ROADS LESS TRAVELED: GROWTH IN EMERGING MARKET AND DEVELOPING ECONOMIES IN A COMPLICATED EXTERNAL ENVIRONMENT

Emerging market and developing economies have become increasingly important in the global economy in recent years. They now account for more than 75 percent of global growth in output and consumption, almost double the share of just two decades ago. The external environment has been important for this transformation. As these economies have integrated into the global economy, terms of trade, external demand, and, in particular, external financial conditions have become increasingly influential determinants of their medium-term growth. With potentially persistent structural shifts occurring in the global economy, emerging market and developing economies may face a less supportive external environment going forward than they experienced for long stretches of the post-2000 period. The still-considerable income gaps in these economies vis-à-vis those in advanced economies suggest further room for catch-up, favoring their prospects of maintaining relatively strong potential growth over the medium term. However, steady catch-up growth has not been automatic in the past. Emerging market and developing economy growth has exhibited episodes of accelerations and reversals over time. Nevertheless, these economies can still get the most out of a weaker growth impulse from external conditions by strengthening their institutional frameworks, protecting trade integration, permitting exchange rate flexibility, and containing vulnerabilities arising from high current account deficits and external borrowing, as well as large public debt.

Introduction

After a remarkable period of synchronized acceleration in the early 2000s and broad resilience immediately following the global financial crisis, growth across emerging market and developing economies in recent years once again displays heterogeneity—a mix of tapering, standstills, reversals, and continued strength in some

cases. This change has taken place against a backdrop of fading external tailwinds, including waning potential growth in advanced economies, slowdown and rebalancing in China, and a shift in the commodity cycle that has affected commodity exporters. Together with a risk of protectionism in advanced economies and tighter financial conditions as U.S. monetary policy normalizes, these changes make for a more challenging external environment for emerging market and developing economies going forward.

What are the implications of this environment for medium-term growth in emerging market and developing economies? The still-considerable income gaps in these economies vis-à-vis those in advanced economies suggest room for catch-up and thus favorable prospects for maintaining relatively strong potential growth in emerging market and developing economies over the medium term, even if there is a persistent shift in some key external conditions.

The historical record suggests, however, that steady, sustained catch-up growth spurred by income gaps relative to advanced economies is not automatic (Pritchett 2000; Hausmann, Pritchett, and Rodrik 2005; Jones and Olken 2008; Berg, Ostry, and Zettelmeyer 2012). Growth across emerging market and developing economies over time instead exhibits episodes of accelerations and reversals, with a possible role for external conditions in influencing the patterns. Understanding which policies emerging market and developing economies can deploy to maintain steady growth and avoid reversals as the external environment becomes less supportive is critical for improving living standards in those economies and for lifting global growth.

Against this backdrop, the chapter studies how country-specific external conditions affect emerging market and developing economies' medium-term growth prospects (that is, over five-year horizons that smooth the influence of business cycle fluctuations) and their likelihood of experiencing persistent acceleration and reversal episodes. It also explores how domestic policies and structural attributes influence the impact of external conditions on the propensity to experience these episodes. After taking stock of

emerging market and developing economy growth performance in recent decades and how much these economies' income gaps have narrowed compared with advanced economies, the chapter examines the following main questions:

- How do country-specific external demand conditions, external financial conditions, and terms of trade influence growth patterns in emerging market and developing economies, their likelihood of experiencing accelerations or reversals, and thus how quickly they narrow income gaps vis-à-vis advanced economies? As emerging market and developing economies have become more integrated into the global economy, have external factors become more important in shaping their growth patterns over time?
- Which domestic policies and structural attributes can help emerging market and developing economies get the most out of external conditions?
- What does the current constellation of external conditions imply for emerging market and developing economies' medium-term growth prospects and their ability to continue to contribute significantly to global growth?

The chapter's main findings are:

- Country-specific external conditions have a significant effect on medium-term growth of emerging market and developing economies. The analysis establishes that variation at the country level in external conditions, as well as global factors that affect all economies in a common manner during particular intervals, matter for medium-term growth outcomes of individual emerging market and developing economies.
- Country-specific external conditions also help explain the occurrence of growth accelerations and reversals—episodes that appear to have persistent effects on growth outcomes in emerging market and developing economies and their relative income gaps vis-à-vis advanced economies.
- The importance of country-specific external conditions for emerging market and developing economies' medium-term growth has increased over time, particularly in the case of external financial conditions. For instance, their contribution to medium-term growth has increased by about ½ percentage point—or one-third of the increase in average per capita income growth—between the 1995–2004 and 2005–14 periods. While the contribution of

external demand conditions as a whole appears to have remained broadly stable over this period, demand among emerging market and developing economies has played an increasingly powerful role.

- Certain domestic policy settings and structural attributes can to some extent help offset a diminishing growth impulse from less supportive external conditions. The chapter confirms previous findings in the literature that higher-quality legal systems and stronger protection of property rights are associated with better medium-term growth outcomes (see Jones 2016 and references therein). Sound monetary frameworks, financial depth, and exchange rate flexibility also enhance medium-term growth. But, crucially, the chapter points to an additional role for some attributes: trade integration, exchange rate flexibility, and strong institutions help emerging market and developing economies enhance the growth impulse from external conditions either by increasing the likelihood of accelerations or by decreasing that of reversals.

The analysis presented in this chapter focuses specifically on the impact of the external environment on emerging market and developing economies' medium-term growth in income per capita. The external environment can also influence other important aspects of these economies and raise associated policy challenges not considered in this chapter. As documented in Chapter 4 of the April 2014 *World Economic Outlook* (WEO), external demand and financial shocks have a quantitatively significant impact on short-term growth fluctuations in emerging market and developing economies. Exposure to short-term speculative capital flows can impose costs in the form of higher volatility (Ostry, Loungani, and Furceri 2016). Integration into the global trading system also affects the way rewards of economic growth are divided across domestic factors of production. As shown in Chapter 3, emerging market and developing economies' participation in global value chains may have contributed to lower labor income shares in these economies.

The rest of the chapter is structured as follows. It starts with an overview of emerging market and developing economy growth performance in recent decades and examines the role of country-specific external conditions in shaping growth patterns observed across countries and over time. It then zooms in on episodic patterns of emerging market and developing economy growth and explores the role of external conditions in affecting the likelihood of accelerations and reversals. The analysis

examines how domestic policies and attributes influence the effect of external conditions on the likelihood of experiencing accelerations and reversals. Finally, the chapter looks at the prospects for emerging market and developing economy growth in the external environment they are likely to face over the medium term.

Emerging Market and Developing Economy Growth Performance over Time

In recent decades, the contribution of emerging market and developing economies to global growth of output and consumption has increased rapidly, and these economies' growth prospects have become increasingly relevant for the entire global economy.[1] Understanding how the complicated external environment may affect their growth prospects is therefore important not just for the quest to sustain improvements in these economies' living standards, but also to assess the overall outlook for the global economy.

During 2000–08, emerging market and developing economies, on average, accounted for 70 percent of global growth in output and consumption in purchasing-power-parity terms, nearly double their contribution during the 1980s. After the global financial crisis, with advanced economies experiencing a slow recovery, emerging market and developing economies' contribution to global growth rose to about 80 percent of output growth and 85 percent of consumption growth (see also Box 1.1 of the April 2016 WEO). In market exchange-rate terms, emerging market and developing economies accounted for close to 70 percent of global output growth and just over 70 percent of global consumption growth during 2010–15 (Figure 2.1).
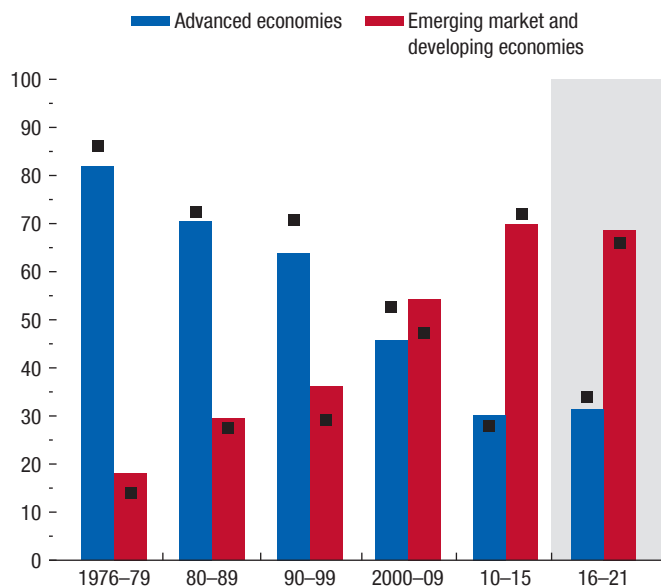
Despite emerging market and developing economies' increasing overall importance in the global economy, particularly in the 2000s, income levels of individual countries within the group are still relatively low vis-à-vis those of advanced economies.[2] In 90 percent of

Figure 2.1. Contribution to Global Output and Consumption Growth
(Percent)

Emerging market and developing economy growth prospects are increasingly relevant for the global economy.

Source: IMF staff calculations.
Note: Weighted averages are calculated using market exchange rates. Colored bars show percentage of contribution to output growth; black squares show percentage of contribution to consumption growth.

emerging market and developing economies, current real income per capita (converted at purchasing-power-parity exchange rates that more accurately reflect differences in the cost of living across countries) is less than half what it is in the United States. In 85 percent of emerging market and developing economies, real income per worker is less than half that in the United States (Figure 2.2).[3]

To the extent that labor productivity growth in emerging market and developing economies is in part a function of the relative productivity gap with advanced economies (proxied by the United States), these large gaps in output per worker suggest that there may still be significant room for catch-up

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[1]In this chapter, the emerging market and developing economy group comprises all economies currently classified as such by the WEO as well as those that have been reclassified as "advanced" since 1996 (Cyprus, Czech Republic, Estonia, Hong Kong SAR, Israel, Korea, Latvia, Lithuania, Macao SAR, Malta, Puerto Rico, San Marino, Singapore, Slovak Republic, Slovenia, Taiwan Province of China). Economies with populations in 2010 below 1 million according to the Penn World Tables 9.0 vintage are excluded from the sample.

[2]The chapter uses data on cross-country real income, factors of production (physical and human capital; labor input), and population from the Penn World Tables (PWT) 9.0 vintage. See Deaton and Aten (2017), and Inklaar and Rao (2017) for discussions on the methodology of the 2011 International Comparison of Prices, which

underpins the calculations of purchasing-power-parity real income in the PWT 9.0.

[3]The ratios are calculated based on average real income per capita over a five-year window, 2010–14, to smooth out business cycle and commodity price fluctuations that may affect the relative income levels. An important caveat is that some emerging market economies use the single-deflation method to calculate real GDP, but this approach may not fully capture relative price changes and may therefore affect the accuracy of the calculation (Alexander and others 2017).

Figure 2.2. Emerging Market and Developing Economies, Relative Income in Purchasing-Power-Parity Terms
(Number of economies per interval)

Large gaps in income per worker vis-à-vis that of advanced economies suggest there may still be significant room for "catch-up" growth in EMDEs.
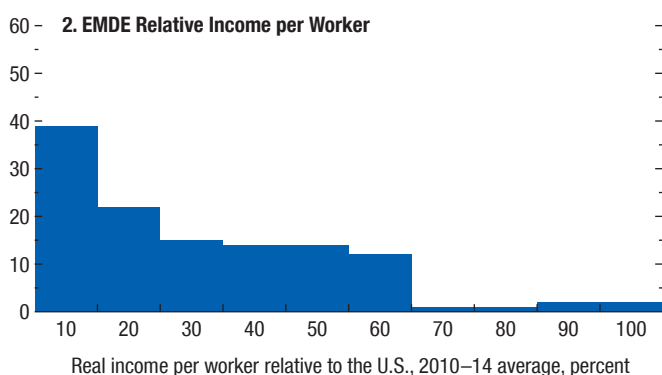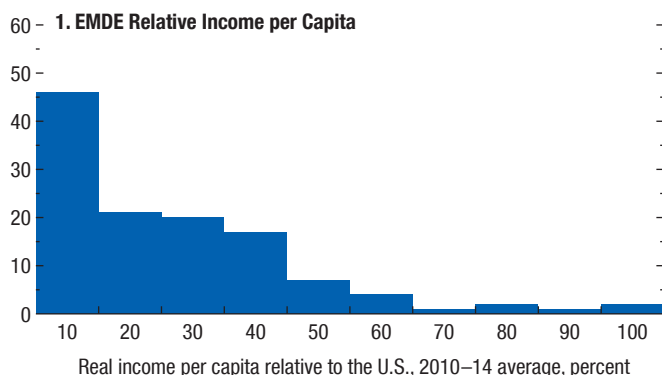
Sources: Penn World Tables 9.0; and IMF staff calculations.
Note: EMDE = emerging market and developing economies; U.S. = United States.

Figure 2.3. Distribution of Income per Capita in EMDEs in the 1970s and the 2010s
(Income per capita in PPP terms relative to the United States, percent)

The narrowing of gaps in income per capita in EMDEs vis-à-vis that of advanced economies has not been automatic in the past. Income gaps of several EMDEs actually widened during 1970–2014.
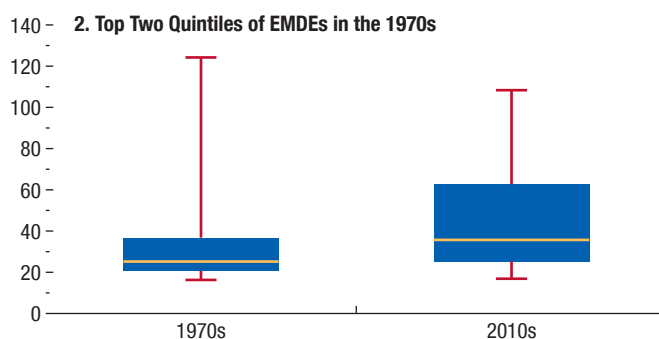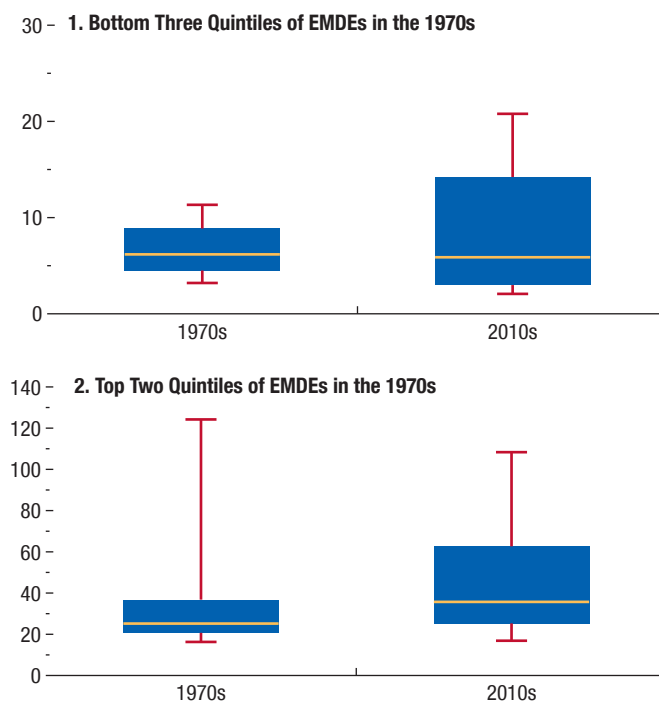
Sources: Penn World Tables 9.0; and IMF staff calculations.
Note: The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles of the average relative income during the decade. EMDEs = emerging market and developing economies; PPP = purchasing power parity.

(although some countries may be close to their own steady-state levels and unlikely to experience further catch-up growth).[4]

In the past, the narrowing of income gaps has not been automatic. Other forces beyond the gap in productivity have shaped the pattern of emerging market and developing economies' growth. For example, consider the *bottom three quintiles* of the income distribution of these economies in the 1970s—that is, those with relative income per capita vis-à-vis the United States below the 60th percentile of the cross-country distribution of the period-average relative income per capita levels

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[4]Some emerging market and developing economies have been experiencing a protracted slowdown in labor productivity growth in recent years (Adler and others 2017), which would be consistent with these economies having reached per capita income levels close to their steady states.

during the 1970s (Figure 2.3, panel 1). Convergence and the narrowing of relative income gaps would have been expected to be greatest among economies in this group; indeed, the best performers in this group (economies in the top decile) have seen some narrowing in income levels relative to the United States (from about 11 percent in the 1970s to about 21 percent in recent years). However, the median relative income level for that group has in fact *declined* over the past four decades. By way of comparison, within the *top two quintiles* of emerging market and developing economies' relative income distribution in the 1970s, the median relative income for the group has increased (Figure 2.3, panel 2).

The uneven record on convergence reflects time variation in the speed at which emerging market

and developing economies' income gaps vis-à-vis the United States have narrowed over the decades (Figure 2.4). During the 1970s the median income gap remained broadly unchanged as the two oil shocks hurt oil-importing emerging market and developing economies while they lifted oil exporters' income levels. During the 1980s and 1990s income gaps widened (that is, the median income level declined relative to that of the United States) as emerging market and developing economies suffered a lost decade (Latin America and the Caribbean) and financial crises (Asia and Latin America and the Caribbean). Income gaps subsequently narrowed in the wake of the commodity boom and other tailwinds in the 2000s and 2010s (IMF 2014; Chapter 2 of the October 2015 WEO). However, as Box 2.1 documents, regional disparities remained large in some of the economies that experienced relatively fast growth during that period.

It is important to note that the narrowing of emerging market and developing economies' relative income gap with the United States during the recent period does not reflect "convergence from above:" except during the global financial crisis, real GDP per capita in the United States did not decline in absolute terms during the 2000s and 2010s. While the relatively slow growth in the United States following the crisis has mechanically helped faster-growing emerging market and developing economies narrow their income gaps relative to the United States, for most of the period, this narrowing occurred in part because of exceptional tailwinds that supported synchronized accelerations (IMF 2014). And, in earlier periods when gaps widened, growth reversals in emerging market and developing economies appear to have played an important role. The time variation in the pace at which relative income gaps narrow and widen therefore reflects in part the episodic nature of growth in emerging market and developing economies, with a recurrence of accelerations and reversals.

The rest of the chapter explores the role of external conditions in accounting for these patterns, building on previous research that has documented the importance of certain aspects of external conditions for emerging market and developing economies' growth.[5]

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[5]IMF (2014) demonstrates the importance of external demand and terms of trade for medium-term growth in emerging market and developing economies. Jones and Olken (2008) show that growth accelerations ("upbreaks" in their terminology) are associated with increases in the trade share of GDP. Berg, Ostry, and Zettelmeyer (2012) document a positive association between terms-of-trade shocks and the duration of growth spells, while Hausmann, Pritch-

Figure 2.4. Change in Real Income per Capita in EMDEs Relative to the United States over Decades
(Percentage points)

Across decades there is wide variation in the pace at which EMDEs' income gaps vis-à-vis the United States have narrowed.
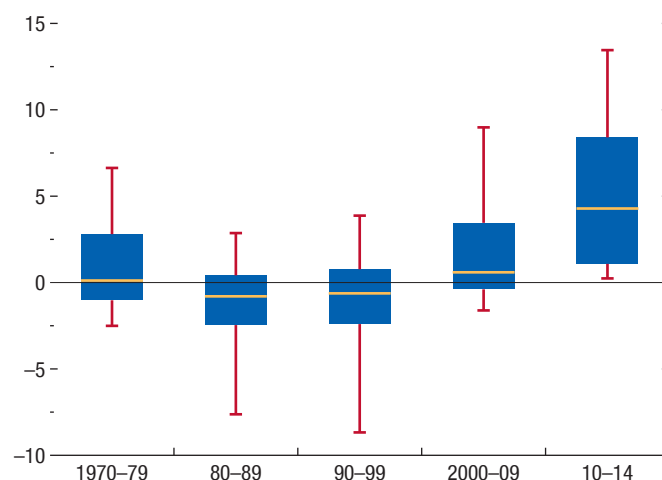
Sources: Penn World Tables 9.0; and IMF staff calculations.
Note: The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles of the average change in relative income during the decade. *X*-axis labels denote decades. EMDEs = emerging market and developing economies.

How Important Are External Conditions?

