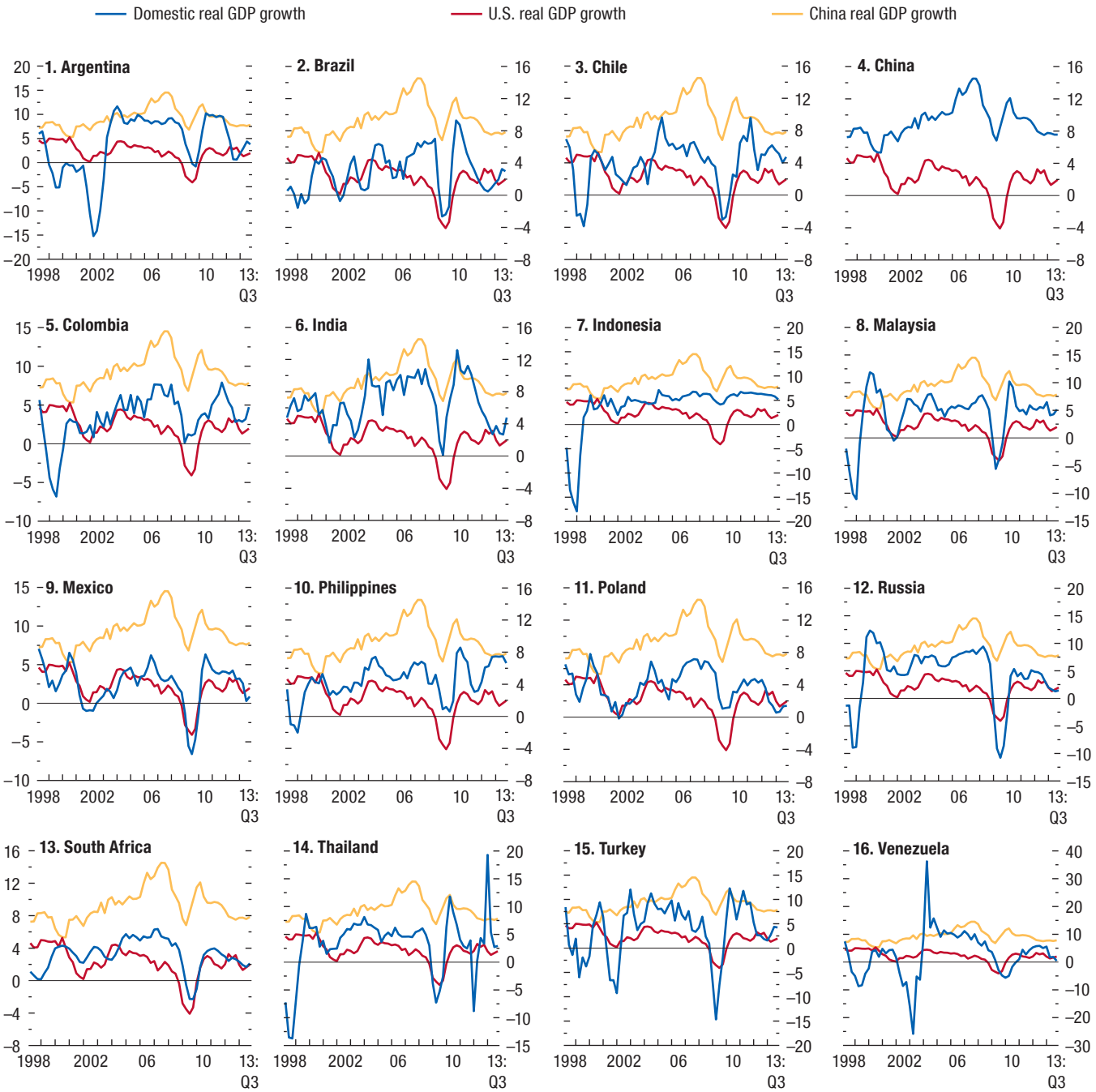
Real GDP growth has varied significantly over the sample period for the 16 economies. Figure 4.14 shows that year-over-year quarterly real GDP growth in China outperforms growth in nine of the sample economies since 2000. Only Argentina, India, Thailand, Turkey, and Venezuela are exceptions, typically because of very high output volatility rather than continuing outperformance. In addition, some emerging market economies were unable to post higher growth than the United States until the mid-2000s: these were largely economies in Latin America; economies in East Asia generally grew at rates above those of the United States, although below the level of China's growth.

Figure 4.15 presents regional growth averages based on the economies in the sample and compares those averages with the evolution of growth in advanced economies and China. Once again, it is clear that China's growth rate dominates those of almost all other economies in the sample. In fact, with China excluded, the surge in the sample economies' average growth before the global financial crisis is much less spectacular. Among the three regional groups (emerging Asia excluding China, emerging Europe and South Africa, Latin America), emerging Asia's growth performance was the strongest both before and during the global financial crisis. Growth in the LA4 (Brazil, Chile, Colombia, Mexico) tended to trail that in other economies. Growth in emerging Europe and South Africa was close to the levels for emerging Asia before the crisis, but then fell the most during the global financial crisis. Since then, the recovery in emerging Europe and South Africa has tended to be weaker than that in emerging Asia.

Table 4.6 provides information on simple pairwise correlations between domestic real GDP growth for the sample economies and the key variables used in the statistical analysis over the sample period. There are a few items of note:

- Domestic output growth is positively correlated with output growth in China for all economies in the sample. For Argentina, Brazil, Colombia, India, Indonesia, Thailand, and Venezuela, the growth correlation with China's growth is stronger than that with the euro area or the United States. In contrast, output growth in Chile, Malaysia, Mexico, Russia, and Turkey is more correlated with growth in the United States than with growth in China. Among the economies examined, those in emerging Europe and South Africa (Poland, Russia, South Africa, Turkey) generally tend to have the highest growth correlations with growth in the advanced economies and China. Furthermore, growth in China, Colombia, and Indonesia is negatively correlated with growth in the euro area, the United States, or both.
- Interestingly, terms-of-trade growth is not always positively correlated with domestic GDP growth. In fact, for six economies (China, Indonesia, Philippines, Poland, South Africa, Turkey), the correlation is negative, whereas for two, the correlation is numerically insignificant (India, Venezuela). This may reflect the fact that increases in the terms of trade do not always reflect improvement in global demand, and to the extent that it is actually associated with supply shocks, the effect may not be positive for growth.

Figure 4.14. Domestic Real GDP Growth across Emerging Markets versus United States and China
(Percent)



Source: IMF staff calculations.

- All economies demonstrate a strong negative correlation between domestic growth and proxies for global financial conditions, such as the J.P. Morgan Emerging Markets Bond Index (EMBI) spread and yield. There is much more cross-economy heterogeneity in the correlation between domestic growth and the U.S. federal funds rate and the 10-year U.S. Treasury bond rate. On average, only half of the sample shows a negative correlation between domestic growth and U.S. interest rates.

Appendix 4.2. Estimation Approach and Robustness Checks

This appendix provides further details regarding the identification and Bayesian estimation of the structural vector autoregression (SVAR) model used in the chapter and presents alternative specifications that assess the robustness of the main results.

Model Identification

The analysis uses a standard SVAR model to estimate the growth effects of external factors. The model is estimated separately for each economy using quarterly data from the first quarter of 1998 to the latest available quarter in 2013.