The empirical exercise in this section defines and describes a set of external conditions for emerging market and developing economies, assesses their relevance for medium-term growth performance in those economies, and explores how the importance of external conditions varies across economies and over time.

Country-Specific External Conditions Measures

The external conditions that emerging market and developing economies face comprise a complex mix of factors that do not always move in the same direction. For instance, weak external demand associated with low growth in key trading partners may go hand in hand with loose monetary conditions, low global interest rates, and strong capital flows to emerging market and developing economies. To take this potential divergence into account, the chapter focuses on three sets of external conditions—external demand conditions, external

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ett, and Rodrik (2005) establish that very strong terms-of-trade realizations are associated with the onset of growth accelerations.

financial conditions, and terms of trade—each of which can manifest itself differently for individual countries. Country-specific metrics of these external conditions are constructed to capture the specificities of the global context for each emerging market and developing economy, while at the same time being largely exogenous from the point of view of each individual economy.[6]

- Country-specific *external demand conditions* are measured by the export-weighted growth rate of domestic absorption of trading partners, along the lines of Arora and Vamvakidis (2005) and IMF (2014). Each country's external demand measure is further decomposed to capture external demand conditions by three groups of trading partners—China, other emerging market and developing economies (excluding China), and advanced economies.

- Country-specific *external financial conditions* are proxied by a quantity-based measure of capital flows to peer economies (other emerging market and developing economies within the same region) as a share of their aggregate GDP (constructed to be exogenous to each country along the lines of Blanchard, Adler, and de Carvalho Filho 2015). A quantity-based metric is used to better capture the fluctuations in availability of diverse financial flows ranging from direct investment to cross-border bank lending. These fluctuations may be missed if price-based proxies for external financial conditions are used, such as those calculated from a narrow set of global interest rates.

- Country-specific changes in the *terms of trade* are based on international commodity prices as in Gruss 2014 and Chapter 2 of the October 2015 WEO to ensure that they are exogenous from the perspective of each economy. The country-specific commodity terms of trade index is constructed by weighting international prices of individual commodities according to the share of net exports of each commodity in GDP. This index provides an indication of the income windfall gains and losses (as a share of GDP) associated with changes in those prices for both commodity exporters and importers.[7]

The cross-correlation between these country-specific measures of external conditions is low

[6]See Annex 2.1 for details on the construction of these measures of external conditions.

[7]The country-specific weights capture differences across countries in the composition of commodity export and import baskets and in the importance of commodities in the overall economy. The weights are predetermined, so that movements in commodity terms of trade reflect exogenous changes in international prices (see Annex 2.1).

(Annex Table 2.1.3), indicating that each dimension potentially exerts an influence separate from the other two. Moreover, the country-specific measures of external conditions often deviate considerably from their corresponding global variables, suggesting that idiosyncratic variation is an important driver of the variability in external conditions at the level of individual economies (Annex Figure 2.1.1). For instance, the time-varying correlation of individual economies' external demand conditions with aggregate world output growth shows that idiosyncratic external conditions often deviate significantly from the average external conditions faced by all countries (Annex Figure 2.1.1, panel 1). In turn, external financial conditions exhibit, not surprisingly, a strong role for the common factor at the regional level.[8] By restricting the set of related economies to those within the same geographical region, the country-specific measure nonetheless shows substantial variability. This is evident in the relatively wide variation in the correlation of individual economies' external financial conditions with aggregate capital flows to emerging market and developing economies (Annex Figure 2.1.1, panel 2). The correlation of changes in commodity terms of trade with that of oil prices or aggregate commodity prices also varies substantially across countries (Annex Figure 2.1.1, panel 3).

Establishing the Importance of External Conditions

Have external conditions had a persistent, medium-term impact on income per capita growth in emerging market and developing economies? And how has the importance of external conditions as a whole, and each one in particular, evolved over time and across groups of countries?

To answer these questions, this section follows the approach of Arora and Vamvakidis (2005); Calderón, Loayza, and Schmidt-Hebbel (2006); and Box 4.1 in Chapter 4 of the April 2014 WEO to estimate a standard growth regression over 1970–2014 for a broad sample of more than 80 emerging market and developing economies (Annex 2.3). The dependent variable is the growth rate of GDP per capita in purchasing-power-parity terms averaged over nonoverlapping five-year windows (to smooth the influence of business cycles).

[8]This is consistent with the findings of Chapter 2 of the April 2016 WEO, which establish the importance of a common global factor in driving capital flows and their cycles.

The explanatory variables of interest are the country-specific measures of external demand conditions, external financial conditions, and terms of trade, defined in the previous section. While the construction of the country-specific measures described above aims to capture aspects of the external environment that are exogenous to the economy, for some individual cases the measures may nevertheless be affected by growth outcomes of the economy in question or respond to other variables that also affect medium-term growth. A priori, across the entire sample, there is no reason to expect that the external conditions measures are systematically affected by growth outcomes or by other variables that also directly affect growth in ways that would introduce reverse causality or omitted variables bias in the estimations presented below. Nevertheless, the analysis presented here attempts to mitigate these concerns by simultaneously including all three external conditions in the specifications, together with time fixed effects that capture unobservable common factors.[9] The regression also allows for unobserved country fixed effects and includes initial real income per capita at the start of the period and a set of domestic variables found in the literature to be associated with medium-term growth.[10]

For the period as a whole, all three external conditions have economically and statistically significant effects on emerging market and developing economies' medium-term growth. The coefficients are statistically significant at the 10 percent level, even after controlling for common global factors captured by the time fixed effect (Figure 2.5, panel 1, and Annex Table 2.3.1). Specifically,

- A 1 percentage point increase in the growth rate of domestic absorption in trading partners is

[9]Additional exercises show that the results are robust to excluding key large emerging market and developing economies, using alternative measures of external conditions that are less likely to be affected by growth outcomes of the economy in question, and instrumenting some of the external conditions variables with exogenous variables such as interest rates from a few large advanced economies (Annex 2.3).

[10]Because the interest is in exploring the role of external conditions rather than on assessing the contribution of all factors that may affect medium-term growth, the domestic covariates included in the regression are aimed at attenuating potential omitted variable bias (rather than at maximizing the share of variance explained by the model). The country-specific measures of external conditions are derived from demand or financial conditions in trading partners and from global commodity prices, so there is less of a concern of omitted variable bias or endogeneity than would be the case if the analysis were using measures of export growth or openness (which could be affected by domestic factors that directly affect per capita income growth).

Figure 2.5. Elasticity of Medium-Term GDP per Capita Growth in EMDEs with Respect to External Conditions
(Percentage points)

External conditions have a significant effect on EMDE medium-term growth. The sensitivity to external conditions has risen as EMDEs have become more integrated into the global economy.
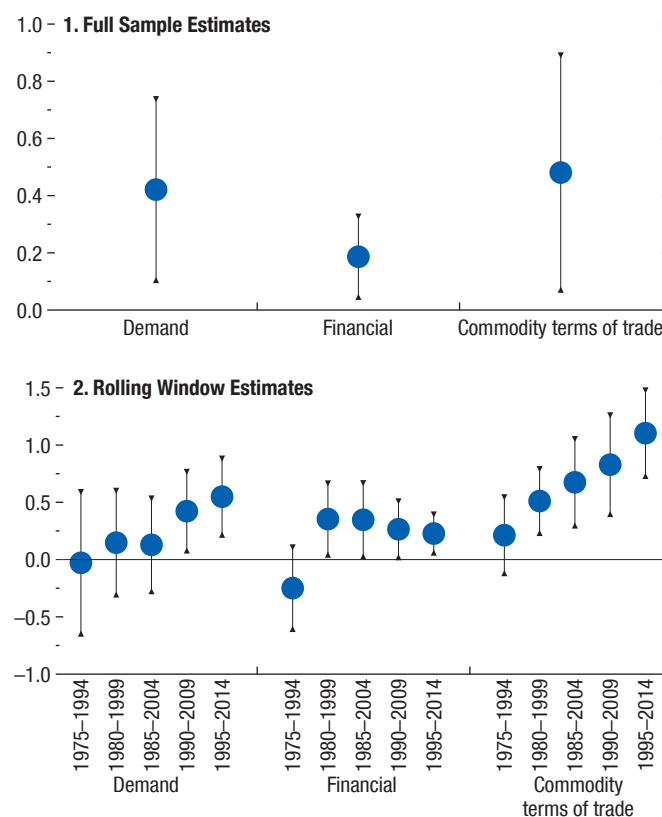
Source: IMF staff calculations.
Note: The figure shows the coefficient estimates from the baseline growth regression described in Annex 2.3. The specification includes all three external conditions variables, country and time fixed effects, and additional control variables. The first panel corresponds to the estimates for the whole sample period (1970–2014), while the second panel shows estimates over subintervals. The vertical lines denote 90 percent confidence intervals. EMDEs = emerging market and developing economies.

associated with a 0.4 percentage point increase in medium-term growth, equivalent to about one-fifth of the average annual growth rate of GDP per capita in the sample. This strong effect may reflect, for example, persistent productivity gains from economies of scale associated with a larger market size via trade.[11]

[11]See Grossman and Helpman (2015) for a discussion of the various potential links between integration and growth, and Ahn and Duval (forthcoming) on the productivity gains from trade.

- A 1 percentage point increase in the ratio of capital flows to GDP of emerging market and developing economies within the region raises medium-term growth by 0.2 percentage point. A larger volume of inflows can raise growth by, for example, easing credit rationing and reducing borrowing costs in recipient economies (Box 2.2).[12]
- A 1 percentage point increase in commodity terms of trade increases medium-term growth by almost ½ percentage point, reflecting the comovement of actual and potential output with commodity terms-of-trade windfalls (see Chapter 2 of the October 2015 WEO).[13]

Has the Role of External Conditions Evolved across Groups of Economies and over Time?

The universe of emerging market and developing economies is heterogeneous in terms of income levels, economic size, and degree of integration with the global economy. Looking within subsamples of economies could shed light on whether the overall results are affected by particular economies (for example, very large emerging market and developing economies).

A first exercise along these lines examines whether the results reported above are driven by large emerging market and developing economies. The estimation is repeated on a sample that excludes China. Subsequently, all economies in the sample that are members of the Group of Twenty (Argentina, Brazil, China, India, Indonesia, Korea, Mexico, Russia, Saudi Arabia, South Africa, and Turkey) are excluded from the estimation. The coefficients for these alternative samples are very similar to those for the overall sample (Annex Table 2.3.2), suggesting that the large economies are not driving the results for the entire set.

The baseline sample includes several very small economies. A natural question is to what extent the baseline result is representative of aggregate growth dynamics in emerging market and developing economies. A second exercise repeats the estimation on a reduced sample that excludes the smallest economies, which collectively

account for less than 5 percent of emerging market and developing economies' aggregate GDP, effectively reducing the sample by about half. The coefficient on terms of trade is about twice as large and strongly significant when the smallest economies are excluded (Annex Table 2.3.2), while the coefficient on external financial conditions is similar to the estimate based on the full sample. In turn, the coefficient on external demand conditions is smaller and statistically insignificant in the reduced sample.

The importance of external conditions may also change over time as, for instance, countries become more open to international trade (and, more recently, become more integrated with global supply chains) as well as to cross-border capital flows (Chapter 3 of the October 2015 WEO; Leigh and others 2017). To trace this evolution over time, the analysis is repeated within subsamples. Specifically, rolling regressions are estimated over 20-year horizons (such that each regression has four nonoverlapping five-year windows).[14]

The results of the rolling regressions indicate that the coefficients generally increase over time as countries become more integrated into the global economy (Figure 2.5, panel 2). The elasticity is almost four times as large over 1995–2014 compared with 1980–99 in the case of external demand and more than twice as large in the case of commodity terms of trade. The elasticity with respect to external financial conditions varies much less.

Contribution of Country-Specific External Conditions to per Capita Income Growth

The full sample results indicate that the three external conditions considered in this chapter have collectively contributed, on average, almost 2 percentage points to income per capita growth over 1975–2014 (Figure 2.6, panel 1). Their contribution increased from about 1.7 percentage points over 1975–94 to about 2⅓ percentage points during the past two decades, accounting for more than half of medium-term growth, on average, across emerging market and developing economies during this latter period. In general, external conditions have been very important for growth in Latin America and the Caribbean; the Middle East, North Africa, Afghanistan, and Pakistan; and sub-Saharan Africa; whereas for Asia and European emerging market and developing economies, domestic and unaccounted-for

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[12]Exposure to external financial conditions does not necessarily imply a loss of control over domestic financial conditions, as documented in Chapter 3 of the April 2017 *Global Financial Stability Report*.

[13]A 1 percentage point change in the commodity terms of trade index is akin to a windfall income gain of 1 percent of GDP—a relatively large amount. The interquartile range for the average annual change in the commodity terms of trade index across all countries and periods is –0.4 to 0.3 percent.

[14]This naturally comes at the cost of having fewer observations per estimation, resulting in less precisely estimated coefficients, so the focus of the narrative here is on comparing point estimates.

Figure 2.6. Average Contribution to GDP per Capita Growth
(Percentage points)

The contribution of external conditions to income per capita growth in EMDEs is important throughout the sample period and increased somewhat during the past two decades. External conditions appear to have been particularly important for growth in the LAC, MENAP, and SSA regions.
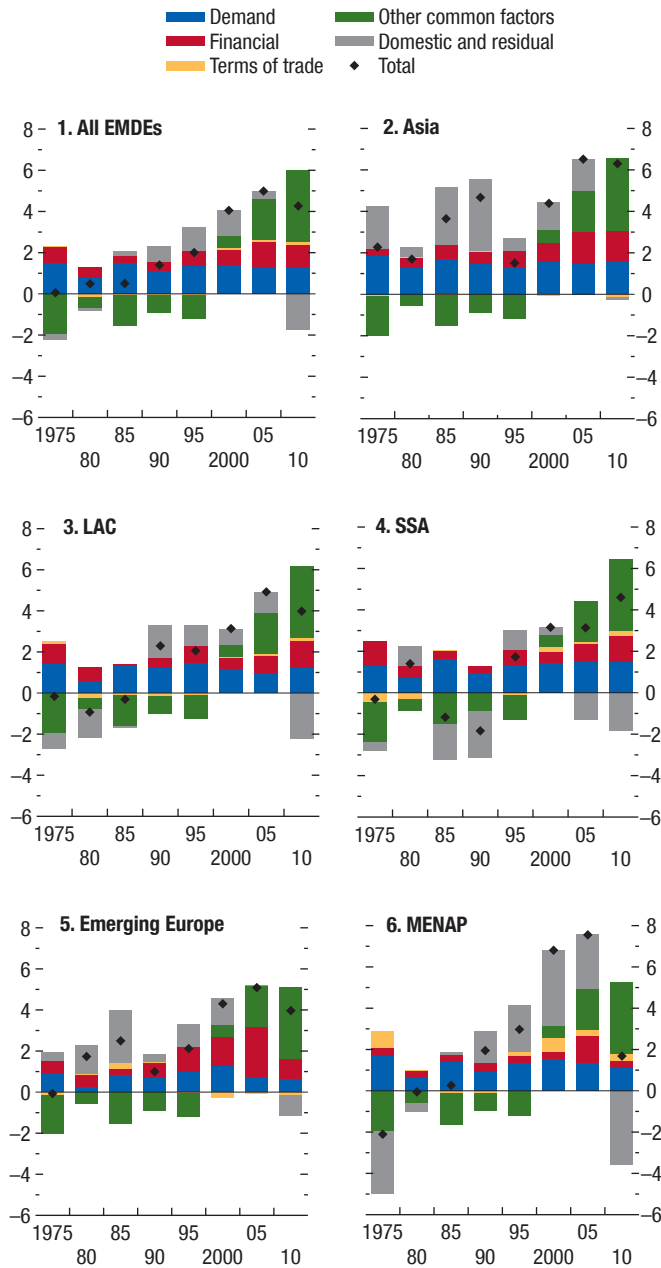
Source: IMF staff calculations.
Note: The figure shows, for each variable and period, the average contribution to fitted GDP per capita growth across economies. The results are based on the coefficient estimates from the baseline growth regression for the whole sample (see Annex 2.3). "Other common factors" corresponds to the estimated time fixed effects (de-meaned). X-axis labels indicate start of a five-year period. EMDEs = emerging market and developing economies; LAC = Latin America and the Caribbean; MENAP = Middle East, North Africa, Afghanistan, and Pakistan; SSA = sub-Saharan Africa.

Figure 2.7. Relative Average Contribution to GDP per Capita Growth among External Conditions Variables
(Percent)

External financial conditions and intra-EMDE trade have become increasingly influential drivers of medium-term growth in EMDEs over time.
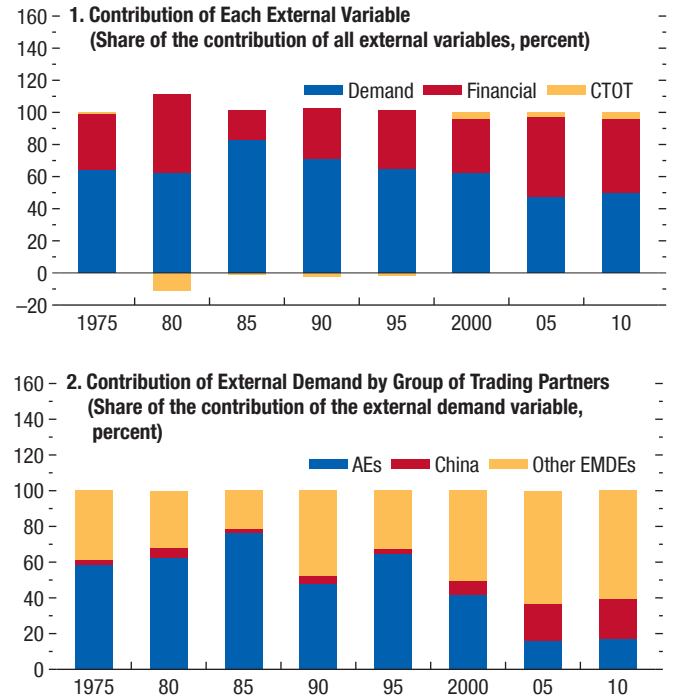
Source: IMF staff calculations.
Note: The results are based on the estimates from the baseline growth regression for the whole sample (see Annex 2.3). X-axis labels indicate starting year of five-year period. AEs = advanced economies; CTOT = commodity terms of trade; EMDEs = emerging market and developing economies.

factors appear to be just as important as external conditions in terms of their contributions to growth.

Zooming in on the role of each external condition suggests that financial conditions, as proxied by the intensity of gross capital inflows, are becoming increasingly important over time. Their contribution to medium-term growth has increased by about ½ percentage point—or one-third of the increase in average income per capita growth—between the 1995–2004 and 2005–14 periods. This represents about half of the contribution from external factors since 2005—up from about one-third during 1995–2004 (Figure 2.7, panel 1).

Another important question regarding the shifting role among external conditions is how China's growing influence in the global economy and, more generally, the expansion of trade among emerging market and developing economies have affected these economies'

Figure 2.8. Average Contribution of Terms of Trade to GDP per Capita Growth, by Groups of Economies
(Percentage points)

The contribution of commodity terms of trade to medium-term growth is substantially larger for commodity exporters than for the average EMDE.

■ Commodity exporters   ■ Average EMDE
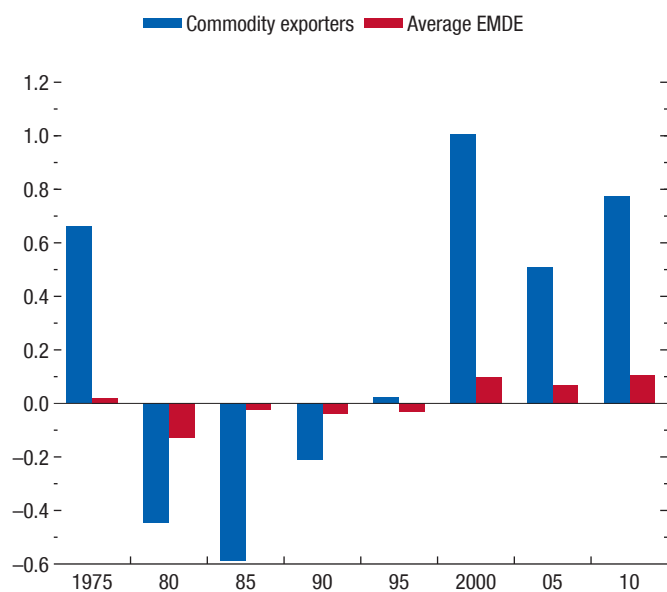
Source: IMF staff calculations.
Note: The figure shows the average contribution of commodity terms of trade to fitted GDP per capita growth across economies. Commodity exporters are defined in Annex 2.1. The results are based on the coefficient estimates from the baseline growth regression for the whole sample (see Annex 2.3). *X*-axis labels indicate starting year of five-year period. EMDE = emerging market and developing economy.

growth outcomes. To explore how these developments have influenced medium-term growth in emerging market and developing economies, the decomposition of the external demand measure by trading group is used instead of the aggregate external demand measure.[15] The results show that China's domestic absorption from 2000 onward has become increasingly important in accounting for growth in other emerging market and developing economies (Figure 2.7, panel 2). Furthermore, the combined demand from China and other emerging market and developing economies accounts for more than 80 percent of the contribution

[15]While this breakdown does not separate out the role of global value chains and trade in intermediate goods (thus some of the demand attributed to China may in fact reflect final demand from another country), the use of trading partner domestic absorption in the construction of the external demand measure allows for a closer mapping into final demand from the individual regions than would have been the case had aggregate GDP been used in the calculation.

of external demand to GDP per capita growth in other emerging market and developing economies (up from 36 percent in the late 1990s).

While the contribution of commodity terms of trade to medium-term growth for the average economy in the sample appears to be relatively small, this reflects the fact that the beneficial impact from higher prices for commodity exporters is weighed down in the average by its negative impact on economies that rely on imported commodities. The contribution of commodity terms of trade to annual GDP per capita growth is substantially larger for commodity exporters than for the average country in the sample. It fluctuates from about 1 percentage point around the time of the oil price shock in the late 1970s and the commodity boom in the early 2000s to –0.6 percentage point in the mid-1980s (Figure 2.8).

Moreover, a breakdown of the variance explained jointly by all three external conditions suggests that, in fact, commodity terms of trade account for a large fraction (Figure 2.9). Over the whole sample, commodity terms of trade account for almost 40 percent of the variance attributable to the three external factors, external demand about 35 percent, and external financial conditions the remaining 25 percent. The relative contributions of each external condition to the variance of output per capita vary substantially over time, however. The share of variance attributable to commodity terms of trade among all three external variables over 1975–80 was as large as 80 percent, but only about 10 percent in 1990–94.

In sum, the analysis in this subsection points to the importance of country-specific external conditions in influencing medium-term growth in emerging market and developing economies. These conditions have become more important over time as economies have opened up to trade and became more financially integrated into international capital markets.

The Role of Common Factors

Above and beyond the influence of country-specific external conditions, the shift in the contribution of other common factors may be capturing to some extent the influence of external conditions that are common across economies. The estimates presented above on the contribution of country-specific external conditions to emerging market and developing economies' medium-term growth could therefore be interpreted as a lower bound on the impact of external conditions.

Figure 2.9. Variance of GDP per Capita Growth Accounted for by Each External Conditions Variable
(Share of the variance accounted for by all external variables, percent)

The relative importance of each country-specific external conditions variable in explaining growth variability across economies has varied significantly over decades. On average, commodity terms of trade and external demand each account for almost 40 percent of the variability.
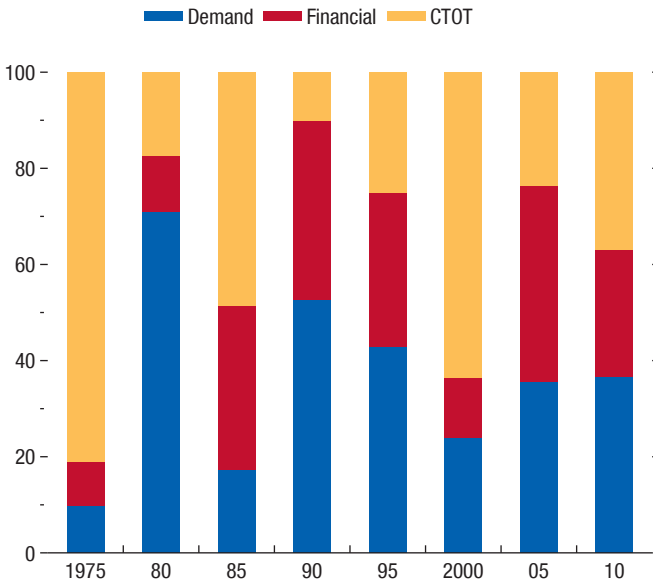
Source: IMF staff calculations.
Note: The results are based on the estimates from the baseline growth regression for the whole sample (see Annex 2.3). *X*-axis labels indicate starting year of five-year period. CTOT = commodity terms of trade.

Figure 2.10. Contribution of Other Common Factors to GDP per Capita Growth and Selected Global Variables
(Percent, unless noted otherwise)

The increase in the contribution from other common factors to EMDE growth since the early 2000s may reflect a larger role of external financial conditions and the changing nature of intra-EMDE trade linkages.
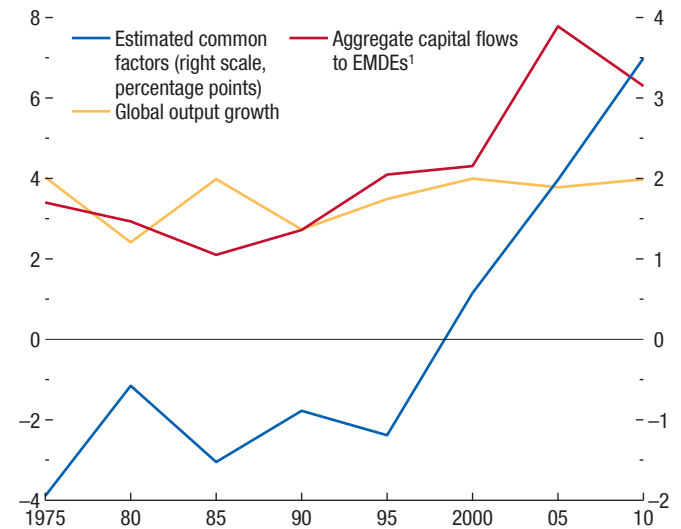
Source: IMF staff calculations.
Note: Estimated common factors correspond to the estimated time fixed effects (de-meaned) from the baseline growth regression for the whole sample (see Annex 2.3). *X*-axis labels indicate start year of five-year period. EMDEs = emerging market and developing economies.
[1]Aggregate capital flows to EMDEs are expressed as a share of their aggregate GDP.

The contribution of other common factors captured by the time fixed effects (which includes the influence of external conditions common across economies) appears to have been relatively stable during 1975–99, but has increased sharply since the early 2000s. Comparing the estimated role of common factors with global activity and financial variables suggests that the overall contribution of external conditions—and, in particular, external financial conditions—to medium-term growth over the past 15 years may have been larger than what is captured by the country-specific external conditions variables (Figure 2.10).

The shift in the contribution of other common factors over the past few decades may reflect, in part, the synchronized increase of gross capital inflows to emerging market and developing economies.[16] By contrast,

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[16]Given that global asset prices and capital flows to emerging market and developing economies are affected by portfolio shifts in advanced economies, the rising importance of external financial conditions in emerging market and developing economies' medium-term

the association between estimated common factors and global economic activity is less clear. Economic activity in advanced economies slowed during 2000–14, largely offsetting the faster growth and higher influence in the global economy of large emerging market and developing economies. The demand implications from these developments are likely to be adequately captured by the country-specific external demand variable. But the transformation in trade linkages between emerging market and developing economies over the past few decades may have affected their growth through channels beyond external demand. The share of value added from many emerging market and developing economies absorbed by China's final demand during the 2000s increased faster than can be explained by China's economic growth during that period (Box 2.3). Emerging market and developing

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growth may also indicate a change in how advanced economies influence emerging market and developing economies' growth, with the relative importance of the financial channel rising and that of the demand channel declining.

economies' participation in global value chains has also increased significantly since the mid-1990s (Chapter 2 of the October 2016 WEO), which may have affected the efficiency of resource use and productivity growth. The increasing contribution of estimated common factors during 2000–14 may therefore also reflect in part the growth effects of changes in trade linkages among emerging market and developing economies.

How Do External Conditions Influence the Occurrence of Growth Episodes?

With the importance of external conditions for emerging market and developing economies' medium-term growth established, this section takes a closer look at their influence on the occurrence of growth accelerations and reversals—a key feature of the growth process in several emerging market and developing economies.[17]

Identifying Persistent Growth Acceleration and Reversal Episodes

Growth acceleration and reversal episodes are identified using statistical methods similar to those employed in the literature. Along the lines of Hausmann, Pritchett, and Rodrik (2005), a *growth acceleration episode* is defined as an interval spanning five years during which the following occur (see also Annex 2.4):[18,19]

- The trend growth rate of real GDP per capita during the period is relatively strong (at least 3.5 percent a year).[20]

- Trend growth increases by at least 2 percentage points.[21]
- The level of real GDP per capita at the end of the episode is at least as large as the maximum level recorded prior to the onset of the episode (to rule out capturing the rebound from a collapse).

A fourth criterion is applied to distinguish between persistent accelerations and those that end in a banking crisis or growth reversal. Accelerations associated with either a reversal that starts within three years of the end of the episode, or a banking crisis (as identified by Laeven and Valencia 2013) that starts three years before or after the end of the episode are labeled as nonpersistent accelerations.

In turn, a *growth reversal episode* is defined as an interval spanning five years during which the following occurs:

- There is a discrete drop in the trend growth rate such that it is at least 2 percentage points lower than during the preceding five-year interval.
- The level of real GDP per capita declines such that its average during the five-year episode is lower than the average during the five-year period immediately preceding the episode.

The History and Geography of Episodes

These filters pick up substantial variation over time in the occurrence of growth episodes (Figure 2.11). In total, there are 127 growth acceleration episodes in the sample during 1970–2014. Of these, 95 represent persistent accelerations, and 32 represent nonpersistent accelerations (see Annex Table 2.4.1 for a list of country-year persistent acceleration episodes). Of the 32 nonpersistent accelerations, 12 are associated with subsequent reversals, 18 with banking crises, and 2 with both. The filter for reversals identifies 125 such episodes during 1970–2014. (Annex Table 2.4.2 lists the country-year reversal episodes.)

A closer look at the occurrence of the episodes over time shows that accelerations picked up in the 2000s, but were relatively rare during other decades. More recent decades have also seen the balance of accelerations shift increasingly toward the persistent kind. There was a large number of reversals in the 1970s and 1980s as oil-importing emerging market and developing econo-

[17]A large volume of work has studied the occurrence and determinants of episodes and structural breaks (or, alternatively, "growth regimes" and "spells") in the long-term time series of emerging market and developing economies' growth. See, for example, Ben-David and Papell (1998); Pritchett (2000); Hausmann, Pritchett, and Rodrik (2005); Pattillo, Poirson, and Ricci (2004); Hausmann, Rodrigues, and Wagner (2006); Jerzmanowski (2006); Jones and Olken (2008); Reddy and Minoiu (2010); Berg, Ostry, and Zettelmeyer (2012); the April 2012 WEO; and Eichengreen, Park, and Shin (2013). The lack of persistence in emerging market and developing economies' medium-term growth rates was documented by Easterly and others (1993) and recently revisited by Pritchett and Summers (2014).

[18]Jones and Olken (2008); Berg, Ostry, and Zettelmeyer (2012); and Tsangarides (2012) use an alternative statistical approach. In particular, the latter two papers use a variant of the procedure proposed by Bai and Perron (1998, 2003) to test for multiple structural breaks in time series when both the total number and the location of breaks are unknown.

[19]As a robustness test, an alternative interval spanning seven years is used to identify episodes (Annex 2.5).

[20]A trend growth rate of 3.5 percent a year is slightly above the 60th percentile of the distribution of the annual growth rates for the full sample and about the 75th percentile of the trend growth rates over five-year intervals.

[21]An increase in trend growth of 2 percentage points is about the 75th percentile of the difference in trend growth rates between two periods in the sample.

Figure 2.11. Growth Episodes in Emerging Market and Developing Economies, 1970–2015
(Number of episodes)

Over time, the balance of acceleration episodes has tilted toward the persistent kind, and the number of reversal episodes has declined.

Source: IMF staff calculations.
Note: Growth episodes are identified according to the criteria described in Annex 2.4.

Figure 2.12. Cumulative Growth during Episodes, 1970–2015
(Percent change relative to the initial level of income per capita)

While the cumulative change in income per capita during episodes is large, there is considerable variation across countries.

Source: IMF staff calculations.
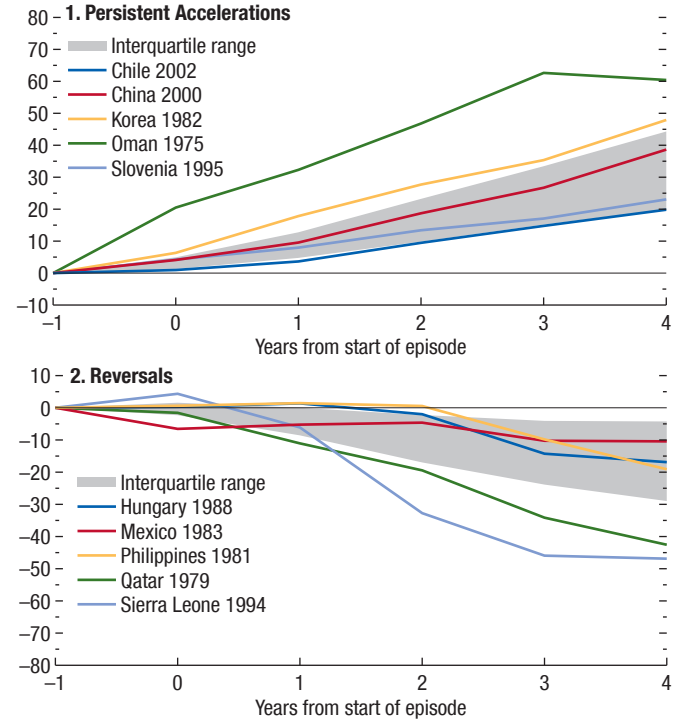Note: Growth episodes are identified according to the criteria described in Annex 2.4. For the full list of episodes, see Annex Tables 2.4.1 and 2.4.2. "Interquartile range" denotes the interquartile range of the distribution of cumulative growth for all country-year episodes.

mies suffered during the decade of high oil prices, and other economies, particularly in Latin America and the Caribbean, experienced severe financial crises with persistent negative effects on income per capita. Reversals have declined in number since then.

Across regions, accelerations have been relatively steady in Asia over time (including, for example, the persistent acceleration in Korea in the beginning of the 1980s and in China in the 2000s; [Figure 2.12, panel 1]), but they have been more variable elsewhere (Annex Figure 2.4.2). It is important to note, though, that growth accelerations occur in all regions and are not largely restricted to emerging market and developing economies in one or two regions of the world. Some examples include Oman in 1975, Slovenia in 1995, and Chile in 2002 (Figure 2.12, panel 1). Reversals, on the other hand, are more concentrated geographically. They tend to occur mostly in the

Middle East, North Africa, Afghanistan, and Pakistan; Latin America and the Caribbean; and sub-Saharan Africa (for instance, Qatar in 1979, Mexico in 1983, and Sierra Leone in 1994). Asia and Europe have seen fewer of these episodes.

Do Episodes Have Persistent Effects on Growth Trajectories?

The cumulative impact of episodes on per capita income levels appears to be large, with considerable variation across country experiences. Persistent accelerations are associated with increases in real income per capita typically ranging from 15–40 percent above the starting level before the episode (Figure 2.12, panel 1). During reversals, real income per capita typically declines 5–30 percent relative to the initial starting level—with income drops as large as 50 percent in

Figure 2.13. Normalized GDP per Capita during Growth Episodes and Their Aftermath, 1970–2015
(Scalar)

Persistent accelerations and reversals seem to have long-lasting effects on the level of income per capita beyond the span of the episode.
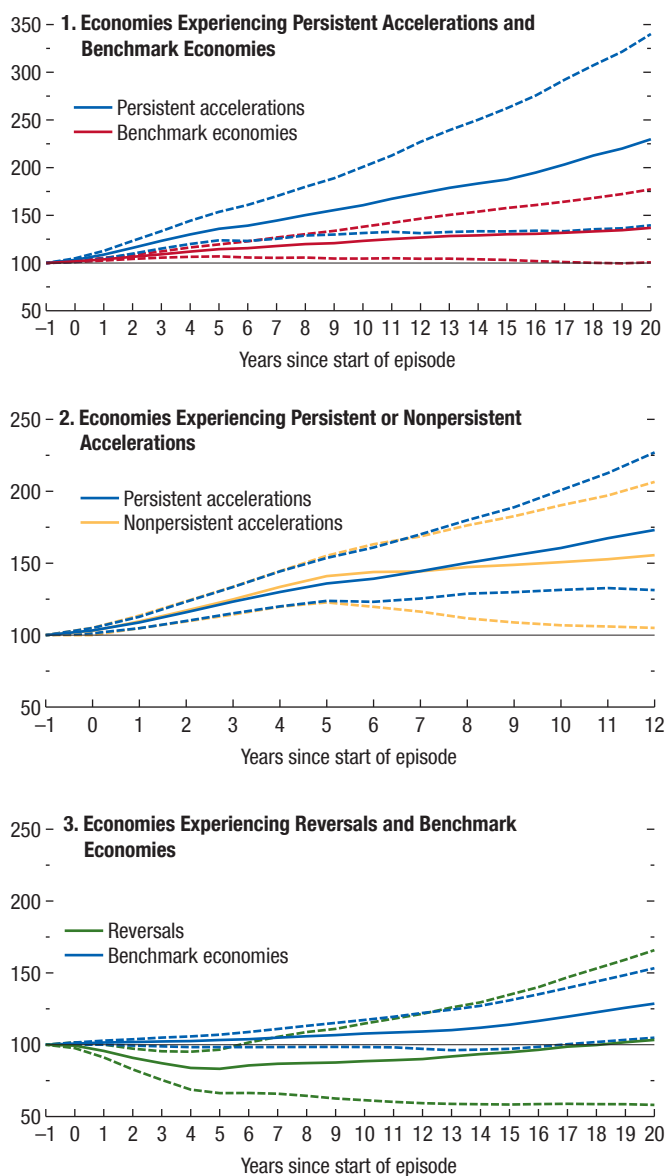
1. Economies Experiencing Persistent Accelerations and Benchmark Economies

Persistent accelerations
Benchmark economies

Years since start of episode

2. Economies Experiencing Persistent or Nonpersistent Accelerations

Persistent accelerations
Nonpersistent accelerations

Years since start of episode

3. Economies Experiencing Reversals and Benchmark Economies

Reversals
Benchmark economies

Years since start of episode

Source: IMF staff calculations.
Note: Growth episodes are identified according to the criteria described in Annex 2.4. For the full list of episodes, see Annex Tables 2.4.1 and 2.4.2. *Y*-axis labels represent GDP per capita levels, normalized to be equal to 100 at *t* = –1. Solid lines denote the medians. Dashed lines denote the interquartile range of the distribution of the normalized GDP per capita for all country-years episodes.

some cases, such as Sierra Leone in the mid-1990s (Figure 2.12, panel 2).

Persistent accelerations and reversals also appear to have long-lasting effects on the level of real income per capita beyond the span of the episode. Persistent accelerations, for example, are associated with permanent increases in income levels: during the two decades after the onset of a persistent acceleration, the median level of income per capita increases nearly twice as much as the median level of income per capita for economies that do not experience accelerations (Figure 2.13, panel 1).

Moreover, comparing persistent with nonpersistent accelerations (Figure 2.13, panel 2), the level of real GDP per capita increases in similar fashion during the first five years of both sets of episodes. The level of real GDP per capita then increases at a slower rate in the case of nonpersistent accelerations, leading to a lower level eight years after the onset of the episode compared with that seen in the group of persistent accelerations.