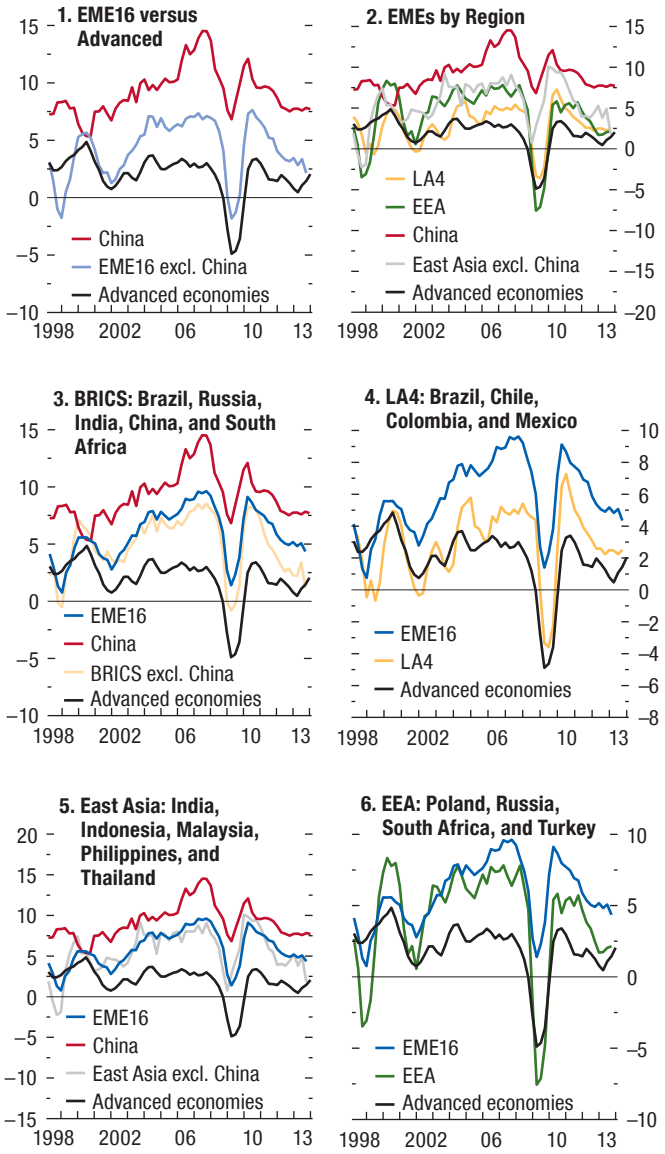
The baseline model takes the following form:

$$A(L)y_t = \varepsilon_t = A_0 u_t, \tag{4.1}$$

in which y_t is a $k \times 1$ vector, where k is the total number of endogenous variables; $A(L)$ is a $k \times k$ matrix polynomial of lag operator L with lag length p; and ε_t is a $k \times 1$ vector of contemporaneously correlated, mean-zero reduced-form errors. The contemporaneous relationships across variables are disentangled by mapping ε_t to a $k \times 1$ vector of mutually orthogonal, mean-zero, structural shocks, u_t, through the $k \times k$ matrix A_0.

Each economy's baseline vector autoregression (VAR) consists of nine variables in the vector y_t (k = 9) ordered as follows: U.S. real GDP growth (Δy^*), U.S. inflation (π^*), the nominal 10-year U.S. government bond rate (r^*), the EMBI Global yield (r^{EMBI^*}), the economy-specific terms-of-trade growth (Δtot), domestic real GDP growth (Δy), domestic inflation (π), the rate of appreciation of the economy's real exchange rate vis-à-vis the U.S. dollar (e), and the domestic monetary policy rate or short-term interest rate (r). Note that all growth rates are calculated as

Figure 4.15. Average Growth for Regional Groups of Emerging Market Economies
(Percent)



Source : IMF staff calculations.
Note: EME = emerging market economy. EME16 denotes the 16 emerging market economies within the sample. LA4 denotes the Latin American economies within the sample, excluding Argentina and Venezuela. EEA denotes economies from emerging and developing Europe and Africa within the sample.

Table 4.6. Correlations of Domestic Real GDP Growth with Key Variables, 1998–2013

	U.S. Real GDP Growth	U.S. Federal Funds Rate	Ten-Year U.S. Treasury Bond Rate	Euro Area Real GDP Growth	China Real GDP Growth	EMBI Spread	EMBI Yield	Terms-of-Trade Growth
Argentina	0.12	–0.13	–0.28	0.15	0.56	–0.68	–0.64	0.33
Brazil	0.15	0.03	0.03	0.42	0.51	–0.51	–0.37	0.63
Chile	0.31	–0.01	–0.11	0.44	0.25	–0.62	–0.52	0.33
China	–0.10	0.05	–0.05	0.16	1.00	–0.64	–0.50	–0.27
Colombia	–0.08	–0.18	–0.28	0.15	0.53	–0.82	–0.71	0.29
India	0.27	0.10	0.19	0.42	0.66	–0.44	–0.29	0.03
Indonesia	–0.32	–0.38	–0.35	–0.15	0.27	–0.56	–0.52	–0.26
Malaysia	0.26	–0.07	0.00	0.33	0.21	–0.37	–0.26	0.29
Mexico	0.76	0.35	0.18	0.77	0.16	–0.26	–0.16	0.52
Philippines	0.18	–0.27	–0.32	0.16	0.32	–0.61	–0.58	–0.40
Poland	0.40	0.44	0.36	0.61	0.49	–0.32	–0.13	–0.20
Russia	0.45	0.30	0.31	0.66	0.21	–0.23	–0.04	0.77
South Africa	0.39	0.32	0.23	0.67	0.42	–0.38	–0.18	–0.14
Thailand	0.17	–0.15	–0.07	0.18	0.26	–0.31	–0.24	0.15
Turkey	0.44	–0.06	–0.04	0.45	0.38	–0.51	–0.41	–0.14
Venezuela	0.17	0.12	–0.02	0.24	0.26	–0.48	–0.38	0.09

Source: IMF staff calculations.
Note: Period is 1998:Q1–2013:Q2. EMBI = J.P. Morgan Emerging Markets Bond Index.

log differences of the relevant level's time series. The first five variables constitute the "external" or foreign block, and the remaining variables make up the "internal" or domestic block.

Identification (the mapping to the structural shocks) uses contemporaneous restrictions on the structure of the matrix A_0. The key restriction is that shocks to the external block are assumed to be exogenous to shocks to the internal block; in other words, the external variables do not respond to the internal variables contemporaneously. Within the external block, structural shocks are further identified using a recursive (Cholesky) scheme, defined by the ordering of the variables in the vector y_t. Therefore, U.S. real GDP growth is assumed to respond to other shocks only with a lag. U.S. inflation is affected by U.S. growth shocks contemporaneously, but by other shocks with a lag. The U.S. interest rate responds contemporaneously to U.S. real GDP growth and inflation shocks, but not to the EMBI Global yield or to any emerging market economy's terms-of-trade growth. The EMBI Global yield is placed ahead of economy-specific terms-of-trade growth, but behind all the U.S. variables. Finally, terms-of-trade growth is placed last in the recursive ordering, implying that it responds contemporaneously to all other external variables, but not to the domestic variables. Structural shocks within the internal block are unidentified.

All variables enter the model with four lags. Other than the contemporaneous restrictions on the matrix A_0, there are no restrictions on the coefficients for the lagged variables; that is, the lags of the internal block variables are allowed to affect the external block variables.

Estimation by Bayesian Methods

The number of sample observations relative to the number of parameters to be estimated in each equation of each economy's SVAR is not very large. This means that there is a danger of overfitting if the model estimation is left unrestricted. Overfitting leads to good performance of the estimated model within the sample (as it tends to follow the noise in the sample more closely), but to poor out-of-sample performance.

There are a number of ways to address this overfitting problem. One is to impose hard restrictions on the parameters, by fixing some of them to specific values. However, by taking a hard stance before the fact, such restrictions rule out potentially interesting dynamics. An alternative to such restrictions is to estimate the model using Bayesian methods, which is the approach followed in this chapter. This involves specifying restrictions on estimated parameters that are softer, such as constraining them to be more likely at some values than at others. Operationally, a prior probability distribution is imposed on the estimated parameters, pulling in additional information from outside the sample observations, to avoid overfitting. This is combined with the information in the sample to generate estimates for the parameters.