Reversals also appear to have persistent negative effects on real GDP per capita, with the level not returning to that attained at the start of the episode until about 15 years after the start of the episode (Figure 2.13, panel 3).

The persistent effects of episodes are also seen in the association between cumulative income gains during accelerations (or losses during reversals) and long-term average growth rates (Figure 2.14). Economies with larger increases in levels of per capita income during persistent accelerations tend to grow faster, on average, over the long term, while those with bigger decreases in income levels during reversals tend also to witness lower long-term average growth rates.

External Conditions during Episodes: How Different?

Before estimating the effect of external conditions on the likelihood of accelerations and reversals, the data are examined to explore how attributes of episodes differ from those of comparators spanning the same time interval.[22]

The median annual growth rate during persistent acceleration episodes in the sample is about 5.5 percent (compared with 1.7 percent for comparator economies not in an episode over the same period), while

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[22]The comparison is based on a test of equality of medians, and the results are robust to a Kolmogorov-Smirnov test of congruence of the distribution of the variable (Chakravarti, Laha, and Roy 1967) for the two sets of countries.

Figure 2.14. Cumulative Growth Rate of Real Income per Capita during Episodes versus Average Growth Rate of Real Income per Capita during 1970–2015

(Percent)

The occurrence of growth episodes seems to have persistent effects on long-term income per capita growth rates.
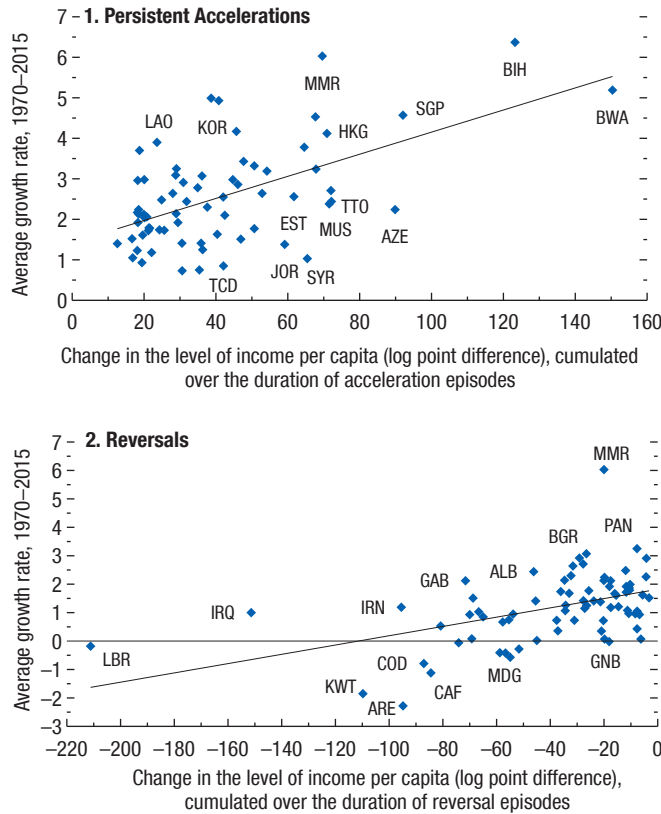
Source: IMF staff calculations.
Note: Growth episodes are identified according to the criteria described in Annex 2.4. For the full list of episodes, see Annex Tables 2.4.1 and 2.4.2. Data labels in the figure use International Organization for Standardization (ISO) country codes.

the median growth rate during reversals is –3 percent (compared with 2.6 percent for comparators over the same period).

External conditions during the episodes evolve differently from the comparator set not experiencing an episode (Figure 2.15) as well as across persistent and nonpersistent accelerations (Figure 2.16). For persistent acceleration episodes, the median of trading partner growth is just above half a percentage point higher than the median trading partner growth for comparator economies not in an episode (Figure 2.15, panel 1). The difference in medians is statistically significant. External financing—the gross capital flow into the region—is about 1.5 percentage

Figure 2.15. Event Analysis: Persistent Accelerations and Reversals, 1970–2015
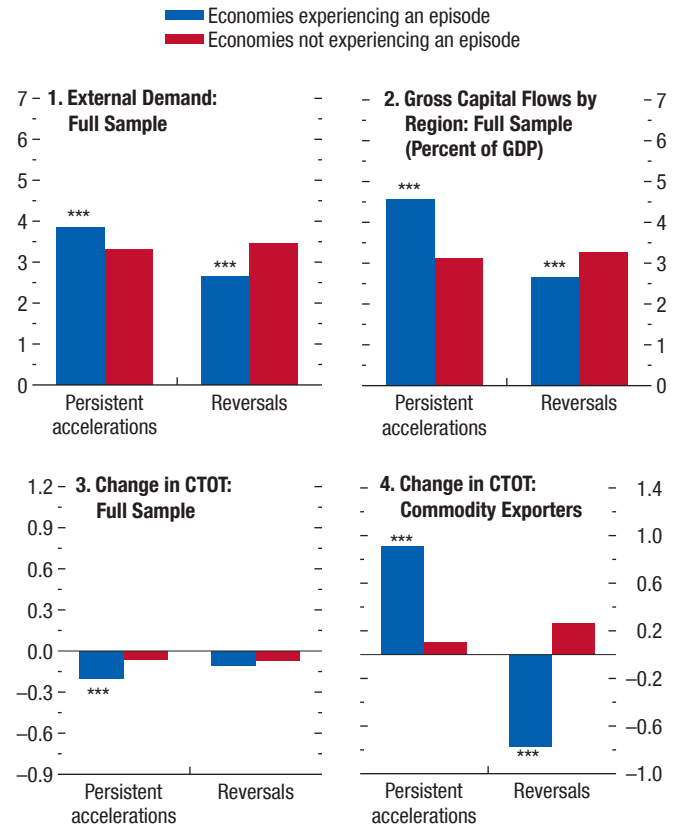
(Percent, unless noted otherwise)

Differences in external conditions between economies that experience growth episodes and those that do not suggest these conditions may play a relevant role in the occurrence of growth episodes.

Source: IMF staff calculations.
Note: Each variable is measured as the average between $t + 1$ and $t + 5$, where t corresponds to the onset of the episode. ***, **, and * denote significance of an equality test of medians at the 1, 5, and 10 percent level, respectively. The results are robust to a Kolmogorov-Smirnov test of congruence of the distribution of the variable for the two sets of economies. CTOT = commodity terms of trade.

points higher than for comparator economies (Figure 2.15, panel 2).

The median change in commodity terms of trade is very close to zero and only marginally different between the two sets of economies (–0.2 percent for persistent accelerations episodes versus about –0.1 percent for the comparator countries), given that the full sample includes both commodity importers and exporters (Figure 2.15, panel 3). However, for commodity exporters only (Figure 2.15, panel 4), the median change in terms of trade is positive and significantly higher for those among them that experienced persistent accelerations

Figure 2.16. Event Analysis: Persistent and Nonpersistent Accelerations, 1970–2015

(Percent, unless noted otherwise)

While external demand and financial conditions evolve in a similar manner in economies experiencing persistent accelerations compared with those experiencing nonpersistent accelerations, commodity terms of trade behave differently.

■ Economies experiencing an episode
■ Economies not experiencing an episode

1. External Demand Growth

2. Gross Capital Flows by Region
(Percent of GDP)

3. Change in Commodity Terms of Trade

Source: IMF staff calculations.
Note: Each variable is measured as the average between $t + 1$ and $t + 5$, where t corresponds to the onset of the episode. ***, **, and * denote significance of an equality test of medians at the 1, 5, and 10 percent level, respectively. The results are robust to a Kolmogorov-Smirnov test of congruence of the distribution of the variable for the two sets of economies.
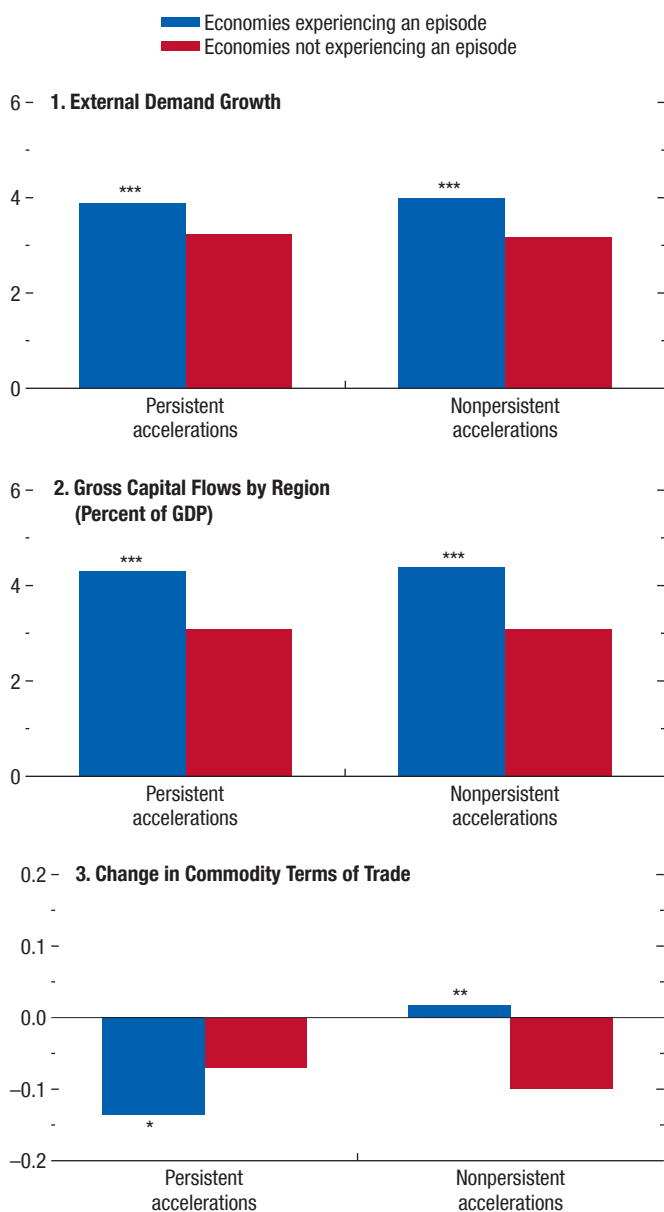
than for the comparator group of commodity exporters (0.9 percent and 0.1 percent, respectively). The median change in terms of trade is also positive and significantly higher for those that experienced nonpersistent accelerations (Figure 2.16, panel 3).

For reversal episodes, trading partner growth is almost 0.7 percentage point lower than for nonepisodes spanning the same time interval (Figure 2.15). Capital flows to the region for reversal episodes are also roughly 0.7 percentage point lower compared with nonepisode countries over the same period. The median change in terms of trade for reversals is again very close to zero and with no statistically significant difference between the episode and nonepisode samples (–0.10 percent and –0.08 percent, respectively). However, among commodity exporters alone, that difference becomes significant, with commodity exporters in reversal episodes experiencing a decline of about 0.75 percentage point in their terms of trade versus an increase of about 0.3 percentage point for commodity exporters that did not experience a reversal during the same period.

The Tipping Point: Do External Conditions Influence the Likelihood of Experiencing Accelerations and Reversals?

To assess how external conditions affect the likelihood of accelerations and reversals, this section reports estimates from logit regressions (along the lines of Hausmann, Pritchett, and Rodrik 2005). The regressions are estimated with a dummy for the onset of the identified episodes as dependent variable. Given the challenge of accurately dating the beginning of the episodes, the dummy assumes the value 1 for the periods t, $t–1$, and $t+1$ of the episode (see Hausmann, Pritchett, and Rodrik 2005).

The specifications include as independent variables the moving average of each of the three external conditions variables between periods t and $t+5$.[23] As an additional control, the logit specification also includes country fixed effects in the baseline estimations. As shown in Annex 2.6, however, the pattern of significance across coefficients is robust to the inclusion of additional

[23]Using leading moving averages implies that the external conditions variables are contemporary to the output outcome used to identify episodes in the economy in question, raising concerns of potential endogeneity. However, these variables are based on measures of the external environment that are expected to be exogenous to the economy in question. The results of the baseline and robustness exercises from the linear growth model (Annex 2.3) further suggest that the potential endogeneity of the external conditions variables in the sample is not a serious concern.

Figure 2.17. Change in the Probability of Occurrence of Growth Episodes, 1970–2015
(Percentage points)

External conditions influence the growth process in EMDEs by significantly affecting the probability of persistent acceleration and reversal episodes.

1. Persistent Accelerations and Reversals

2. Persistent Acceleration and Reversal Episodes for Commodity Exporters

3. Persistent and Nonpersistent Accelerations
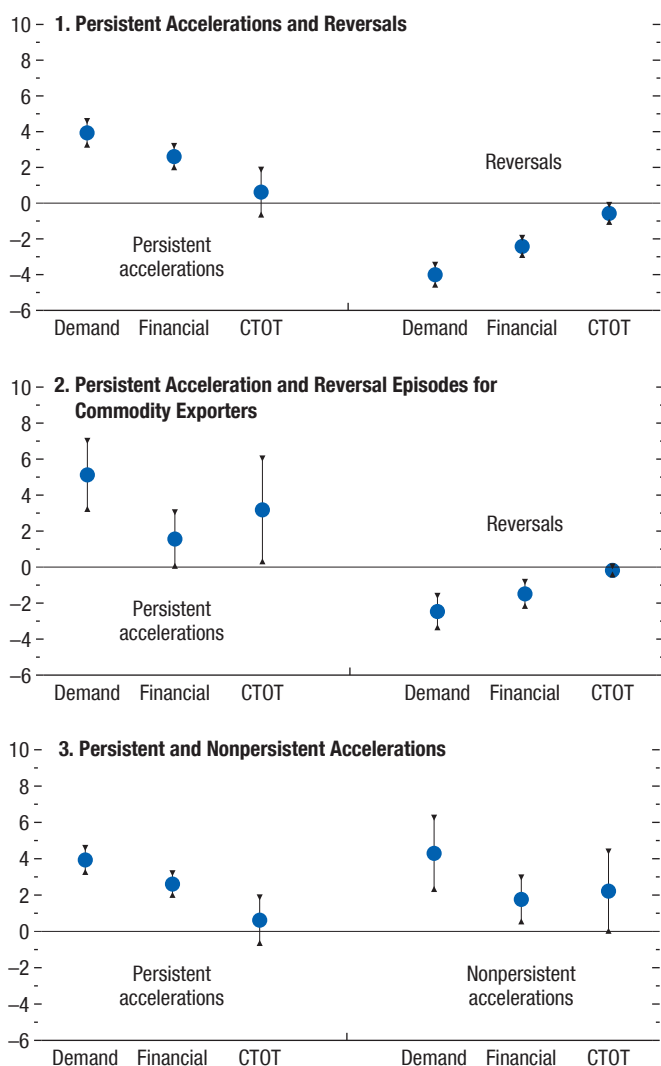
Source: IMF staff calculations.
Note: Estimates are from a logistic regression with a dummy for the identified episodes as dependent variable and including country fixed effects and the three external conditions variables. No additional controls are included in the estimates (see Annex 2.5). The vertical lines denote 90 percent confidence intervals. EMDEs = emerging market and developing economies. CTOT = commodity terms of trade.

controls, including time fixed effects and measures of de jure integration and institutional variables, and controls for the quality of the policy framework.

Figure 2.17 shows the impact of a one-unit increase in the external conditions variable on the likelihood of experiencing persistent accelerations, nonpersistent accelerations, and reversals. These *marginal effects* are derived from the logit estimations presented in Annex 2.5 and with the external conditions evaluated at their means.

Accelerations

In the case of accelerations, a 1 percentage point increase in trading partner demand evaluated at the mean of all external conditions significantly raises the probability of acceleration by 3.9 percentage points (Figure 2.17, panel 1). Compared with the unconditional probability, this represents a near-doubling—to 9.7 percent—of the probability of acceleration. The persistent effect of external demand conditions in this instance may reflect the favorable impact of higher exports on productivity growth via technology upgrades and scale efficiencies associated with an expansion in production.

In turn, a 1 percentage point of GDP increase in regional capital flows raises the probability of persistent acceleration by 2.6 percentage points, possibly reflecting that greater availability of funding facilitates investment and capital deepening (see also Annex 2.5).

Finally, an improvement in the terms of trade is not significantly associated with a change in the likelihood of persistent accelerations in the entire sample of emerging market and developing economies. However, there are two exceptions. First, for commodity exporters (Figure 2.17, panel 2), the increase in the terms of trade is significantly associated with an increase in the likelihood of persistent accelerations. This is in line with Chapter 2 of the October 2015 WEO and Aslam and others (2016), which find a significant effect of changes in the terms of trade on potential output. Second, for the subset of 32 nonpersistent accelerations (Figure 2.17 panel 3), the increase in the terms of trade is significantly associated with the occurrence of such episodes, reflecting that terms-of-trade windfalls may trigger accelerations with an initial surge in growth that is not sustained over a longer horizon.[24]

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[24]This finding is consistent with Collier and Goderis (2012), who find that commodity price booms do not necessarily have positive effects on output growth over long-term horizons.

Reversals

Turning to reversals, all three external conditions have a statistically significant effect on the probability of a reversal (Figure 2.17, panel 1).

With all external conditions evaluated at the mean, a 1 percentage point increase in external demand lowers the probability of a reversal by 4 percentage points (about 50 percent of the unconditional probability). Similar patterns emerge for external financial conditions: a 1 percentage point of GDP increase in capital flows to the region is associated with a 2.4 percentage point decrease in the probability of a reversal. The change in terms of trade is associated with a statistically significant reduction in the likelihood of reversals of 0.6 percentage point.

The Role of Policies and Structural Attributes in Mediating the Impact of External Conditions

Although external conditions affect the likelihood of accelerations and reversals, domestic policies and structural attributes could amplify or mitigate the persistence of the response of domestic activity to shifts in external conditions.

Previous research on emerging market and developing economies' growth episodes has found evidence of a positive association between the duration of an episode and such attributes as macroeconomic stability, quality of domestic institutions, and integration with the global economy (for example, Berg, Ostry, and Zettelmeyer 2012). Greater resilience in emerging market and developing economies has also been linked to improvements in policy frameworks and augmented policy space—seen, for instance, in low inflation and low public debt (Chapter 4 of the October 2012 WEO). Conversely, persistent declines in emerging market and developing economies' growth rates ("downbreaks") have been found to be associated with increases in inflation and possibly diminished monetary policy control (Jones and Olken 2008). In line with the approaches adopted in the literature, four broad categories of domestic attributes are studied to examine how they influence the impact of external conditions on the likelihood of accelerations and reversals.

- The first category of domestic attributes includes the degree of de jure trade and financial integration, as well as domestic financial depth (as a proxy for the capacity to intermediate cross-border capital flows and allocate them domestically). Economies more integrated into the global economy would be more sensitive to external conditions than those that are relatively closed.
- The second category includes initial conditions, such as the level of external debt and the current account balance, at the onset of the episode. A low level of external debt, for instance, may be associated with stronger confidence effects and thus a more forceful response of domestic economic activity to favorable shifts in the external environment, as well as with stronger buffers that can smooth the impact of worsening global financial conditions (Chapter 2 of the April 2016 WEO).
- The third category covers aspects of the macroeconomic policy framework, such as the exchange rate regime, extent of monetary stability, and level of public debt. The policy framework affects expectations of future fundamentals, borrowing costs, and the overall predictability of the economic environment. In turn, these factors shape firms' investment decisions and households' spending on durable goods—both critical channels that determine the persistence of the response of domestic activity to shifts in the external environment. Prudent fiscal policy, for example, may be associated with less crowding out of private investment as public debt remains contained (Chapter 2 of the April 2016 *Fiscal Monitor*). It could also imply larger buffers and fiscal space for a countercyclical policy response to reduce the probability of a persistent reversal. In addition, a flexible exchange rate regime can play an important role in adjusting to shifting external conditions by mitigating persistent deviations in the real exchange rate from its equilibrium level and facilitating price signals that ensure an efficient allocation of resources.
- The fourth category represents structural factors and institutions, such as quality of governance, legal and regulatory environment, availability of public services, and level of education. These elements have an important bearing on long-term growth outcomes (Acemoglu, Johnson, and Robinson 2001) and could also influence, for example, how economies respond to changes in external factors (Rodrik 1999).

An initial inspection of the domestic attributes comparing episodes with nonepisodes (Figure 2.18) indicates that de jure trade integration, financial depth, and institutional quality are significantly different across growth episodes and nonepisode comparators

over the same period. For example, economies experiencing accelerations (reversals) have a larger (smaller) number of free trade agreements than comparator economies not experiencing accelerations (reversals) over the same period. Similarly, economies experiencing accelerations (reversals) have higher (lower) financial depth—measured as the ratio of bank assets to GDP—than comparators not experiencing accelerations (reversals) over the same period.

Some of these domestic attributes, in particular those associated with policy frameworks and structural characteristics, are likely to affect medium-term growth outcomes in and of themselves—that is, independently of their effect through the impact of external conditions. Including these domestic attributes in the logit regressions discussed in the previous section suggests that this is indeed the case (Annex 2.6). In particular, the analysis suggests that economies with stronger institutions—proxied by higher-quality legal systems and better protection of property rights—are significantly more likely to experience persistent acceleration episodes (Annex Figure 2.6.1). The likelihood of experiencing growth reversal episodes, in turn, significantly decreases with the extent of exchange rate flexibility. A sound monetary framework and domestic financial depth are significantly associated with a higher likelihood of persistent acceleration episodes and lower likelihood of growth reversal episodes. Trade and financial openness and initial conditions in themselves are not found to significantly affect the probability of experiencing a sustained shift in growth—although they may affect how external conditions influence the occurrence of episodes, as explored below.

How Do Domestic Attributes Affect the Influence of External Conditions on Growth Episodes?

As already established in the previous section, external conditions influence the likelihood of accelerations and reversals. This section examines whether this sensitivity depends on domestic attributes. More precisely, it explores whether a change in each domestic attribute leads to an additional increase in the likelihood of an acceleration for a given impulse from external conditions, an additional decrease in the likelihood of a reversal, or both.

Results from the logit regressions confirm the role played by several of these domestic attributes in influencing the marginal effect of external conditions

Figure 2.18. Domestic Attributes across Persistent Accelerations and Reversals, 1970–2015

Domestic attributes are significantly different between economies that experience a persistent acceleration or reversal and economies that do not.
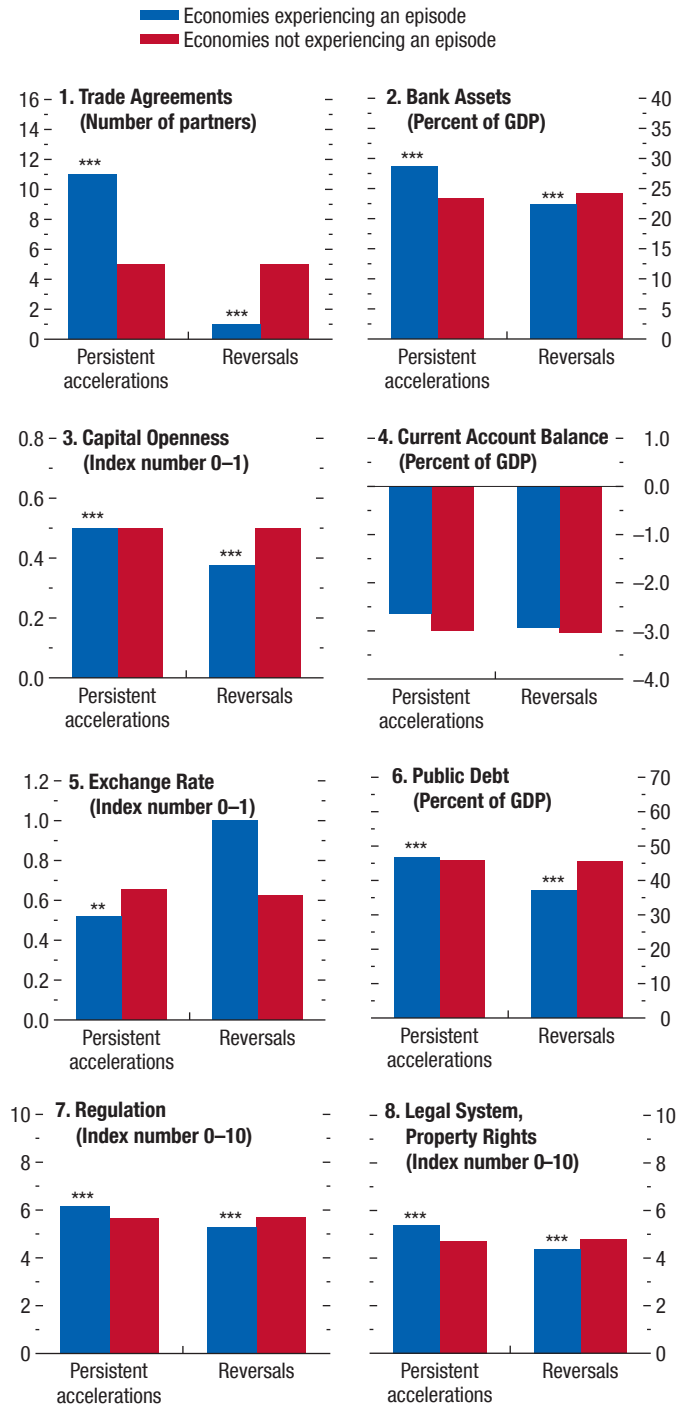
Source: IMF staff calculations.
Note: Each variable is measured as the average between $t-3$ and $t-1$, where t corresponds to the onset of the episode. ***, **, and * denote significance of an equality test of medians at the 1, 5, and 10 percent level, respectively. The results are robust to a Kolmogorov-Smirnov test of congruence of the distribution of the variable for the two sets of economies.

on episode probabilities. The exercise examines how shifting each domestic attribute from its 25th percentile (low quality) to its 75th percentile (high quality) within the estimation sample changes the marginal effect of external conditions, which are evaluated at their medians.[25] Each domestic attribute is measured as the moving average of the variable during the three years preceding the onset of the episode to minimize concerns that the attributes are responding to changes in growth rates during the episode.[26]

Integration and Domestic Absorptive Capacity

The analysis suggests that demand from trading partners has a stronger growth impact in emerging market and developing economies that are de jure more open to international trade. Likewise, a given loosening of external financial conditions is more likely to result in sustained growth when these economies impose fewer restrictions on capital mobility and the domestic financial system is sufficiently developed and sound. In other words, it channels external financing to financially constrained agents while maintaining relatively robust risk management and origination standards that minimize the pitfalls from excessive credit growth. More specifically (Figure 2.19, panel 1):

Deeper de jure *trade integration* as captured by the coverage of trade agreements increases the likelihood that supportive external conditions lead to growth accelerations in emerging market and developing economies.[27] For instance, when the number of partners with which an economy has free trade agreements

increases from the 25th to the 75th percentile in the sample, a 1 percentage point increase in external demand raises the probability of an acceleration by 3 additional percentage points.

Financial development helps emerging market and developing economies benefit from favorable financial conditions. For instance, supportive external financial conditions (an increase in capital inflows to the region of 1 percentage point of GDP) raise the probability of accelerations by 6.6 percent in economies at the 75th percentile of financial development compared with 4.5 percent in economies at the 25th percentile, and the difference is statistically significant.[28] Deeper financial systems also further reduce, for a given impulse from external financial conditions, the probability of reversals, although by only ⅓ percentage point.

Sound credit growth—that is, avoiding credit booms—is associated with stronger growth outcomes under favorable external financial conditions.[29] The probability of a persistent acceleration when external financial conditions are supportive is about 7 percentage points higher when domestic credit has been growing at a healthy pace as opposed to under credit-boom conditions. The marginal effect of external financial conditions on reversals also improves (that is, the probability of the episode decreases further) by 2⅓ percentage points for economies that avoid excessive credit growth.

Capital account openness enhances the supportive role of external financial conditions in avoiding reversals: in more open economies, favorable external financial conditions lower the probability of reversals 2½ percentage points more than under restrictive capital account settings.[30] There is a trade-off, though, as the probability of an acceleration *increases less* for economies with more open capital accounts—although the change in the marginal effect is small and not statistically significant.

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[25]The logit model specification for the purpose of evaluating the impact of domestic attributes includes one external condition at a time, the relevant domestic attribute variable (constructed as the moving average during the three years preceding the episode), the interaction of these two, and country fixed effects (see Annex 2.6 for more details). In all estimation results discussed in this section, the marginal effects of the external conditions on the probability of experiencing growth episodes evaluated at the median of the external condition and the 75th percentile of the domestic attribute are statistically significant. For a discussion on how to calculate and interpret interaction terms and their marginal effects in a logit model see, for example, Ai and Norton (2003).

[26]The results discussed below are those for which the marginal effects of the external conditions on the probability of experiencing growth episodes (evaluated at the median of the external condition and the 75th percentile of the domestic attribute) are statistically significant.

[27]De jure trade integration is proxied by the number of trading partners with which a country has a trade agreement according to the Design of Trade Agreements database (Chapter 2 of the April 2016 WEO and Annex 2.6).

[28]Financial depth is proxied by the ratio of bank assets to GDP from the World Bank World Development Indicators database (Annex 2.6).

[29]An economy is considered to have sound credit growth if it has not experienced credit-boom conditions, as defined in Dell'Ariccia and others (2016), during the four years preceding the episode (Annex 2.6). As noted in Sahay and others (2015), if financial deepening proceeds "too fast" and is poorly regulated and supervised, it can trigger instability by encouraging excessive risk taking.

[30]Capital account openness is based on the Quinn (1997) measure of capital account liberalization (Annex 2.6).

Figure 2.19. Change in Marginal Effect of External Conditions When Domestic Attributes Improve
(Percentage points)

The impact of external conditions on the likelihood of growth outcomes is significantly affected by domestic attributes. A mix of policies that protect trade integration, permit exchange rate flexibility, and reduce vulnerabilities associated with external imbalances and high levels of debt can help emerging market and developing economies extract the most out of external conditions.
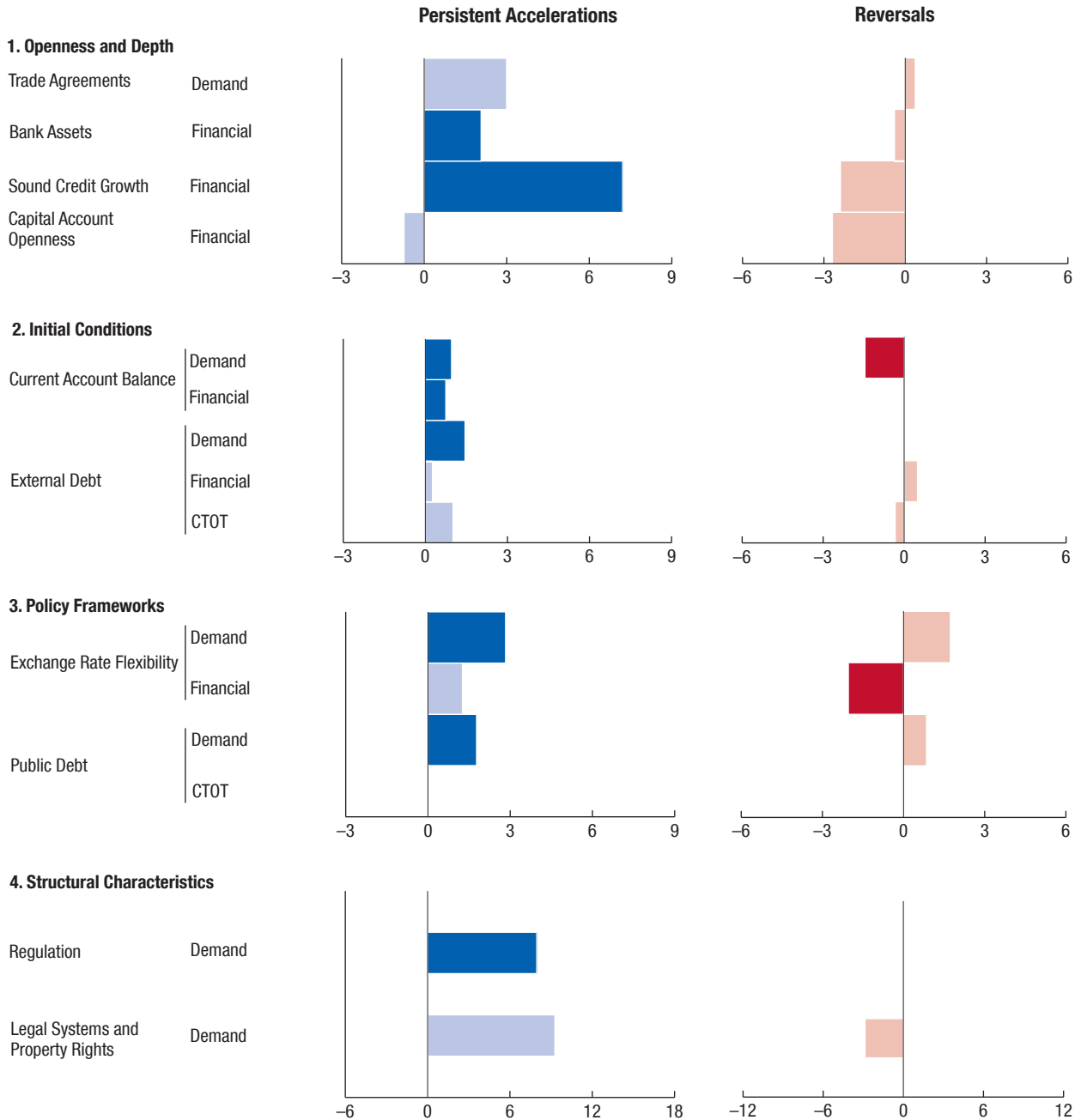
Source: IMF staff calculations.
Note: The figure shows the change in the marginal effect of each external condition when the domestic attribute variable is evaluated at the 75th versus at the 25th percentile of its distribution (while holding the external condition variable at its median value). Estimation results have been transformed such that the 75th percentile represents more openness, lower levels of external and public debt, and higher exchange rate flexibility. A favorable effect from the change in the domestic attribute is represented by a positive (negative) value in the case of persistent acceleration (reversal) episodes. Solid bars denote difference in marginal effects significant at the 10 percent level. CTOT = commodity terms of trade.

Initial Conditions

The results point to the importance of low external imbalances for translating favorable external conditions into positive growth outcomes (Figure 2.19, panel 2):

A *small current account deficit* significantly increases the marginal effect of external financial conditions on the probability of accelerations by ¾ percentage point, while it has a negligible and statistically insignificant impact on the probability of reversals. The marginal effect of better external demand conditions on the likelihood of an acceleration also improves significantly—by 1 percentage point—when the initial current account deficit is small. This finding is consistent with the idea that large current account deficits are often associated with overheating and thus diminished capacity for further sustained acceleration in growth as external conditions improve. The effect of demand conditions on the probability of reversals also significantly decreases—by 1½ percentage points—when the initial current account deficit is small.

A *lower level of external debt* increases the likelihood of accelerations when external demand conditions, terms of trade, or external financial conditions improve—by about 1½ percentage points, 1 percentage point, and ⅓ percentage point, respectively.[31] It also increases the extent to which improvements in terms of trade reduce the probability of reversals.

Policies

The results suggest that certain policy characteristics help emerging market and developing economies experience better growth outcomes for a given impulse from external conditions. In particular, exchange rate flexibility and fiscal discipline appear to have a broadly positive influence on growth outturns, although their influences vary across specific external conditions and by growth episode (Figure 2.19, panel 3):[32]

The *exchange rate regime* plays an important role in influencing the impact of external demand and financial conditions on the probability of growth episodes.[33] The marginal effect of external demand conditions on

the likelihood of episodes of sustained growth significantly improves—by 3 percentage points—with exchange rate flexibility. The lower impact of positive external demand conditions on the likelihood of sustained growth episodes under less flexible exchange rates could reflect inefficient allocation of resources and low productivity growth as price signals are distorted. The trade-off is that the effect of external demand on the probability of reversals decreases *less* for economies with more flexible exchange rate regimes—although the change is not statistically significant—possibly reflecting that steeper real appreciation under favorable external demand growth already exerts a countervailing force on activity. Turning to financial conditions, the effect of exchange rate flexibility on growth outcomes is unambiguously positive. The effect of external financial conditions on the probability of experiencing a period of sustained growth is about 1¼ percentage points larger under a more flexible exchange rate regime than otherwise, while the probability of a reversal decreases further and significantly—by about 2 percentage points.

Prudent fiscal policy, as proxied by the level of public debt to GDP, also influences the impact of external demand conditions on the probability of growth episodes. The marginal effect of external demand conditions on the likelihood of persistent accelerations significantly improves—by about 1.8 percentage points—when public debt is low.

Structural Characteristics

Other structural characteristics that have been identified in the literature as important for medium-term growth, such as the quality of institutions and property rights (Hall and Jones 1999; Acemoglu, Johnson, and Robinson 2001; Acemoglu and Robinson 2014), are also found to influence the effect of external conditions on the likelihood of favorable growth outturns (Figure 2.19, panel 4):

The *quality of regulation* improves the impact of external demand conditions. The marginal effect of external demand on accelerations increases significantly—by 8 percentage points—when the quality of regulation improves.[34]

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[31]The measure of external debt corresponds to the stock of external debt liabilities (updated from Lane and Milesi-Ferretti 2007) as a share of GDP.

[32]While a sound monetary framework in itself has a significant favorable effect on the likelihood of persistent acceleration and reversal episodes (Annex Figure 2.6.1), the exercise in this section suggests that it does not meaningfully influence the marginal effect of external conditions on episode probabilities.

[33]The exchange rate regime flexibility index is a de facto index based on Aizenman, Chinn, and Ito (2010).

[34]The indices of quality of regulation, strength of the legal system, and property rights protection are from Gwartney, Lawson, and Hall (2016). Each index is based on indicators from several sources, including the Global Competitiveness Report (World Economic Forum), International Country Risk Guide (Political Risk Services Group), Doing Business and World Development Indicators (World Bank), and International Financial Statistics (IMF). See Annex 2.6 for further details.

An improvement in the quality of *the legal system and property rights* further increases the marginal effect of external demand on accelerations by 9 percentage points and further decreases the probability of reversals by 3 percentage points.[35]

In sum, improvements in all four categories of domestic attributes considered are typically associated with a better growth outturn for a given impulse from external conditions. The exercise in this subsection assumes neutral external conditions—that is, external conditions variables evaluated at their sample medians. Additional analysis suggests that the beneficial impact of sound domestic attributes is even larger in a relatively worse external environment. For instance, the effect that each percentage point of capital flows to the region has on reducing the likelihood of a reversal when the financial system is deep and sound and the exchange rate is flexible, is larger when external financing is scarce than when it is abundant (see Annex Figure 2.6.2).

Taking Stock: What Does the Current Environment Imply for Growth Prospects in Emerging Market and Developing Economies?

The external environment has been getting more complicated for emerging market and developing economies over the past few years. Some conditions may be less supportive in the near future, while others remain highly uncertain.

On the external demand front, some of the exceptionally favorable conditions that emerging market and developing economies enjoyed over long stretches during the post-2000 period are not likely to return soon. Waning potential output growth in advanced economies will lead to weaker demand growth for emerging market and developing economies. WEO projections for advanced economy potential output growth have been reduced from close to 2 percent (October 2014 WEO) to just over 1½ percent (October 2016 WEO). An additional complication is the risk of protectionism in some advanced economies and a less favorable view of integration, as documented in Chapter 2 of the October 2016 WEO. While some of these effects may be offset by rising demand among emerging market and developing economies, consistent

[35]These effects possibly reflect that better institutions are also associated with better (fiscal) policy frameworks (Rajkumar and Swaroop 2008; Lledó and Poplawski-Ribeiro 2013).