The prior used in this chapter is a so-called Minnesota prior, inspired by Litterman (1986), in which each variable is assumed to follow a first-order autoregressive (AR(1)) process with independent, normally distributed errors. Given that the variables have already been transformed to induce stationarity, a random walk, with a unit AR(1) coefficient for the prior, would not be appropriate. Simple AR(1) regressions, however, do suggest estimated AR(1) coefficients of about 0.8, which is the AR(1) coefficient used in the prior for the baseline estimation. Some of this persistence reflects the fact that all growth rates are calculated as year-over-year differences.

The weight of the prior versus the sample in the estimation is determined according to the Bayesian approach presented in Sims and Zha (1998). If twice the number of parameters to be estimated in an equation is greater than the estimation sample size, the chapter applies a rule of thumb that gives the prior a relative weight of $\left[1 - \frac{(T-p)}{2(kp+1)}\right] \in [0,1]$, in which T is the number of available sample observations and k and p are defined as above.[25]

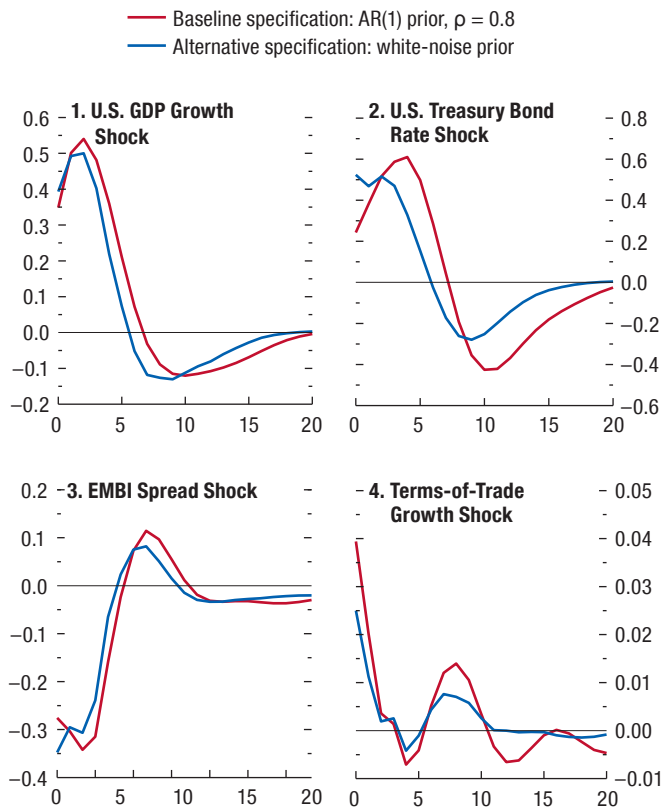
Figure 4.16 compares the average baseline SVAR results using the AR(1) priors with those from an alternative white-noise prior. As expected, with a white-noise prior, the impulse responses show lower persistence and amplitude. The conditional out-of-sample forecasts from these specifications are largely similar to those shown in Figures 4.12 and 4.13, although the forecast performance improves with a less persistent prior for some economies (for example, Malaysia, Mexico, and the Philippines).

Robustness of the Baseline Results

A variety of alternative specifications are used to assess the robustness of the main results. In particular, a number of additional variables are introduced as proxies for external demand, U.S. monetary policy, external financing conditions, and the terms of trade. The results are described in the following.

[25]In the case of China, there are 60 observations for the reduced-form VAR. With 37 coefficients to estimate, the priors receive a weight (importance) of slightly less than 0.25 in the baseline specification (and a maximum weight of 0.50 in the specification for out-of-sample forecasting reported in the chapter text).

Figure 4.16. Impact of Prior Choice on Average Impulse Responses
(Percentage points)

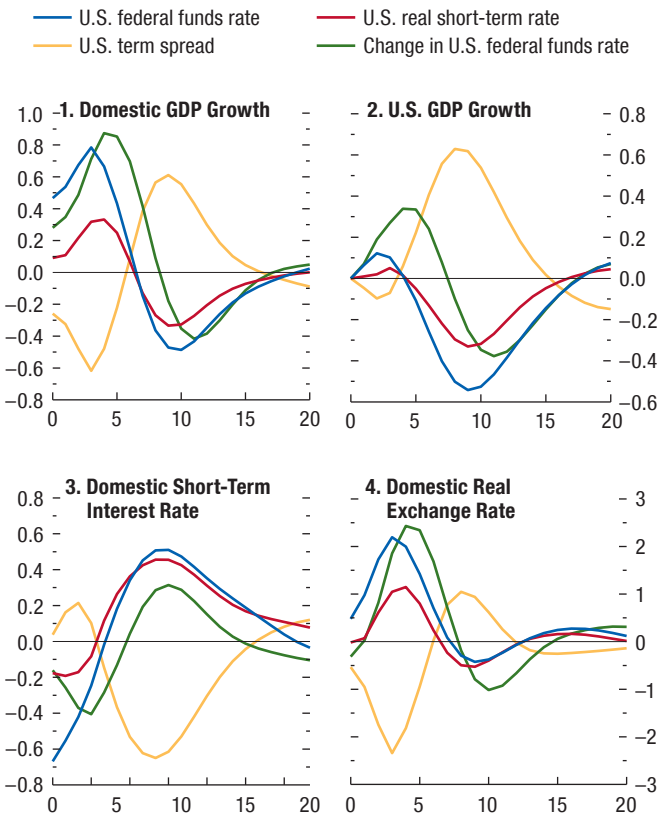


Source : IMF staff calculations.
Note: AR(1) = first-order autoregression; EMBI = J.P. Morgan Emerging Markets Bond Index. Shocks are normalized to a 1 percentage point increase. *X*-axis units are quarters; $t = 0$ denotes the quarter of the shock.

Alternative U.S. monetary policy measures

As described in the chapter, alternative proxies for global financing conditions are tried to assess the robustness of the findings: the 10-year U.S. Treasury bond rate, which is in the baseline specification (see Figure 4.16); and alternative specifications in which the 10-year U.S. Treasury bond rate is replaced by (1) the U.S. effective federal funds rate; (2) the ex ante U.S. real federal funds rate; (3) the change in the U.S. federal funds rate; (4) the U.S. term spread (defined as the 10-year U.S. Treasury bond rate minus the U.S. federal funds rate); (5) Kuttner (2001)–style unanticipated monetary policy shocks, inferred from the behavior of federal funds futures; and (6) an extension of the Romer and Romer (2004) exogenous monetary policy shock series, based on Coibion (2012).

Figure 4.17. Average Impulse Responses to Shocks from Alternative U.S. Monetary Policy Variables
(Percentage points)



Source: IMF staff calculations.
Note: Shocks are normalized to a 1 percentage point increase. *X*-axis units are quarters; $t = 0$ denotes the quarter of the shock.

Note that an increase in the U.S. federal funds or policy rate—nominal or real—negatively affects emerging market economies' growth only after a lag of six quarters just as the 10-year U.S. Treasury bond rate does (Figures 4.17 and 4.18). The impact effect is negative for very few economies (Chile, Malaysia, Thailand, Venezuela). These puzzling results may indicate that the U.S. rate increase embodies expectations of an improvement in future U.S. growth. Indeed, even U.S. growth is adversely affected with a delay (see Table 4.1). Emerging market economies' growth declines only as domestic interest rates gradually rise in response to the U.S. rate increase.