Figure 2.20. Actual and Projected External Conditions for Emerging Market and Developing Economies
(Percentage points; difference relative to the average in 2015–16)

The impulse from the external environment for EMDEs is expected to be weaker, on average, over the medium term compared with what they enjoyed over long stretches during the post-2000 period.
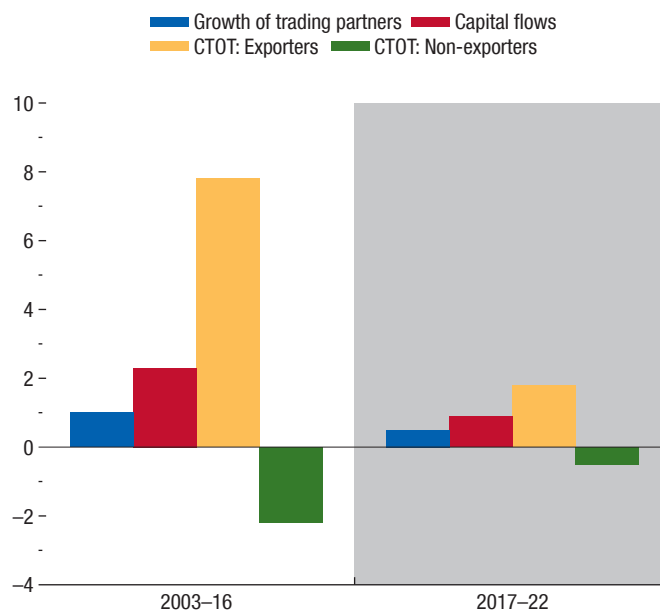
Source: IMF staff calculations.
Note: Projected values for country-specific external conditions variables are constructed based on forecasts of domestic demand, gross capital inflows, and commodity prices from the IMF *World Economic Outlook*. CTOT = commodity terms of trade; EMDEs = emerging market and developing economies.

with the projected pickup in growth for this group over the medium term (see Chapter 1 of this WEO and Box 1.1 of the October 2016 WEO), growth in external demand, on average, is expected to be weaker during 2017–22 than in the past (Figure 2.20).

As discussed in Chapter 1, external financial conditions facing emerging market and developing economies are expected to gradually tighten as U.S. monetary policy normalizes. However, this generalized tightening will likely be accompanied by a continued search for yield in emerging market investment opportunities as long as returns remain modest in a low-growth environment in advanced economies. Investors may therefore discriminate across emerging market and developing economies based on fundamentals. Those with relatively stronger fundamentals may stand to benefit from capital inflows, provided that capital is absorbed into productive uses that sustain growth (Box 2.4).

The third aspect of the external environment studied in this chapter—commodity terms of trade—may improve for a subset of emerging market and developing economies as commodity prices recover, but the outlook remains subdued compared with the past: prices are expected to approach a fraction of those prevailing during the boom years.

Although this constellation of external conditions is not necessarily adverse for emerging market and developing economies, it does point to a less buoyant external environment than a few years ago. In this context, the results of this chapter suggest that emerging market and developing economies should expect a weaker growth impulse from external conditions. Nevertheless, as the analysis demonstrates, domestic policies and structural attributes in emerging market and developing economies matter for mediating the impact of this broad constellation of external forces. In particular, the results indicate that for a given impulse from external conditions, certain domestic policies and reforms can help these economies obtain a more favorable growth outturn.[36]

Conclusion

Emerging market and developing economies have become increasingly important in the global economy, not just as centers of production but also as final destinations for consumer goods and services. They now account for more than three-fourths of global growth in output and consumption, almost double the share of just two decades ago. Although domestic elements (changes to policy frameworks, structural reforms, and accumulation of factors of production) have no doubt been crucial for this transformation, the external environment has also played an important role in shaping these economies' medium-term growth.

The evidence presented in this chapter highlights that country-specific external—demand, financial, and terms of trade—conditions are increasingly influential determinants of emerging market and developing economies' growth over time as these economies become more integrated into the global economy. This result largely reflects the increasingly important role played by external financial conditions. Comparing the post-2005 period with 1995–2004, for instance, their contribution to emerging market and developing economies' medium-term growth has increased by about ½ percentage point—or one-third of the increase in average income per capita growth for the group over this time. Furthermore, demand among emerging market and developing economies has exerted an increasingly powerful force on these economies' medium-term growth outcomes (even though the contribution of external demand conditions as a whole appears to have remained broadly stable over this period).

External conditions also influence the growth process in emerging market and developing economies through their effect on the probability of persistent growth acceleration and reversal episodes. In particular, a favorable impulse from external demand and financial conditions helps medium-term growth outcomes by making growth accelerations more likely. It also reduces the likelihood of growth reversals. The impact varies across groups of economies: terms-of-trade windfalls are particularly influential for the medium-term growth outcomes of commodity exporters, but less so for the broader sample of emerging market and developing economies. These ruptures matter for growth outcomes and the evolution of living standards over horizons beyond the medium-term focus of this chapter. As far as two decades after the onset of acceleration or reversal episodes, real income per capita still appears to diverge from a benchmark path of economies that do not experience the episodes.

Although external conditions have an impact on the likelihood of accelerations and reversals, certain domestic policies and structural attributes can affect the response of domestic activity to shifts in external conditions (in addition to directly affecting the probability of growth episodes). Faced with a potentially less supportive external environment than in the past, emerging market and developing economies can get the most out of a weaker growth impulse from external conditions by strengthening their institutional frameworks and adopting a policy mix that protects trade integration; permits exchange rate flexibility; and ensures that vulnerabilities stemming from high current account deficits and external debt, as well as high public debt, are contained.

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[36]For instance, the impact on the probability of an acceleration episode of trading partners' demand growing by 1 percentage point less would be almost entirely offset by opening up to trade or allowing the exchange rate to fluctuate more.

Box 2.1. Within-Country Trends in Income per Capita: The Cases of Brazil, Russia, India, China, and South Africa

This box examines the province-level distribution of real purchasing power parity GDP per capita in Brazil, Russia, India, China, and South Africa, the "BRICS" economies.[1] Within these emerging markets, large regional disparities remain, with some provinces of these economies operating at per capita levels close to those of upper-middle- and high-income countries, whereas other provinces continue to lag.

All BRICS economies enjoyed a period of strong income growth in the early 2000s due to a period of favorable external tailwinds (as discussed in the chapter) and as some of them exited from crises. The gap between their average income per capita (in purchasing-power-parity adjusted U.S. dollars) and that of the United States narrowed significantly between 2002 and 2014. For instance, in China and Russia, per capita income as a share of that in the United States increased by about 13 percentage points and 26 percentage points, respectively, during that period.

Zooming in on developments at the national level, the analysis shows important differences in the level of real income per capita across provinces within a country (Figure 2.1.1). The time series on individual province-level real GDP and population data are gathered from national sources. The IMF *World Economic Outlook* purchasing-power-parity exchange rate indicator is used to convert real GDP per capita in national currencies to purchasing-power-parity adjusted real GDP per capita. The transformation allows for a cross-country comparison of living standards at the provincial level, after adjusting for average differences in the cost of living across countries. However, it is important to bear in mind that using national averages may overestimate the real income level in rich provinces and underestimate it in poor provinces, to the extent that there is substantial variation in prices across provinces at times.

While income per capita in the richest provinces in some BRICS economies has risen to more than half of that in the United States (notably in Moscow, Russia,

The author of this box is Felicia Belostecinic.
[1]The box uses the term "province" to refer to subnational administrative units immediately below the federal government, as is the case in China and South Africa. In Brazil and India these units are referred to as states, and in Russia these units are federal districts.

Figure 2.1.1. Decomposition of Selected Emerging Market Economies by Province
(Real PPP GDP per capita, thousands of PPP U.S. dollars)
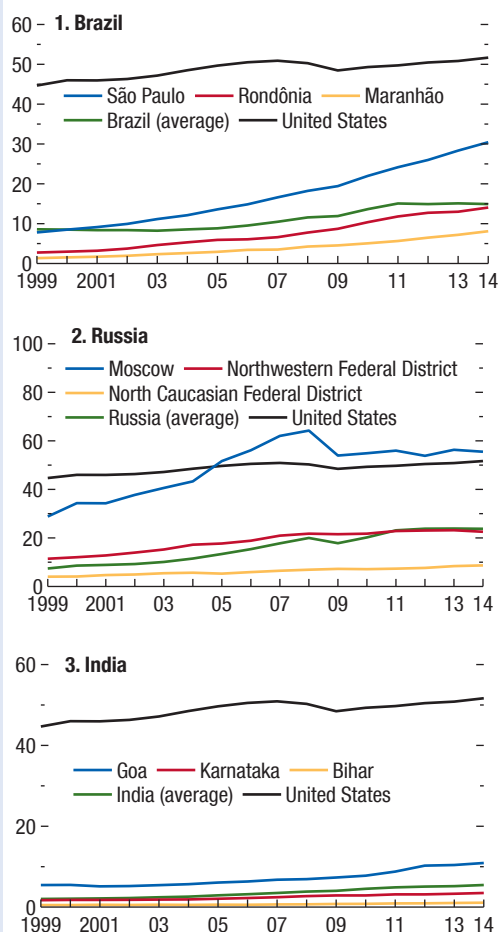
Source: IMF staff calculations.
Note: The selected provinces within each country denote the top, median, and bottom provinces, ordered by real PPP GDP per capita for 2014. PPP adjustment is calculated using the base year 2010. PPP = purchasing power parity.

and, to a lesser extent, São Paulo, Brazil), the poorest provinces are still lagging behind. In Russia, incomes are close to seven times higher in the richest than in the poorest province; in India they are 10 times higher in the richest than in the poorest province (also see Sodsriwiboon and Cashin 2017). In Brazil and China,

Box 2.1 *(continued)*

Figure 2.1.1. Decomposition of Selected Emerging Market Economies by Province (cont'd)
(Real PPP GDP per capita, thousands of PPP U.S. dollars)
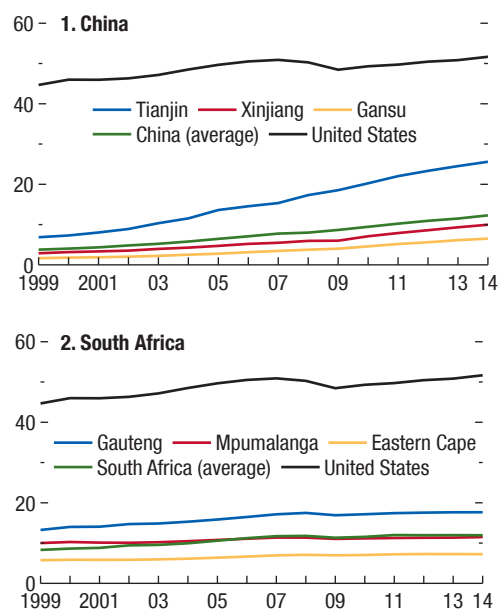
Source: IMF staff calculations.
Note: The selected provinces within each country denote the top, median, and bottom provinces, ordered by real PPP GDP per capita for 2014. PPP adjustment is calculated using the base year 2010. PPP = purchasing power parity.

the richest province is approximately four times better off than the poorest one.[2] In South Africa, this gap is narrower—with the richest province two-and-a-half times better off than the poorest.

[2]São Paulo is Brazil's second-richest state (after Distrito Federal, which includes Brasilia, the nation's capital). However, given that Distrito Federal is a relatively small administrative jurisdiction with a very large fraction of its population related to the federal government, São Paulo was used for the purpose of this analysis.

Box 2.2. Growing with Flows: Evidence from Industry-Level Data

Capital inflows can enhance growth in emerging market and developing economies through various channels: augmentation of funds available for investment, transmission of crucial know-how and technological diffusion, and adoption of market discipline and better governance practices. Cross-country aggregate data often do not allow for a clean identification of the causal impact of capital flows on growth because of endogeneity and reverse causality concerns. This box uses industry-level data that permit a more reliable identification of causal impacts of capital inflows on growth. The analysis sheds light on the role played by the first channel, when capital inflows relax credit constraints and reduce borrowing costs and thereby stimulate growth.[1]

The empirical strategy relies on a panel-based fixed-effects approach that investigates whether capital inflows affect growth differentially in industries that are more dependent on external finance. Industries that depend more on external finance in countries that host more capital inflows are expected to grow disproportionately faster; relaxation of constraints would benefit these firms more. The analysis uses a data set covering 28 manufacturing industries in 22 emerging market economies during 1998–2007.[2,3] Data on total gross private capital inflows come from the Institute of International Finance and are expressed in percent of GDP.[4] Industry growth is computed as

the percent change in the real output of an industry in a given country.[5] Dependence on external finance is determined following Rajan and Zingales (1998).[6] The empirical specification is:

$$G_{ict} = \alpha + \beta_1 S_{ic,t-1} + \beta_2 CI_{ct} + \beta_3 CI_{ct} * D_i$$
$$+ \theta_i + \theta_c + \theta_{ic} + \theta_t + \varepsilon_{ict}. \qquad (2.2.1)$$

G_{ict} is the growth of industry i in country c in period t. $S_{ic,t-1}$ is the share of value added by each industry to total value added by all industries in a country, and comes in with a one-period lag, capturing the heterogeneous degree of importance and development across industries within a country over time. CI_{ct} and D_i denote capital inflows and external finance dependence. The interaction term, $CI_{ct} * D_i$, is the main variable of interest in detecting whether capital inflows affect growth in industries that are more dependent on external finance than those that are not. Also included is an expansive set of fixed effects to capture time-invariant industry-, country-, and cross-industry cross-country factors and time-varying global factors. Standard errors are clustered by industry-country.[7]

Integration of emerging markets into global financial markets has gone hand in hand with a rapid process of industrialization in these economies, supporting the argument that international capital is important for industrialization (for example, Markusen and Venables 1999). Indeed, aggregate industry growth moves closely with capital inflows (Figure 2.2.1).

Looking across industries distinguished by their need for external finance and their peers located in countries receiving different amounts of capital inflows, it is evident that industries that are more dependent on external finance grow disproportionately faster if they are located in countries hosting more

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The author of this box is Deniz Igan. The analysis is based primarily on that in Igan, Kutan, and Mirzaei (2016).

[1]The analysis here uses a reduced-form specification and investigates the association between capital inflows and growth. Evidence on the intermediate step of capital inflows relaxing constraints and reducing the cost of capital has been presented, for instance, in Henry (2000); Harrison, Love, and McMillan (2004); and Bekaert, Harvey, and Lundblad (2005).

[2]The countries in the sample are Argentina, Brazil, Bulgaria, Chile, China, Colombia, the Czech Republic, Ecuador, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Peru, Poland, Romania, Russia, South Africa, and Turkey. The results are robust to excluding China, which stands out for its size and transformation experience during the sample period.

[3]Industry-level data come from the United Nations Industrial Development Organization's Industrial Statistics database. The data can be extended to 2010 with the currently available data. The box focuses on the period before the global financial crisis given that the relationship between capital inflows and industry growth is markedly different during the crisis and its immediate aftermath. See Igan, Kutan, and Mirzaei (2016) for more details.

[4]The results are robust to using net inflows and capital inflows data from the IMF's International Financial Statistics database. The data sources are used as alternatives, with no implications for the conclusions of the analysis.

[5]Industry output data are reported in nominal U.S. dollars. For the analysis, the series are deflated using the producer price index for finished goods.

[6]External finance dependence aims to capture the ability of internally generated funds to meet investment demand, as determined by an industry's intrinsic technological characteristics. It is computed as the ratio of capital expenditures net of cash flow from operations to total capital expenditures using U.S. data (based on the observation that given the relatively advanced capital markets in the United States, U.S. firms' dependence on external funds reflects demand factors rather than supply constraints).

[7]Given that the identification strategy aims to exploit cross-industry differences on external finance dependence, the specification focuses on financial conditions and not on external demand and terms of trade.

Box 2.2 *(continued)*

Figure 2.2.1. Capital Inflows and Industry Growth, 1998–2010
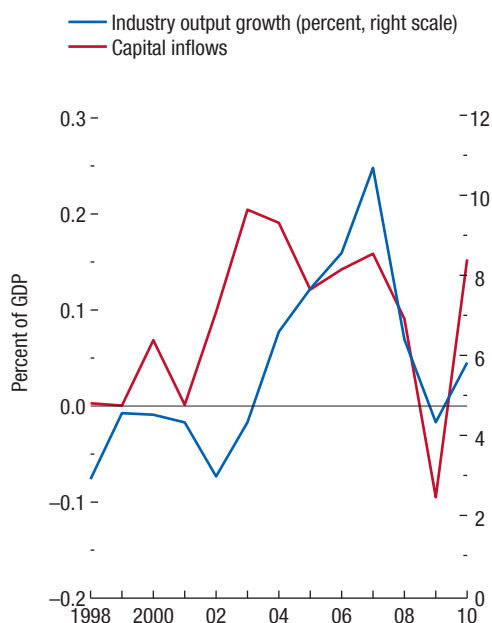
Sources: Institute of International Finance; United Nations Industrial Development Organization; and IMF staff calculations.

inflows (Table 2.2.1). This relationship is statistically significant, even after purging industry and country effects, and holds both for annual growth rates and for growth rates calculated over three-year windows (Table 2.2.2).

The differential effects of capital inflows on industry growth are economically relevant. Based on the results using annual growth rates, relative to less dependent industries (at the 25th percentile level), industries dependent on external finance (at the 75th percentile level) grow about 1.58 percent faster in a country that receives significant capital inflows (in the 75th percentile) than in a country that receives only limited foreign capital (in the 25th percentile). This accounts for approximately 14 percent of the observed sample mean of 11 percent. This relationship is driven mainly by, and is slightly stronger for, debt flows. An industry at the 75th percentile of external finance dependence grows 1.71 percent faster than one at the 25th percentile if it is domiciled in a country at the 75th percentile of debt capital inflows rather than in one at the 25th percentile. This translates to 16 percent of the observed sample mean.

Table 2.2.1. Industry Growth with Low versus High Levels of Capital Inflows

	Economies with Low Capital Inflows (25th percentile)	Economies with High Capital Inflows (75th percentile)	Difference
Highly Dependent Industries (75th percentile)	0.08	0.12	0.04
Less Dependent Industries (25th percentile)	0.06	0.09	0.03
Difference-in-Difference	0.02	0.03	0.01
Source: IMF staff calculations.			

Box 2.2 *(continued)*

Table 2.2.2. Capital Inflows and Industry Growth

	Total Inflows	Equity Inflows	Debt Inflows
	(1)	(3)	(5)
Annual Growth Rates, 1998–2007			
Share (t-1)	−5.002***	−5.018***	−5.009***
	(−5.33)	(−5.40)	(−5.33)
Capital Inflow	0.004**	0.003	0.005**
	(2.52)	(1.03)	(2.51)
Capital Inflow * Dependence	0.008**	0.004	0.013***
	(2.34)	(0.73)	(2.93)
Constant	0.856***	0.853***	0.867***
	(3.75)	(3.76)	(3.79)
Number of Observations	4,396	4,396	4,396
R^2	0.257	0.252	0.259
Growth over Three-Year Windows, 1999–2007			
Share (t-1)	−0.951*	−0.956*	−0.971*
	(−1.89)	(−1.90)	(−1.90)
Capital Inflow	0.003	0.005	0.002
	(1.32)	(1.42)	(0.78)
Capital Inflow * Dependence	0.006*	0.004	0.011*
	(1.87)	(0.47)	(1.93)
Constant	−0.065	−0.068	−0.052
	(−0.55)	(−0.57)	(−0.42)
Number of Observations	1,570	1,570	1,570
R^2	0.548	0.546	0.547
Industry Fixed Effects	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes
Industry * Country Fixed Effects	Yes	Yes	Yes
Period Fixed Effects	Yes	Yes	Yes
Number of Economies	22	22	22
Number of Industries	28	28	28

Source: IMF staff calculations.
Note: ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively. *t*-statistics are reported in parentheses.

Box 2.3. The Evolution of Emerging Market and Developing Economies' Trade Integration with China's Final Demand

The implications for the global economy of China's rapid growth have been studied extensively in recent years (see Chapter 4 of the October 2016 *World Economic Outlook* [WEO], among others). This box explores the evolution of various emerging market and developing economies' integration with China over the past two decades, using data on countries' value added in China's final demand.[1]

As a result of many years of strong growth, China has accounted for a rapidly increasing share of global demand—this growth alone suggests countries' exposures to China should be increasing. As such, it is not surprising that the analysis indicates that all emerging market and developing economies have become more integrated with China over time (Figure 2.3.1). More interesting, commodity exporters and countries outside Asia have seen more substantial gains in recent years, outpacing the gains predicted by China's growth alone (Figure 2.3.2). In addition, the sectors of China's economy to which countries are linked have been relatively stable over time, with the exception of commodity-exporting countries that benefited from the increase in oil and metal prices during 2005–10, as well as rapid infrastructure development in China.

To assess countries' integration with China, this box uses data on trade in *value added*, which captures the marginal contribution of a country's domestic economy to the production of a given good or service. These data also provide a better measure of countries' ties to China than do conventional bilateral trade statistics because they account for exports that are ultimately consumed in China—even if they are routed through other countries—and they discount goods that are exported to China but are ultimately reexported elsewhere (and hence are not related to changes in China's final demand).

As Figure 2.3.2, panel 1 indicates, commodity-exporting countries have experienced a rapid increase in their integration with China, but only since 2005, likely reflecting higher commodity prices as well as rapid growth in China's infrastructure development. Emerging market and developing economies in Asia have strong ties to China's final demand—

The authors of this box are Patrick Blagrave and Ava Yeabin Hong.

[1]Organisation for Economic Co-operation and Development Trade in Value Added database.

Figure 2.3.1. Value Added in China's Final Demand
(Share of country group's world total, percent)
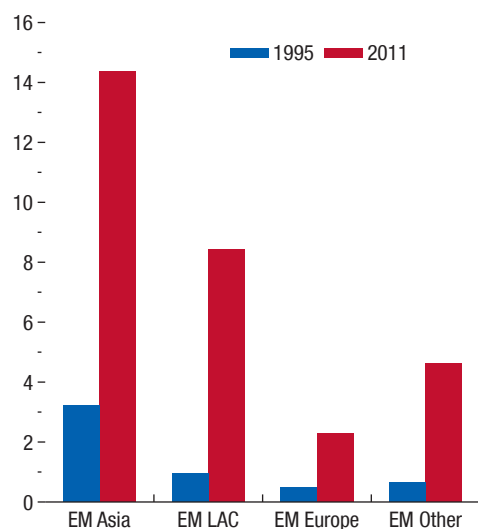
Sources: Organisation for Economic Co-operation and Development–World Trade Organization, Trade in Value Added database; and IMF staff calculations.
Note: EM = emerging market; LAC = Latin America and the Caribbean.

China consumed only 3 percent of the nondomestic global-value-added production of these countries in 1995, but this measure has since increased rapidly, to about 14 percent in 2011. Still, over this time, Asian countries' integration with China's final demand has in fact merely kept pace with China's rising share of global GDP—that is, the rising exposure of countries in Asia to China's final demand is as expected, given its strong growth. For countries outside Asia, however, China has become an increasingly important source of demand—by considerably more than would be suggested by China's strong demand growth alone (Figure 2.3.2, panel 2). The sharp rise in integration since 2000 indicates that this was associated with China's accession to the World Trade Organization in 2001, which fostered stronger trade integration between China and countries outside the region.

Within countries, the sectoral composition of links with China has been quite stable over time for noncommodity exporters (Figure 2.3.3); although

Box 2.3 *(continued)*

Figure 2.3.2. Relative Changes in Country Exposures to China's Final Demand
(Share of world exposure, index 1995 = 100)

1. Commodity versus Noncommodity Exporters

- Commodity exporters
- Noncommodity exporters
- China's share of global GDP

2. Asia versus Non-Asian Economies

- Asian EMDEs
- Non-Asian EMDEs
- China's share of global GDP

Sources: Organisation for Economic Co-operation and Development–World Trade Organization, Trade in Value Added database; and IMF staff calculations.
Note: EMDEs = emerging market and developing economies.

Figure 2.3.3. Sector Composition of Value Added in China's Final Demand
(Share of total, by sector of final demand)

- Manufacturing (excluding commodity related)
- Commodities and related
- Services
- Other

Noncommodity exporters (1995)

Noncommodity exporters (2011)
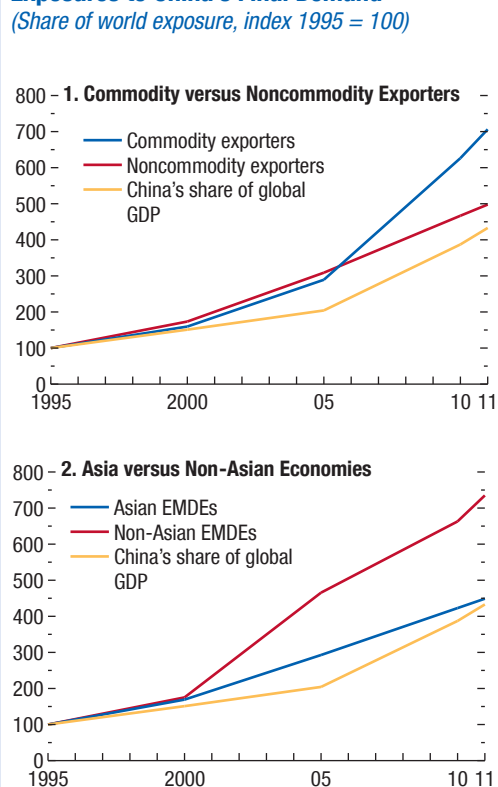
Sources: Organisation for Economic Co-operation and Development–World Trade Organization, Trade in Value Added database; and IMF staff calculations.

rapid growth fostered tighter integration with China, this integration seems to have occurred broadly similarly across sectors for this group of countries. However, for commodity exporters, the share of exports relating to commodities has risen dramatically in recent years.[2] Although this development partly reflects a shift in relative prices—given that these data are in nominal terms—stronger, relatively commodity-intensive demand in China also played a role. Indeed, comparing the composition of these countries' exports to China (Figure 2.3.4, far-right bar) to the composition of their exports to the rest of

the world (Figure 2.3.4, second bar from right), the increase in commodity-related exports to China has been much sharper relative to the benchmark of these countries' commodity-related exports to the rest of the world. Given that this rest-of-the-world benchmark provides a proxy for the relative price effect on the sectoral composition of countries' value-added exports, the larger increase in these countries' commodity-related exports to China is plausibly due to stronger demand for these types of goods, which fostered increased integration.[3]

Ultimately, greater integration with China's final demand has been a boon to many countries over the past two decades. As discussed in Chapter 4 of the October 2016 WEO, China's recent slowdown poses challenges for trading partners, as this long-standing source of demand growth slows. However, some elements of China's economic transition—such as its

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[2]Commodity-related sectors are chemicals and nonmetal mineral products, basic metals and fabricated metal products, and mining and quarrying.

[3]From 1995 to 2011, commodity-exporting countries' share of commodity-related exports to China increased by 20 percentage points, and by 12 percentage points to the rest of the world.

Box 2.3 *(continued)*

Figure 2.3.4. Sector Composition of Commodity-Exporting Economies' Foreign Value Added
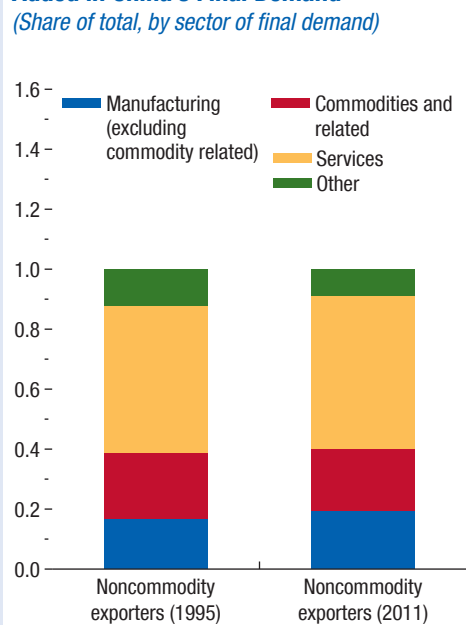
(Share of total, by sector of final demand)
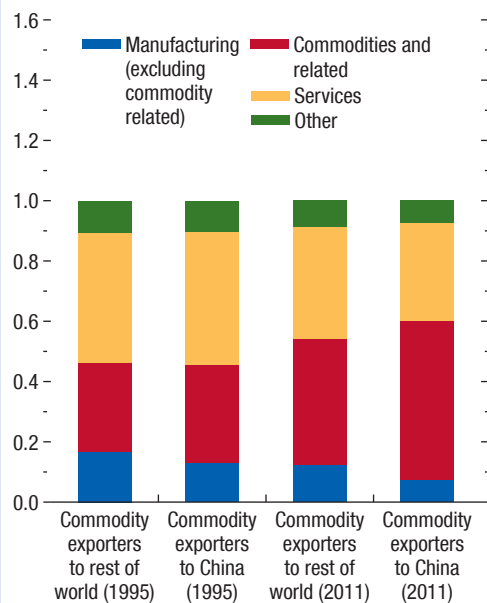
Sources: Organisation for Economic Co-operation and Development–World Trade Organization, Trade in Value Added database; and IMF staff calculations.

move up the value chain and the prospective boost to domestic consumption growth in coming years—will create opportunities for some economies, notably in emerging Asia. In addition, the increase in services trade associated with rebalancing and China's increasing investment abroad are likely to continue to produce short-term benefits for some countries in the years ahead.[4]

[4]For a discussion of the short-term costs and long-term gains of China's transition, see Chapter 4 of the October 2016 WEO, and Hong and others (2016).

Box 2.4. Shifts in the Global Allocation of Capital: Implications for Emerging Market and Developing Economies

Uphill flows, or flows from poor to rich countries, have intensified during most of the 2000s (Rajan 2006; Prasad, Rajan, and Subramanian 2007). Basic economic theory suggests that saving should flow from relatively wealthy, capital-rich countries to poorer countries where capital is scarce and profitable investment opportunities should therefore be abundant. However, this theory is not borne out in the data, as highlighted by Robert Lucas in his seminal 1990 paper. Measuring total inflows by the size of the current account deficit (the difference between national saving and investment), advanced economies as a group received persistent and sizable net inflows during the decade preceding the global financial crisis. These inflows reflected large and growing outflows from China and commodity-exporting emerging market and developing economies (especially fuel exporters). These were in turn supported by China's integration into the global economy, low global interest rates, and the sharp rise in commodity prices (Figure 2.4.1, panel 1). Moreover, the capital outflows were dominated by official reserve accumulation, which was used to back the export-oriented growth models of some emerging market and developing economies, smooth the use of the commodity windfalls, and self-insure against external shocks.

After the global financial crisis, however, uphill flows slowed and have reversed more recently (Boz, Cubeddu, and Obstfeld 2017). Net outflows from emerging market and developing economies fell and reversed, as China started to rebalance its economy toward domestic absorption and the commodity income windfall for commodity exporters vanished (Chapter 4 of the October 2016 WEO). The slowdown and eventual reversal in uphill flows largely reflected movements in official foreign reserves, which started registering an overall decline a few years ago (Figure 2.4.1, panel 2). These declines in foreign reserves, which are official capital inflows, imply that *private* net capital inflows need not match the behavior of *total* capital inflows and, indeed, some emerging market and developing economies have recently experienced increased total net inflows despite decreased private net inflows.

Despite these shifts in the global allocation of capital, most emerging market and developing economies have consistently been net recipients of capital inflows

The authors of this box are Emine Boz and Luis Cubeddu.

Figure 2.4.1. EMDEs: Current Account Balance by Group and Net Capital Inflows by Type
(Percent of world GDP)
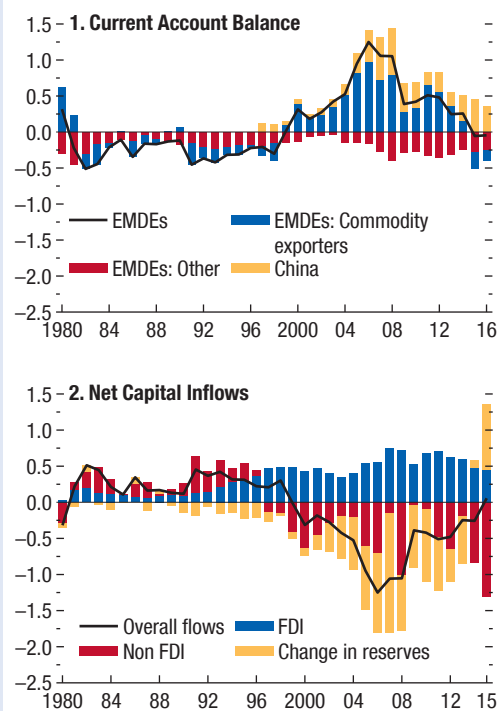
Source: IMF staff calculations.
Note: EMDEs = emerging market and developing economies; FDI = foreign direct investment.

since 2000, and foreign direct investment has flowed in the expected direction (Figure 2.4.1, panel 2; Figure 2.4.2).

- Across emerging market and developing economies, about 75 percent of countries were, on average, net recipients of inflows after 2000; excluding commodity exporters, this ratio increases to about 90 percent. Moreover, although these countries' net capital inflows were small in relation to world GDP, their unweighted average inflow ratio to domestic GDP reached as high as almost 4 percent.
- Net foreign direct investment inflows to emerging market and developing economies have stayed positive throughout the post-2000 period and have displayed far more stability than other capital

Box 2.4 *(continued)*

Figure 2.4.2. Distribution of EMDEs' Average Current Account Balances, 2000–16
(Number of economies per interval)
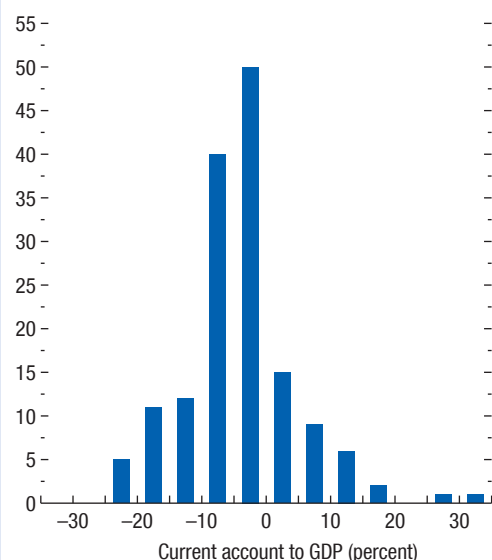
Source: IMF staff calculations.
Note: EMDEs = emerging market and developing economies.

Figure 2.4.3. Correlation between Capital Flows and per Capita Real GDP Growth
(Correlation coefficient, 20-year rolling windows)
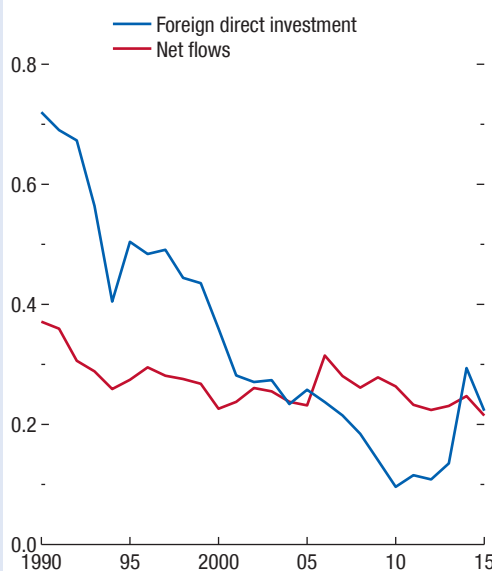
Source: IMF staff calculations.

account components. This stability is consistent with findings of other researchers (Alfaro, Kalemli-Ozcan, and Volosovych 2014), who have documented that sovereign-to-sovereign flows, including foreign reserve accumulation, accounted for a large share of uphill flows, and that, apart from such flows, the data are consistent with *private* capital flowing from rich to poor countries. This result is also broadly consistent with the finding that *nonreserve* capital flows respond strongly to growth differentials (Chapter 2 of the April 2016 *World Economic Outlook*).

Capital has tended to flow somewhat more to countries with higher per capita output growth, which is positively correlated with labor productivity growth (Figure 2.4.3).[1] Although it is not clear which way causality runs, the data suggest a slightly positive relationship between overall net inflows and per capita output growth since 1990. The positive

correlation between net inflows and per capita real GDP growth across around 150 emerging market and developing economies using 20-year rolling window averages is, moreover, fairly stable throughout the period. In other words, countries with higher growth rates have tended to run smaller current account surpluses and to be net capital importers.[2] The analogous correlation has been positive for net foreign direct investment flows, as well, although the relationship appears to have weakened over time. Overall, capital flows seem to have discriminated among potential destinations, on average favoring countries with higher output growth.

Going forward, the overall direction of flows will depend on the relative strength of several forces. On the one hand, stronger growth and infrastructure needs in emerging market and developing economies, as well as structural changes such as population aging in advanced economies, could direct excess savings to emerging market and developing economies. On

[1]A vast amount of literature studies the drivers of capital flows to emerging market and developing economies and was recently surveyed by Koepke (2015).

[2]This exercise is in the spirit of Gourinchas and Jeanne (2013), who calculate a similar correlation for 1980–2000, but only for a narrower set of countries.

Box 2.4 *(continued)*

the other hand, prospects of monetary policy normalization in advanced economies could work in the opposite direction, especially if associated with a more expansionary U.S. fiscal stance or adverse balance sheet effects in emerging market and developing economies. Moreover, global uncertainties remain large, not least because of the rising risk of protectionism, which, if realized, could affect emerging market and developing economies disproportionately. In sum, a large and persistent downhill flow of capital seems unlikely to develop over the short term.

Reaping the benefits of capital inflows remains a central challenge for emerging market and developing economies. Meeting this challenge will require that these countries further strengthen policy frameworks to address potential capital flow reversals triggered by higher U.S. interest rates and a stronger U.S. dollar. Exchange rate flexibility in particular can help insulate these economies from changes in global financial conditions, although additional tools may be needed at times to maintain orderly market conditions (IMF 2016). Moreover, as highlighted in a vast literature on the topic, robust institutions and policy frameworks (Obstfeld 1998; Kose and others 2006; Ghosh, Ostry, and Qureshi 2016), including well-functioning domestic and international financial markets (Igan, Kutan, and Mirzaei 2016), remain crucial to harness the benefits of capital inflows.

Annex 2.1. Data

Data Sources

The primary data sources for this chapter are the IMF World Economic Outlook (WEO) database, the Penn World Tables (version 9.0), and the World Bank World Development Indicators database. The chapter also uses several other databases to construct the external conditions variables and policy and other domestic attribute variables used in the empirical analyses. Annex Table 2.1.1 lists all indicators used in the chapter as well as their sources.

The sample of countries included in the various analytical exercises varies due to data constraints. Annex Table 2.1.2 lists the sample of all emerging market and developing economies used in the various analytical exercises. It includes all emerging market and developing economies currently classified as such by the WEO as well as those that have been

reclassified as "advanced" since 1996 (Cyprus, Czech Republic, Estonia, Hong Kong Special Administrative Region, Israel, Korea, Latvia, Lithuania, Macao Special Administrative Region, Malta, Puerto Rico, San Marino, Singapore, Slovak Republic, Slovenia, Taiwan Province of China), but excludes economies with a population of less than 1 million in 2010 (according to Penn World Tables 9.0 data).

Data Definitions

Real GDP per Capita

Aggregate GDP and population data used to construct real GDP per capita at purchasing-power-parity adjusted U.S. dollars are from Penn World Tables 9.0. The source for aggregate GDP used to construct real GDP per capita at constant national prices is also Penn World Tables 9.0, to be consistent with data used on production factors (labor and capital).