The alternative proxy using the term spread produces a more immediate negative effect (Figure 4.17). It is possible that the Federal Reserve's heavy reliance on unconventional policies to lower long-term rates over the past few years means that long-term rates are now a better measure of its stance than short-term rates. With the short-term rate at the zero lower bound, positive shocks to the term spread would indicate a tighter U.S. monetary policy (see also Ahmed and Zlate, 2013). With the exception of the U.S. term spread, emerging markets' growth responses to shocks to the alternative measures are similar to their responses to shocks to the 10-year U.S. Treasury bond rate or the U.S. policy rate.[26]

It is important to note that shocks to the 10-year U.S. Treasury bond rate may not correspond closely to unanticipated U.S. monetary policy changes unrelated to U.S. GDP growth and inflation. Because it is a long-term rate, it is much more likely that shocks to the 10-year rate reflect expectations in regard to the U.S. economy. Furthermore, since the global financial crisis, the 10-year U.S. Treasury bond rate has been suppressed by safe haven flows into U.S. Treasuries, reflecting not just the U.S. growth outlook, but also uncertainty over the global recovery. Therefore, shocks to the 10-year U.S. Treasury bond rate could occur in response to a wide range of external (non-U.S.) factors.

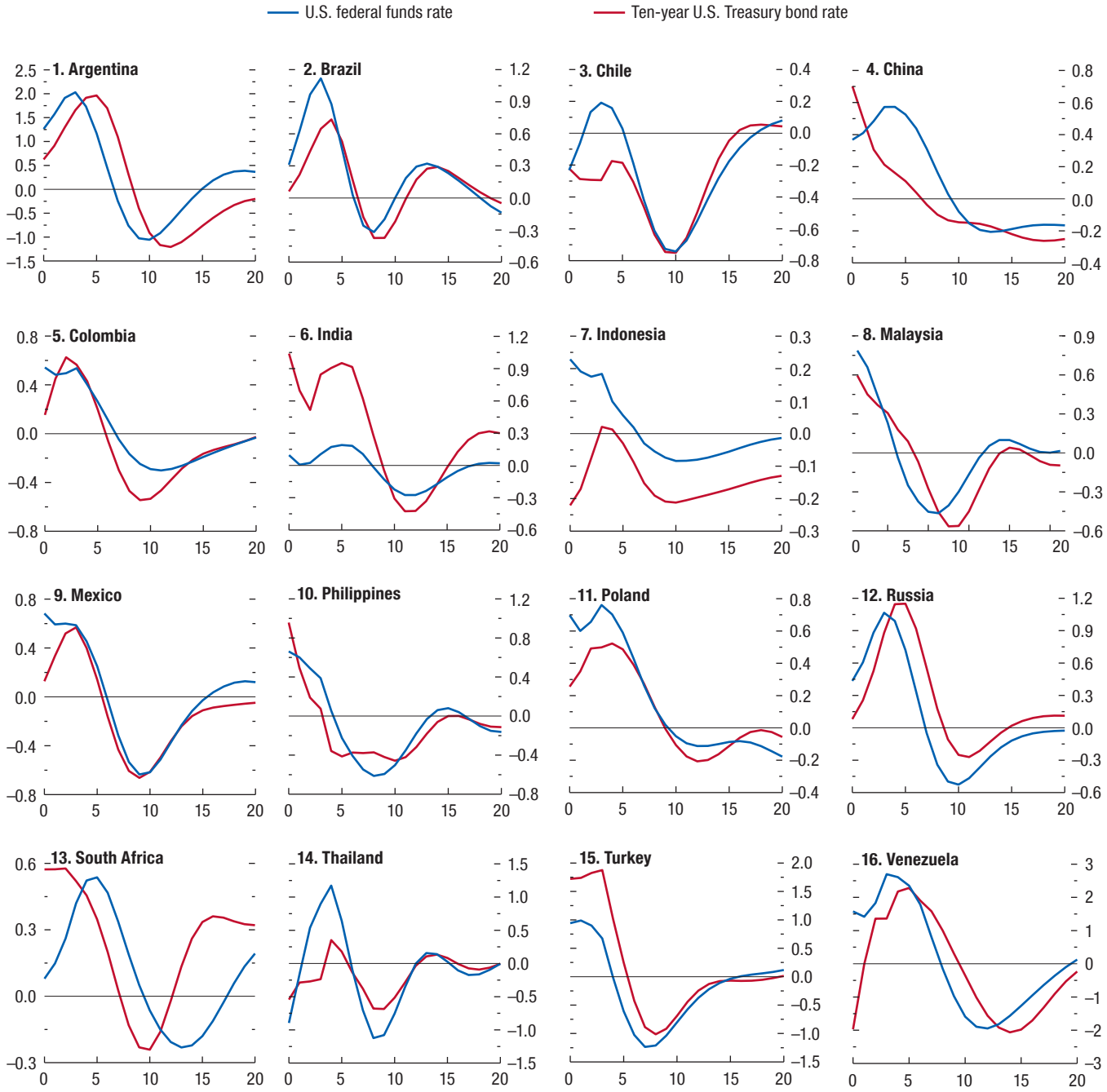
The impulse responses from specifications (5) and (6) use monetary policy measures to represent more accurately true U.S. monetary policy shocks. As shown in Figure 4.19, the sign and shape of the responses are broadly the same as for the other proxies discussed earlier. Growth in emerging market economies responds to U.S. monetary policy shocks only after one year. The reason for such responses could be that monetary policy shocks have been fairly limited and muted over the sample period. As Figure 4.20 shows, the largest shocks are shown to have occurred in the 1980s, when calculated using the technique set out in Romer and Romer (2004), and to have occurred with much less frequency, when calculated using the information contained in federal funds futures contracts, as described in Kuttner (2001).

External financing conditions

Robustness checks are also conducted for different types of external financing shocks besides the EMBI Global yield used in the baseline specification. The

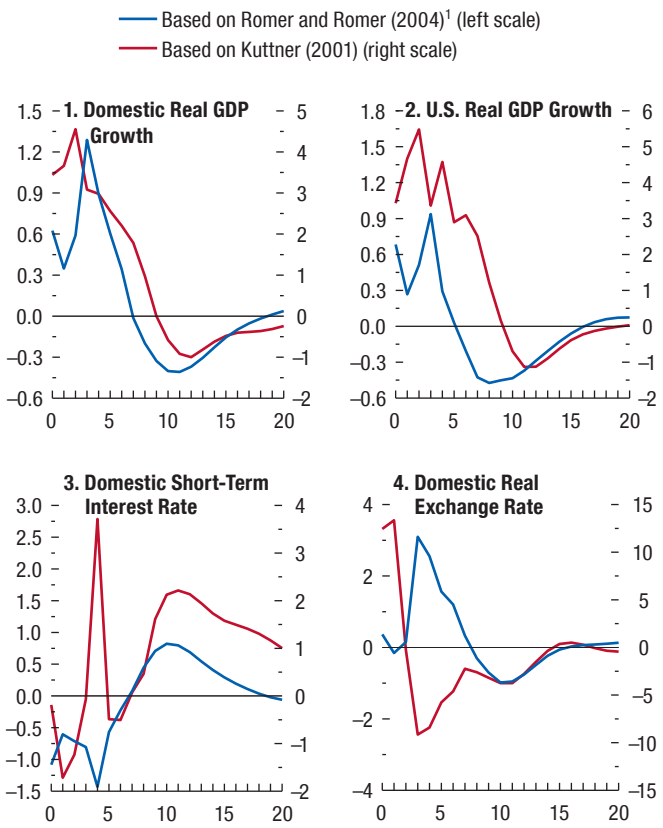
[26]Another alternative specification is also tried in which the 10-year U.S. Treasury bond rate is added after the policy rate in the external block. Shocks to either the policy rate or the 10-year rate in this expanded specification still elicit a lagged negative growth response for most emerging markets.

Figure 4.18. Domestic Real GDP Growth Response to U.S. Federal Funds Rate and 10-Year U.S. Treasury Bond Rate under Alternative Specifications
(Percentage points)



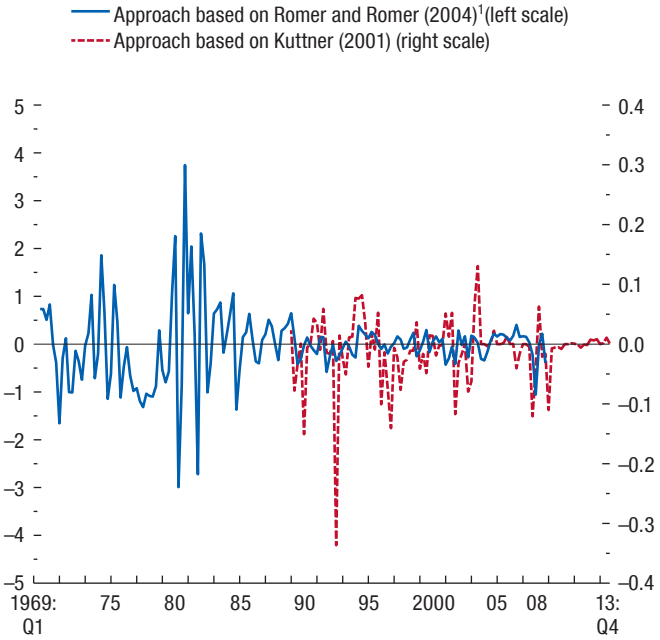
Source: IMF staff calculations.
Note: Shocks are normalized to a 1 percentage point increase. *X*-axis units are quarters; $t = 0$ denotes the quarter of the shock.

Figure 4.19. Average Impulse Responses to Alternative Measures of U.S. Monetary Policy Shock
(Percentage points)



Sources: Federal Reserve Economic Data; Haver Analytics; IMF, International Financial Statistics database; Thomson Reuters Datastream; and IMF staff calculations.
Note: Shocks are normalized to a 1 percentage point increase. *X*-axis units in panels are quarters; $t = 0$ denotes the quarter of the shock.
[1] See Coibion (2012).

Figure 4.20. Alternative Monetary Policy Shocks
(Percentage points)



Source: IMF staff calculations.
Note: *X*-axis units in panels are quarters; $t = 0$ denotes the quarter of the shock.
[1]See Coibion (2012).

variables used across the alternative specifications are (1) the EMBI Global spread and (2) the U.S. high-yield spread. As Figure 4.21 shows, the average response of domestic GDP growth in the 16 emerging market economies to all three identified shocks is very similar.

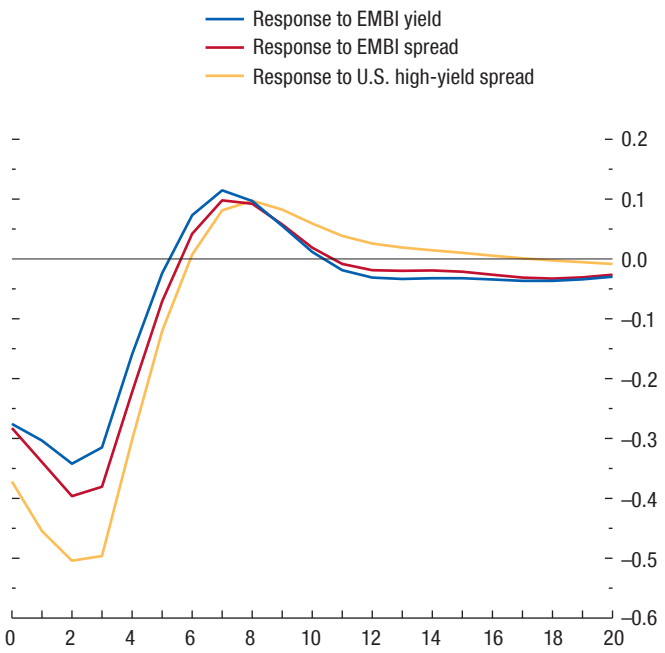
External demand conditions

The analysis assesses whether and how the effects of U.S. real GDP growth on domestic growth are affected by controlling for real GDP growth in the euro area. The euro area growth indicator enters the external block of the SVAR after U.S. real GDP growth in the recursive identification, but before the other U.S. variables. However, placing euro area growth after all the U.S. variables does not change the main results.

As shown in panel 1 of Figure 4.22, the average response of domestic growth to U.S. real GDP growth is largely unaffected by the introduction of this additional variable. Moreover, the response of domestic real GDP growth to euro area growth is also as strong as the response to U.S. real GDP growth, confirming that it is reasonable to use U.S. real GDP growth as a proxy for general advanced economy real growth shocks (Figure 4.22, panel 2). Some economy-specific differences appear in the results: for instance, economies with deeper external trade ties with the euro area (for example, Poland and South Africa) show larger growth effects with respect to euro area real GDP growth changes than with respect to U.S. real GDP growth changes, whereas growth in Mexico shows the reverse (that is, larger effects with respect to U.S. real GDP growth changes).

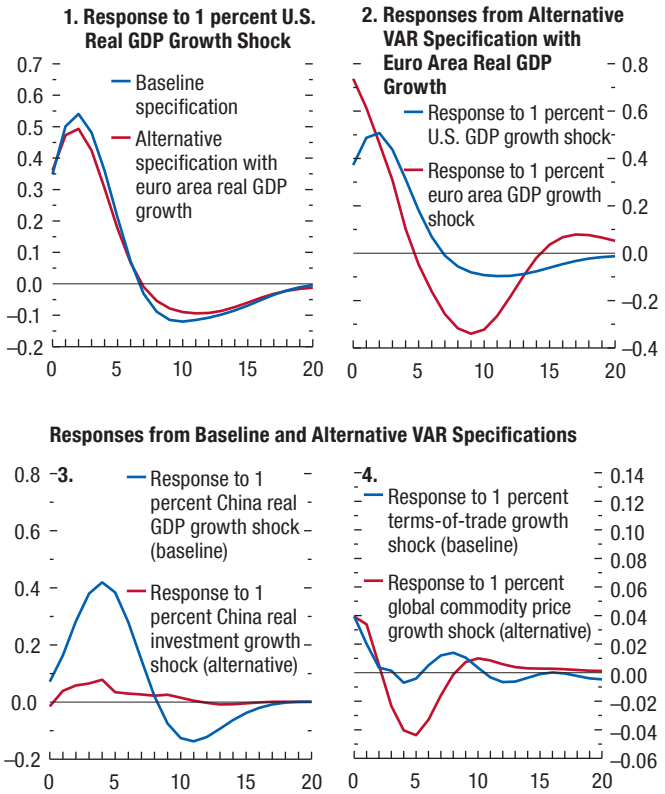
The analysis also considers China's real investment growth as an alternative proxy (instead of China's real GDP growth) for external demand shocks emanating from China (Figure 4.22, panel 3). Although the pattern of domestic growth responses to changes in China's investment growth is very similar to responses

Figure 4.21. Impulse Response of Domestic Real GDP Growth to External Financing Shocks
(Percentage points)



Sources: Bank of America Merrill Lynch; Haver Analytics; Thomson Reuters Datastream; and IMF staff calculations.
Note: Shocks are normalized to a 1 percentage point increase. *X*-axis units in panel are quarters; $t = 0$ denotes the quarter of the shock. EMBI = J.P. Morgan Emerging Markets Bond Index.

Figure 4.22. Average Impulse Responses of Domestic Real GDP Growth to Shocks under Alternative Vector Autoregression Specifications
(Percentage points)



Sources: Haver Analytics; IMF, International Financial Statistics database; Organization for Economic Cooperation and Development; and IMF staff calculations.
Note: Average for all sample economies. Shocks are normalized to a 1 percentage point increase. *X*-axis units in panels are quarters; $t = 0$ denotes the quarter of the shock. VAR = vector autoregression.

to China's real GDP growth, the elasticity is negligible on impact, building up slightly over time.

Terms-of-trade growth alternatives

As a potentially more exogenous proxy for emerging market economies' terms of trade, the exercise includes the global commodity price index in the external block, placing it in the second position within the recursive ordering for the identification of external structural shocks. Panel 4 of Figure 4.22 shows a similar pattern of response to that resulting from a positive shock to terms-of-trade growth.

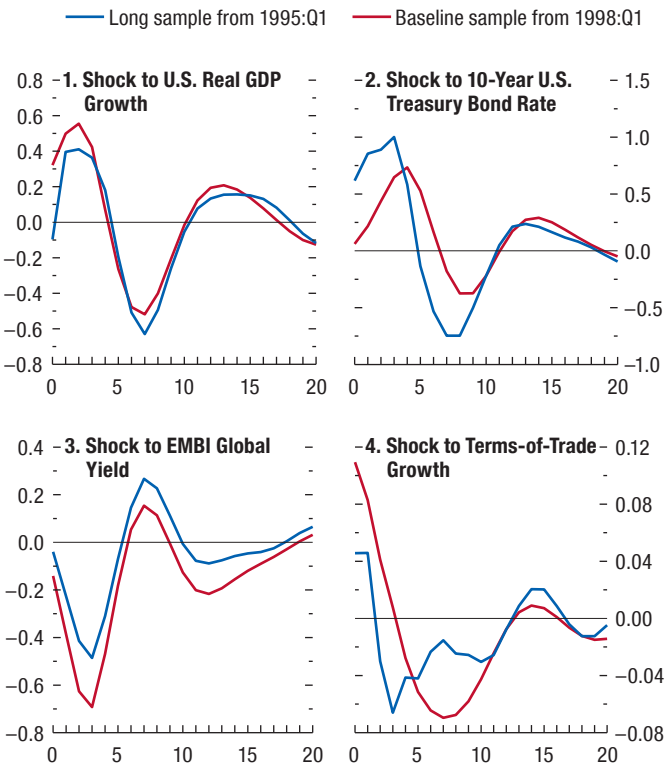
Longer time period

The economy-specific SVARs are also estimated using the longest available quarterly data. Only three economies have all baseline variables available from the first quarter of 1995: Brazil, Mexico, and South Africa. The results for those economies with additional data are not affected by the longer-sample SVAR. Figure 4.23 presents, for Brazil, a comparison of the impulse responses of domestic GDP growth to shocks from four of the key external factors. Similar results are obtained for Mexico and South Africa.

Robustness checks with panel vector autoregressions

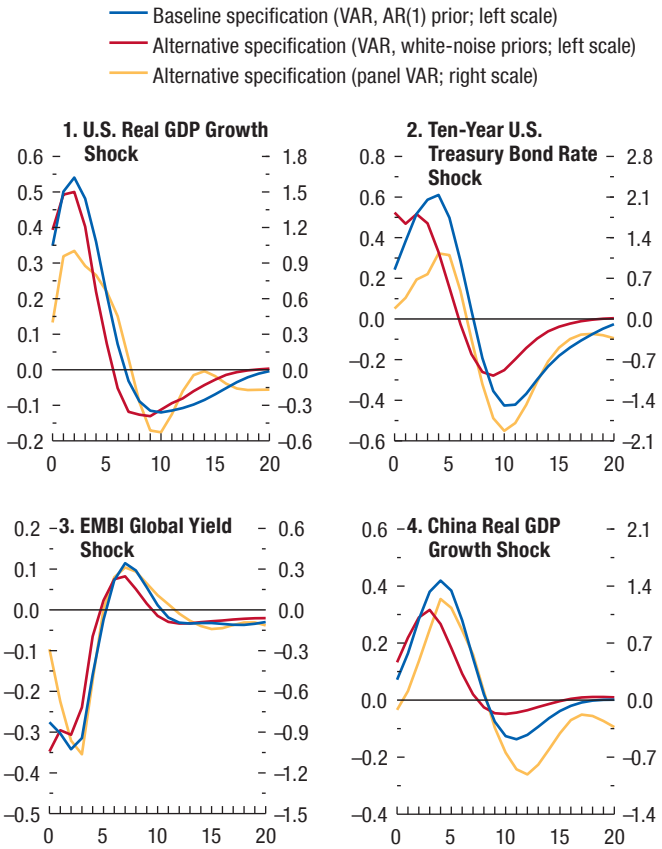
The final section of this appendix assesses how the estimated relationship between emerging market economies' growth and external conditions is affected by an alternative estimation technique in a panel setup. A panel VAR allows for many more degrees of freedom relative to the SVAR because all the economy-specific observations are pooled. As such, it provides a sense of the average behavior among the sample of economies to the alternative external shocks.

Figure 4.23. Brazil: Comparison of Responses under the Baseline Model with Responses from Model with Sample Beginning in the First Quarter of 1995
(Percentage points)



Sources: Haver Analytics; IMF, International Financial Statistics database; Organization for Economic Cooperation and Development; Thomson Reuters Datastream; and IMF staff calculations.
Note: Shocks are normalized to a 1 percentage point increase. *X*-axis units in panels are quarters; $t = 0$ denotes the quarter of the shock.

Figure 4.24. Comparison of Impulse Responses from Panel Vector Autoregression with Responses from the Baseline Model
(Percentage points)



Sources: Haver Analytics; Thomson Reuters Datastream; and IMF staff calculations.
Note: Shocks are normalized to a 1 percentage point increase. *X*-axis units in panels are quarters; $t = 0$ denotes the quarter of the shock. AR(1) = first-order autoregression; EMBI = J.P. Morgan Emerging Markets Bond Index; VAR = vector autoregression.

As Figure 4.24 illustrates, the responses of emerging market economy growth to changes in external conditions in the panel VAR are broadly similar to the average responses from the country-specific SVARs used in the chapter text. The panel VAR typically produces somewhat larger amplitudes, however, such that the cumulated effects are greater. A 1 percent rise in the U.S. growth rate results in a 0.4 percent rise in emerging market economy growth, whereas a 100 basis point rise in the EMBI yield reduces growth by 0.3 percentage point. However, an increase in China's growth has a small negative effect on impact, although the effects build up over time.

Box 4.1. The Impact of External Conditions on Medium-Term Growth in Emerging Market Economies

This box uses panel growth regressions to estimate the impact of external demand and global financial conditions on medium-term growth in emerging market economies. Thus, it complements the analysis in the chapter, which is more focused on the shorter-term growth implications of changes in external conditions. Growth regressions, which abstract from the business cycle by aggregating data over five-year periods, naturally lend themselves to addressing questions relating to the medium-term impact of a protracted period of adverse external conditions on emerging market economies' growth. Also, given wider availability of data at an annual frequency, the findings of the box are applicable to a broader group of emerging markets.

Economic theory suggests several channels through which external conditions affect long-term growth. The standard growth model is the obvious starting point. Real external shocks, such as an increase in external demand or a change in the terms of trade, directly affect the productivity of capital and therefore capital accumulation.

Financial linkages

As for financial linkages, arbitrage ensures that a small open economy with an open capital account will be in a steady state when the productivity of domestic capital is equal to the global interest rate. Although there are many reasons why this equalization may never be achieved (for example, country risk, investment costs), an increase in global real interest rates will necessarily reduce funding for marginal investment projects and negatively affect growth. This process can progress in a dramatic fashion, with an increase in international rates precipitating banking crises and the ensuing decrease in output (Eichengreen and Rose, 2004).

This box analyzes the impact of both trade and financial linkages in a single regression. The two channels operate in opposite directions: whereas a recession in advanced economies may adversely affect emerging market economies' growth (through a combination of lower external demand and weaker terms of trade), relatively lower interest rates in advanced economy downturns can boost domestic demand growth in emerging markets. Analyzing all external factors simultaneously reduces omitted-variable bias, even if it does not allow identification of the exogenous impact of each separately.

The author of this box is Alexander Culiuc.

Specification and methodology

The empirical approach estimates fixed-effects panel growth regressions—for growth averaged over consecutive five-year periods—of the following general form:

$$\Delta \ln GDPPC_{i,t} = \beta_1'(External\ Conditions)_{i,t} + \beta_2' X_{i,t} + \gamma_i + \eta_t + \varepsilon_{i,t}, \quad (4.1.1)$$

in which

$\Delta \ln GDPPC_{i,t}$ = first difference in the log of real per capita GDP;

External Conditions = variables measuring external conditions, which include

Trading partner growth, computed following Arora and Vamvakidis (2005),[1]

Change in the log of the terms of trade, and

International financing conditions (for example, the real interest rate on the 10-year U.S. Treasury bond) interacted with the degree of financial openness;

$X_{i,t}$ = standard growth regressors, such as initial level of income, population growth, and investment ratio;

γ_i = country fixed effect; and

η_t = time fixed effect to control for changes in global conditions not captured by the model.

For most specifications, the panel is estimated for the period 1997–2011[2] and includes 62 emerging market economies with populations of more than two million, of which 14 are classified as mineral commodity exporters. The emerging market economy universe is larger than the one considered in the chapter, covering a number of countries (mostly in eastern Europe) only recently reclassified as advanced economies.[3]

[1]A similar approach is also used by Drummond and Ramirez (2009) and Dabla-Norris, Espinoza, and Jahan (2012).

[2]The period is chosen to coincide roughly with the period covered in the chapter. Results, especially those concerning trade linkages, remain broadly unchanged if the period is stretched back to the mid-1980s and even the 1970s.

[3]The panel is constructed using data from IMF sources (*World Economic Outlook, International Financial Statistics, Direction of Trade Statistics, Annual Report on Exchange Arrangements and Exchange Restrictions*), as well as from the *World Development Indicators* (World Bank), Lane and Milesi-Ferretti (2007), Klein and Shambaugh (2008), and the Armed Conflict Dataset (Peace Research Institute Oslo).

Box 4.1 *(continued)*

Table 4.1.1. Growth Regressions for Emerging Markets, 1997–2011

	All Emerging Market Economies		Non-Commodity-Exporting Emerging Market Economies	
	(1)	(2)	(3)	(4)
Lagged GDP per Capita (log)	–0.053**	–0.051**	–0.083***	–0.082***
	(0.025)	(0.025)	(0.020)	(0.020)
Population Growth	1.473**	1.432**	0.128	0.235
	(0.571)	(0.542)	(0.311)	(0.305)
Gross Capital Formation/GDP	0.052	0.062	0.183***	0.178***
	(0.054)	(0.058)	(0.032)	(0.032)
War	–0.006	–0.001	0.000	0.000
	(0.005)	(0.003)	(0.003)	(0.003)
Terms-of-Trade Growth	0.121*	0.114*	0.066	0.060
	(0.068)	(0.060)	(0.070)	(0.068)
Trading Partner GDP Growth	0.910***	0.692	0.847***	0.541**
	(0.255)	(0.466)	(0.177)	(0.262)
Exports/GDP		–0.054		–0.025
		(0.043)		(0.037)
Trading Partner GDP Growth × Exports/GDP		0.685		1.072
		(1.085)		(1.078)
Time Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Number of Observations	164	164	121	121
Number of Countries	57	57	42	42
R Squared	0.505	0.486	0.685	0.668

Source: IMF staff calculations.
Note: Standard errors (in parentheses) are clustered at the country level. *, **, *** indicate that coefficients are significant at the 10, 5, and 1 percent levels, respectively.

Trade linkages

The growth regressions are estimated separately for all emerging market economies in the sample and for non–mineral commodity exporters. The regressions confirm that emerging markets' per capita GDP growth is subject to conditional convergence (negative coefficient on lagged GDP per capita), and both investment and the terms of trade have positive growth effects (Table 4.1.1, columns 1 and 2 for the full sample, and columns 3 and 4 for non-commodity-exporting emerging markets). Medium-term growth exhibits a correlation close to one vis-à-vis growth in export partner economies. This elasticity tends to increase with trade openness (column 2 of the table and Figure 4.1.1), particularly for the non-commodity-exporting economies (column 4 of the table and Figure 4.1.1). The results also suggest that the terms of trade have a limited role in determining medium-term growth, especially for non–commodity exporters.

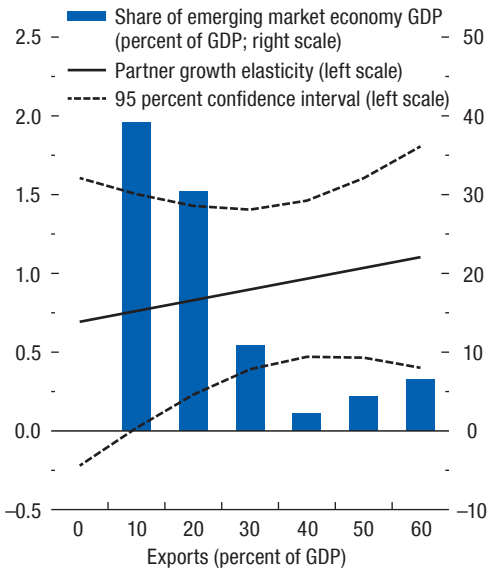
The analysis also tracks the relationship between partner growth elasticity and trade openness over time by introducing interaction effects with time dummies (Figure 4.1.2). As panel 1 of Figure 4.1.2 shows, partner growth elasticity has been increasing since the mid-1980s in line with the median export-to-GDP ratio. However, although advanced economy partner growth elasticity has been rising over time, emerging market economy partner growth elasticity started rapidly picking up (from zero) only in the early 1990s (panel 2 of Figure 4.1.2).

The increase in the growth elasticity of emerging markets with respect to growth in their emerging market partners coincides with—and is likely driven by—the growing prominence of Brazil, Russia, India, China, and South Africa (BRICS) and, particularly, the proliferation of supply chains with China. To assess this supposition, the growth regressions are reestimated for all non-BRICS emerging markets (Table 4.1.2 and panels 3 and 4 of Figure 4.1.2).[4] Panel 3 of the figure appears to corroborate the hypothesis: for the average emerging market economy, correlation with BRICS growth is fairly high (0.3)

[4]All partner growth elasticities are weighted by the share of partner countries in the export basket of each emerging market. This means, among other things, that the BRICS partner growth elasticity is heavily weighted toward China, which, for the average emerging market economy, accounts for more than one-third of exports to the BRICS.

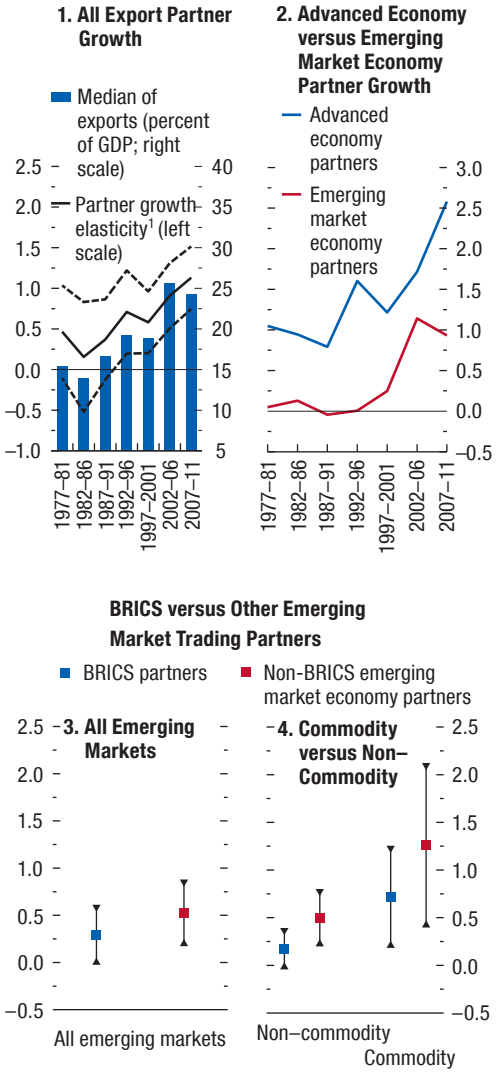
Box 4.1 *(continued)*

Figure 4.1.1. Export Partner Growth Elasticity



Source: IMF staff calculations.
Note: On the *x*-axis, 0 denotes 0–10 percent of GDP; 10 denotes 10–20 percent of GDP; and so on.

Figure 4.1.2. Export Partner Growth



Source: IMF staff calculations.
Note: BRICS = Brazil, Russia, India, China, South Africa. In panels 3 and 4, the upper and lower points of each line show the top and bottom of the 95 percent confidence interval. The estimation period is 1997–2011. "Non-commodity" and "Commodity" refer to non–commodity exporters and commodity exporters, respectively, among the emerging market economies in the sample.
[1]Dashed lines denote 95 percent confidence interval for partner growth elasticity.

and statistically significant. This result, however, hides heterogeneity across country groups. Panel 4 presents results estimated separately for commodity exporters and non–commodity exporters. For non–commodity exporters, BRICS partner growth elasticity is borderline statistically significant. Growth in commodity exporters, on the other hand, exhibits a very strong correlation with both BRICS and other emerging market economy partners, confirming the growing importance of the BRICS, and China in particular, in the global demand for mineral commodities.

Financial linkages

The role of external financial conditions in emerging markets' growth is considered next. Although for a small open economy, an increase in the global interest rate is expected to increase the opportunity cost of capital and, correspondingly, depress growth in the short term, the effect in the medium term remains an open question.

Regressions presented in Table 4.1.3 augment the model with global financing conditions proxied by the

Box 4.1 *(continued)*

Table 4.1.2. Growth Regressions for Emerging Markets: Brazil, China, India, Russia, and South Africa versus Other Emerging Market Partner Growth, 1997–2011

	All EMEs		Non–Commodity Exporter		Commodity Exporter	
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged GDP per Capita (log)	–0.056*	–0.054*	–0.102***	–0.098***	0.130**	0.114**
	(–0.030)	(–0.030)	(–0.021)	(–0.021)	(–0.053)	(–0.048)
Population Growth	1.645***	1.732***	0.465	0.459	–0.911	–0.363
	(–0.515)	(–0.562)	(–0.359)	(–0.383)	(–1.066)	(–1.433)
Gross Capital Formation/GDP	0.055	0.060	0.163***	0.166***	0.178**	0.164*
	(–0.049)	(–0.049)	(–0.037)	(–0.037)	(–0.071)	(–0.078)
War	0.001	0.000	0.005	0.006	0.010	0.008
	(–0.006)	(–0.006)	(–0.004)	(–0.004)	(–0.013)	(–0.013)
Terms-of-Trade Growth	0.145*	0.152**	0.104	0.126*	0.192*	0.127
	(–0.074)	(–0.075)	(–0.073)	(–0.074)	(–0.099)	(–0.132)
AE Partner GDP Growth	–1.210	–1.395	0.859	0.738	–5.666***	–6.116***
	(–0.931)	(–0.956)	(–0.715)	(–0.729)	(–1.257)	(–1.653)
EME Partner GDP Growth	0.666***		0.545***		1.718***	
	(–0.184)		(–0.126)		(–0.382)	
BRICS Partner GDP Growth		0.295*		0.175*		0.718**
		(–0.149)		(–0.098)		(–0.260)
Non-BRICS EME Partner GDP Growth		0.527***		0.500***		1.259**
		(–0.167)		(–0.141)		(–0.427)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	164	164	121	121	43	43
Number of Countries	57	57	42	42	15	15
R Squared	0.505	0.486	0.685	0.668	0.818	0.790

Source: IMF staff calculations.
Note: AE = advanced economy; BRICS = Brazil, Russia, India, China, and South Africa; EME = emerging market economy. Standard errors (in parentheses) are clustered at the country level. *, **, *** indicate that coefficients are significant at the 10, 5, and 1 percent levels, respectively.

real interest rate on the 10-year U.S. Treasury bond interacted with the degree of financial integration.[5] Results confirm the negative effect of high global interest rates on medium-term growth—a 100 basis point increase in the former is associated with a 0.5 percentage point decrease in the latter for the median emerging market economy, with a degree of financial integration of 115 percent of GDP (columns 1 and 2 of the table). However, the relationship is not statistically significant for the sample since the mid-1990s. To make the results comparable to those of previous studies (Frankel and Roubini, 2001; Reinhart and others, 2001; Reinhart and Reinhart, 2001), the model is reestimated for 1997–2011 using annual data (column 3). The negative impact of the foreign interest rate is statistically significant. This suggests that the effect of international borrowing conditions on emerging market economies' growth may be shorter term in nature and cannot be reliably captured when five-year averages are considered. In a similar manner, the terms of trade also gain statistical significance in the regression using annual data.

Conclusion

The main messages of the analysis in this box are the following. First, the importance of partner country growth has increased dramatically as emerging market economies have integrated into the world economy. Second, as some emerging markets have gained a prominent role in the global economy, their impact on smaller peers has also increased. BRICS' growth, in particular, has become an important factor driving growth in other emerging market economies, especially those dependent on mineral commodity exports. Third, international financing conditions, which tend to affect the cyclical component of growth in emerging market economies (as also shown in the main analysis), also exercise a longer-lasting effect, especially for financially integrated countries. Although the analysis has shown that external factors are important for long-term growth, it should be noted that this finding does not diminish the critical role of appropriate domestic

[5]The degree of financial integration is computed from the updated and extended version of the data set constructed by Lane and Milesi-Ferretti (2007) as the sum of gross foreign assets and liabilities net of international reserves as a percentage of GDP.

Box 4.1 *(continued)*

Table 4.1.3. Growth Regressions for Emerging Markets

	1987–2011	1997–2011	1997–2011 (annual data)
	(1)	(2)	(3)
Lagged GDP per Capita (log)	–0.040**	–0.043*	–0.061**
	(0.017)	(0.025)	(0.025)
Population Growth	0.270	1.498**	–0.356
	(0.443)	(0.629)	(0.349)
Gross Capital Formation/GDP	0.087**	0.054	0.193***
	(0.039)	(0.045)	(0.050)
War	–0.010***	0.000	0.002
	(0.003)	(0.004)	(0.008)
Terms-of-Trade Growth	–0.008	0.092	0.061**
	(0.053)	(0.085)	(0.026)
Terms-of-Trade Growth × Commodity Exporter	0.105	0.051	–0.038
	(0.075)	(0.125)	(0.038)
Trading Partner GDP Growth	0.970***	0.891***	0.693***
	(0.239)	(0.263)	(0.206)
Financial Integration	–0.016***	–0.016***	–0.023***
	(0.006)	(0.005)	(0.005)
Financial Integration × Real 10-Year U.S. Treasury Bond	–0.494**	–0.409	–0.237**
	(0.226)	(0.377)	(0.109)
Country Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Number of Observations	248	178	874
Number of Countries	62	62	62
R Squared	0.510	0.508	0.428

Source: IMF staff calculations.
Note: Standard errors (in parentheses) are clustered at the country level. *, **, *** indicate that coefficients are significant at the 10, 5, and 1 percent levels, respectively.

economic and structural policies in this area. Indeed, recent work (see Chapter 4 of the October 2012 *World Economic Outlook*) has established how improvements in domestic policy frameworks have contributed to the increased resilience of emerging market economies since the 1990s.

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