Annex Table 2.1.1. Data Sources

Indicator	Source
Banking Crisis Indicator	Laeven and Valencia (2013)
Bilateral Cross-Border Bank Claims	Bank for International Settlements
Capital Account Openness	Quinn (1997); Aizenman, Chinn, and Ito (2010)
Capital Inflows	IMF, Financial Flows Analytics database
Capital Stock	Penn World Tables 9.0
Commodity Terms of Trade	Gruss 2014
Commodity Export Weights	United Nations Commodity Trade Statistics (Comtrade) database; IMF, World Economic Outlook database
Credit Boom Episodes	Dell'Ariccia and others (2016)
Current Account Balance	IMF, World Economic Outlook database
Deposit Money Banks' Assets Ratio to GDP (percent)	World Bank, World Development Indicators database
Employment	Penn World Tables 9.0
Exchange Rate Stability Index	Aizenman, Chinn, and Ito (2010)
Export Value of Goods (bilateral)	IMF, Direction of Trade Statistics database
External Debt Liabilities as a Share of GDP	Lane and Milesi-Ferretti (2007)
Free Trade Agreements by Year of Signature of Agreement	DESTA, Free Trade Area database; October 2016 *World Economic Outlook*
Free Trade Agreements Coverage	WTO Regional Trade Agreements database; October 2016 *World Economic Outlook*
Human Capital	Penn World Tables 9.0
Legal System and Property Rights Quality Index	Gwartney, Lawson, and Hall (2016)
Nominal GDP	IMF, World Economic Outlook database
Nominal Interest Rate	IMF, World Economic Outlook database
Oil Price in U.S. Dollars	IMF, Global Assumptions database
Polity Score (combined)	Polity IV/Transparency International
Population	Penn World Tables 9.0; United Nations Population database
Public Debt as a Share of GDP	Mauro and others (2013); IMF, World Economic Outlook database
Real GDP at Constant National Prices	IMF, World Economic Outlook database; Penn World Tables 9.0
Real GDP in Purchasing Power Parity Terms	Penn World Tables 9.0
Real Domestic Absorption	Penn World Tables 9.0
Regulation Quality Index	Gwartney, Lawson, and Hall (2016)
Sound Monetary Framework	Gwartney, Lawson, and Hall (2016)
Tariffs	UNCTAD, Trade Analysis Information System; WTO Tariff Download Facility; IMF, Structural Reforms database; October 2016 *World Economic Outlook*

Source: IMF staff compilation.
Note: DESTA = Design of Trade Agreements database; UNCTAD = United Nations Conference on Trade and Development; WTO = World Trade Organization.

Annex Table 2.1.2. Sample of Emerging Market and Developing Economies Included in the Analyses

Albania, Algeria*, Angola*, Argentina, Armenia, Azerbaijan*, Bahrain*, Bangladesh, Belarus, Benin, Bolivia*, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon*, Central African Republic, Chad, Chile*, China, Colombia, Democratic Republic of the Congo, Republic of Congo*, Costa Rica, Côte d'Ivoire*, Croatia, Czech Republic, Dominican Republic, Ecuador*, Egypt, El Salvador, Estonia, Ethiopia, Gabon*, The Gambia, Georgia, Ghana, Guatemala, Guinea*, Guinea-Bissau, Haiti, Honduras, Hong Kong SAR, Hungary, India, Indonesia*, Islamic Republic of Iran*, Iraq*, Israel, Jamaica, Jordan, Kazakhstan*, Kenya, Korea, Kuwait*, Kyrgyz Republic, Lao P.D.R., Latvia, Lebanon, Lesotho, Liberia, Lithuania, FYR Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania*, Mauritius, Mexico, Moldova, Mongolia*, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria*, Oman*, Pakistan, Panama, Paraguay, Peru*, Philippines, Poland, Qatar*, Romania, Russia*, Rwanda, Saudi Arabia*, Senegal, Serbia, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Sri Lanka, Sudan, Swaziland, Syria, Taiwan Province of China, Tajikistan*, Tanzania, Thailand, Togo, Trinidad and Tobago*, Tunisia, Turkey, Turkmenistan*, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela*, Vietnam, Yemen*, Zambia*, Zimbabwe

Source: IMF staff compilation.
Note: The classification of emerging market and developing economies includes economies considered emerging markets before 1996. * denotes commodity exporters, which are economies for which commodity exports constitute the main source of export earnings during the sample period (commodity exports exceed 65 percent of total exports of goods, and net commodity exports account for at least 6 percent of GDP).

Country-Specific External Conditions Measures

The country-specific *external demand condition* is measured as the export-weighted domestic absorption of trading partners, as in Arora and Vamvakidis 2005 and IMF 2014. Thus, for an emerging market economy j in year t, the growth rate of external demand can be represented by

$$\sum_{i \in \Theta_j} \omega_{i,t}^* da_{i,t}, \qquad (2.1)$$

in which $\omega_{i,t}$ is the share of economy j's exports accounted for by economy i (based on IMF Direction of Trade Statistics [DOTS] data); $da_{i,t}$ is the annual growth rate of real domestic absorption in economy i (at constant national prices, from Penn World Tables 9.0); Θ_j is the set of economy j's trading partners for which bilateral export data are reported in DOTS and collectively account for at least 50 percent of total exports. The time-varying correlation of individual country external demand conditions with aggregate world output growth shows that the external conditions that each faces often deviate significantly from average external conditions (Annex Figure 2.1.1). The country-specific external demand series was further decomposed into three components, capturing demand from

China, other emerging market and developing economies (excluding China), and advanced economies.

Following Blanchard, Adler, and de Carvalho Filho (2015), country-specific *external financial conditions* are measured by the ratio of capital inflows to the region of the economy in question (excluding inflows to that economy) as a share of GDP of other economies in the same region. Thus, for emerging market economy j in year t, the external financial condition is measured by the ratio

$$\frac{\sum_{i \in \Theta \backslash j} K\_inflow_{i,t}}{\sum_{i \in \Theta \backslash j} GDP_{i,t-1}}, \qquad (2.2)$$

in which $K\_inflow_{i,t}$ is gross inflows to economy i, $GDP_{i,t-1}$ is GDP of economy i measured in U.S. dollars, and $\Theta \backslash j$ is the set of all related economies (within the same region) but excluding economy j. By excluding capital flows to the economy itself and aggregating capital flows to related economies, the measure aims to capture push factors that are exogenous to the economy in focus. While economies within a comparable group naturally have an important common element, there is important variation across economies, as shown in Annex Figure 2.1.1, panel 2.

The change in *terms of trade* is analyzed in the chapter through commodity terms of trade (CTOT) indices. These are constructed for each economy as a trade-weighted average of the prices of imported and exported commodities, following Gruss (2014). The annual change in the economy i's CTOT index in year t is given by

$$\Delta log CTOT_t = \sum_{j=1}^{J} \Delta log P_{j,t} \tau_{i,j,t}, \qquad (2.3)$$

in which $P_{j,t}$ is the relative price of commodity j at time t (in U.S. dollars and divided by the IMF's unit value index for manufactured exports), and Δ denotes the first difference. Economy i's weights for each commodity price, $\tau_{i,j,t}$, are given by

$$\tau_{i,j,t} = \frac{x_{i,j,t-1} - m_{i,j,t-1}}{GDP_{i,t-1}}, \qquad (2.4)$$

in which $x_{i,j,t-1}$ ($m_{i,j,t-1}$) denote the average export (import) value of commodity j by the economy i between t–1 and t–3 (in U.S. dollars, from the United Nations Comtrade database), and $GDP_{i,t-1}$ denotes the average GDP of the economy i between t–1 and t–3 (in U.S. dollars). An alternative index with $(\sum_{j=1}^{J} x_{i,j,t-1} + \sum_{j=1}^{J} m_{i,j,t-1})$ instead of $GDP_{i,t-1}$ in equation 2.4 is used in robustness exercises in Annex 2.3.

Annex Figure 2.1.1. Correlation between Country-Specific External Conditions Variables and Global Variables over Time
(Correlation coefficient)

1. Correlation between Country-Specific External Demand Conditions and World GDP Growth

2. Correlation between Country-Specific External Financial Conditions and Aggregate Capital Flows to EMDEs

3. Correlation between Change in CTOT and Change in Oil Prices
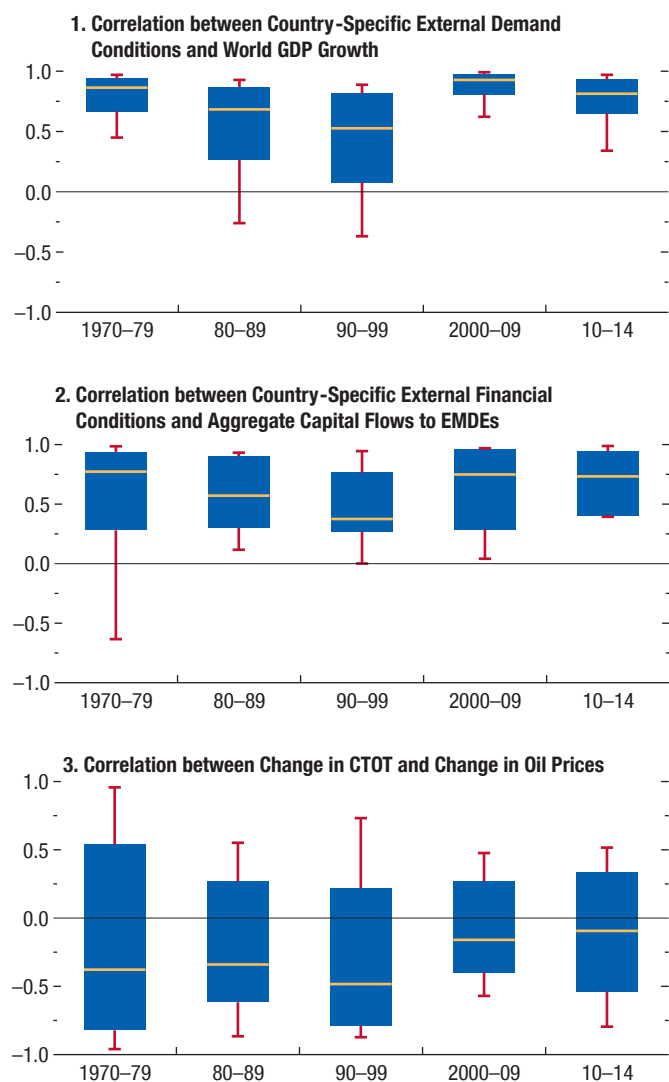
Source: IMF staff calculations.
Note: The figure shows the rolling correlation between country-specific variables and global variables over nonoverlapping five-year windows. The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles. World GDP growth is the weighted average (using market exchange rates) of growth in individual economies. CTOT = commodity terms of trade; EMDEs = emerging market and developing economies.

Annex Table 2.1.3. Pairwise Correlation between External Conditions Variables

Variable	External Demand Conditions	External Financial Conditions	Commodity Terms of Trade
External Demand Conditions	1		
External Financial Conditions	0.1288	1	
Commodity Terms of Trade	0.0737	−0.0016	1

Source: IMF staff calculations.

The commodity price series start in 1960. Prices of 41 commodities are used, sorted into four broad categories:
1. *Energy*: coal, crude oil, and natural gas
2. *Metals*: aluminum, copper, iron ore, lead, nickel, tin, and zinc
3. *Food*: bananas, barley, beef, cocoa, coconut oil, coffee, corn, fish, fish meal, groundnuts, lamb, oranges, palm oil, poultry, rice, shrimp, soybean meal, soybean oil, soybeans, sugar, sunflower oil, tea, and wheat
4. *Raw materials*: cotton, hardwood logs and sawn wood, hides, rubber, softwood logs and sawn wood, soybean meal, and wool

The primary source for international commodity prices is the IMF's International Financial Statistics database. The price of crude oil is the simple average of three spot prices: Dated Brent, West Texas Intermediate, and Dubai Fateh. The World Bank's Global Economic Monitor database is used to extend the price series of barley, iron ore, and natural gas from the IMF's Primary Commodity Price System back to 1960. The price of coal is the Australian coal price, extended back to 1960 using the World Bank's Global Economic Monitor database and U.S. coal price data from the U.S. Energy Information Administration.

Annex Table 2.1.3 shows the pairwise correlation between the three external conditions variables. The low correlation between these variables suggests that each dimension potentially exerts a separate influence from the other two.

Annex 2.2. Channels through Which Emerging Market and Developing Economies Have Narrowed Income Differentials with Advanced Economies

Over the medium term, once the effects of business cycle fluctuations are smoothed out, gaps in income per capita between countries are associated with differences in the stocks of physical and

Annex Figure 2.2.1. Changes in Levels of Selected Variables Relative to the United States
(Percentage points)
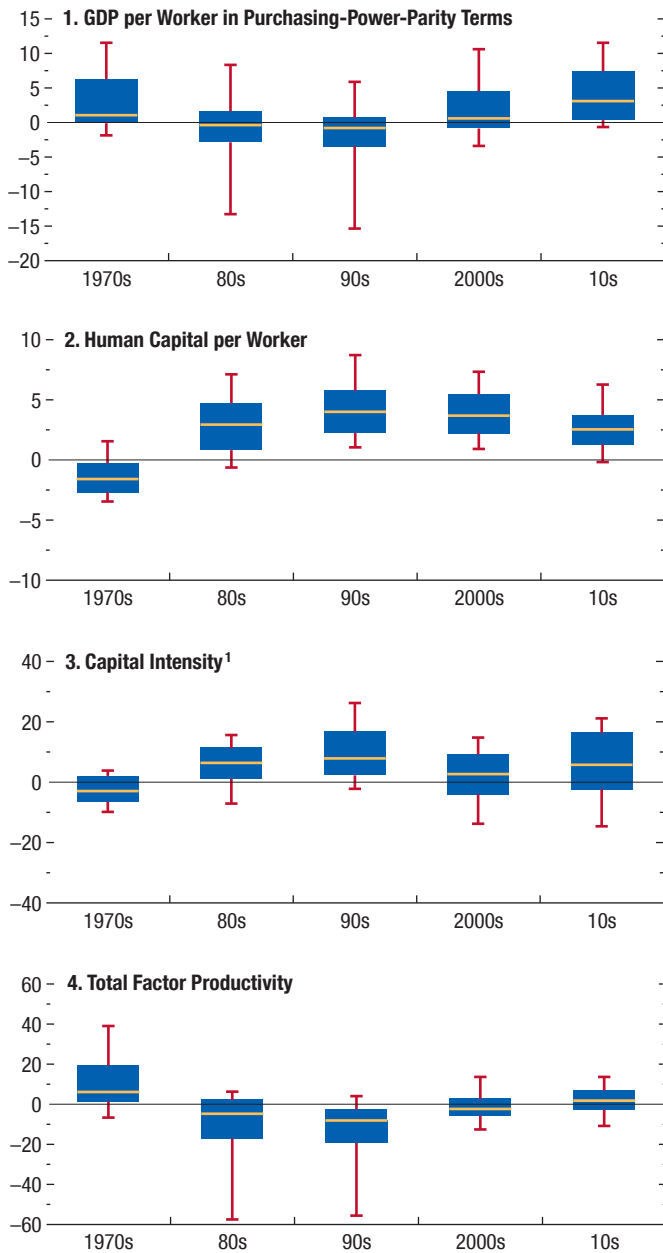
Source: IMF staff calculations.
Note: The horizontal line inside each box represents the median; the upper and lower edges of each box show the top and bottom quartiles; and the red markers denote the top and bottom deciles of the average change in the selected variable during the decade.
[1] Capital intensity is defined as $(K/Y)^{\alpha/(1-\alpha)}$ as explained in Annex 2.2.

human capital used in production (factor gaps) and differences in technology and efficiency (total factor productivity [TFP] gaps). This annex examines the variation over time in factor and TFP gaps between emerging market and developing economies and the United States.

Using a standard production function approach, aggregate output can be expressed as

$$Y = A^* K^{\alpha} (hL)^{1-\alpha}, \tag{2.5}$$

in which Y is real output, K is the stock of physical capital, h is human capital per worker, L is labor input, A is total factor productivity, and α is the capital share of income.

Aggregate GDP can be reexpressed to give output per worker as a function of human capital per worker, the capital-output ratio, and TFP[37]:

$$y = Y/L = A^{\frac{1}{1-\alpha}} * h * \left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}}. \tag{2.6}$$

Comparing each emerging market economy i to the United States, the gap in output per worker can be decomposed into the factor gaps and the residual TFP gap as follows[38]:

$$\frac{y_i}{y_{U.S.}} = \frac{\left(A^{\frac{1}{1-\alpha}}\right)_i}{\left(A^{\frac{1}{1-\alpha}}\right)_{U.S.}} * \frac{h_i}{h_{U.S.}} * \frac{\left(\left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}}\right)_i}{\left(\left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}}\right)_{U.S.}}. \tag{2.7}$$

The decomposition reveals that, over time, the relative importance of different channels through which income gaps have narrowed and widened has shifted (Annex Figure 2.2.1). During the 1970s, 1980s, and 1990s, movements in income-per-worker gaps mirrored movements in the TFP gap, with factor accumulation often moving in the opposite direction. By contrast, over the past 15 years, the relative output-per-worker gap has mirrored movements in the factor gaps more than it has TFP gaps. This suggests that the channels have varied in importance: whereas the TFP channel appears more important in the 1970s, 1980s, and 1990s, factor accumulation appears to have played a greater role in recent years.

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[37] Klenow and Rodríguez-Clare (1997); Hall and Jones (1999); Hsieh and Klenow (2010).

[38] The residual also captures any measurement error in output of any of the inputs.

Annex 2.3. Estimation of the Impact of External Conditions on Emerging Market and Developing Economy Growth

The empirical framework used to assess the role of external conditions for medium-term growth over time is based on a fixed-effects panel growth regression that is standard in the literature.[39] The general regression equation is given by

$$g_{it} = \alpha_i + \mu_t + \beta X_{it} + \gamma Z_{it} + \epsilon_{it}, \qquad (2.8)$$

in which g_{it} is the average annual growth rate of real GDP per capita in purchasing-power-parity terms in country i over period t; α_i captures time-invariant country fixed effects; and μ_t is a time fixed effect that controls for common, global factors. As is common in the literature, each period corresponds to a five-year nonoverlapping window to smooth the influence of business cycles. The period of analysis is 1970–2014, although the panel is not balanced (that is, data are not available for all countries in all periods).

The vector Z_{it} includes the main variables of interest, that is, the three country-specific external conditions described in Annex 2.1. The equation also includes a vector (X_{it}) of standard covariates in long-term growth regressions. Given that the interest is in exploring the role of external conditions, rather than assessing the contribution of all factors that may affect medium-term growth, X_{it} is a parsimonious set of control variables mainly aimed at attenuating potential omitted variable bias affecting the estimates (rather than at maximizing the share of variance explained by the model).[40] The set of controls includes the initial level of income per capita (average log GDP per capita over the previous five-year period) to account for transitional convergence, the average rate of inflation to account for macroeconomic stability, the level of human capital, de jure measures of trade and financial openness (proxied by the level of average import tariffs and an index of restrictions to the capital account, respectively), and deep institutional characteristics (as

captured by the combined Polity IV index of governance characteristics).

The model is estimated with the generalized method of moments (GMM) for dynamic panel models developed by Arellano and Bond (1991) and Arellano and Bover (1995). Given that the model is dynamic, estimation by ordinary least squares (OLS) may lead to biased estimates (lagged income can be correlated with the fixed effects in the error term, leading to dynamic panel bias). Moreover, some of the control variables are potentially endogenous. The difference GMM estimator relies on differencing and instrumentation to deal with these issues.

Table 2.3.1 reports the estimation results. Columns (1) to (3) report the results when one external conditions variable is included at a time. The results reported in the text of the chapter correspond to column (4), in which all three country-specific external variables are included jointly. The results using an OLS estimator with country fixed effects are reported in columns (5) through (8).

Robustness Exercises

Annex Table 2.3.2 reports results from robustness exercises. In all of these exercises, all external conditions variables are included jointly and the model is estimated with a difference GMM method.

Sample of Countries

Some large emerging market and developing economies, notably China, have started to play a key role in global activity in recent decades. To address concerns of potential endogeneity of external demand conditions, key large emerging market and developing economies are excluded from the estimation sample in the exercises reported in columns (1) and (2). More precisely, column (1) excludes China from the estimation sample, while, in column (2), all large emerging market and developing economies (that is, those in the sample that are members of the Group of Twenty—Argentina, Brazil, China, India, Indonesia, Korea, Mexico, Russia, Saudi Arabia, South Africa, and Turkey) are excluded from the estimation.

The baseline sample includes many very small economies (even if economies with very small population are excluded). In this sense, the average coefficients from the baseline sample may not be very representative of aggregate growth in emerging market and developing economies, which is largely driven by large

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[39]See for instance Barro and Sala-i-Martin (2004). Related studies that include measures of external conditions in standard growth regression include, among others, Arora and Vamvakidis (2005); Calderón, Loayza, and Schmidt-Hebbel (2006); and Box 4.1 in IMF (2014).

[40]In any case, the variables in Z_{it} are derived from demand or financial conditions in trading partners and from global commodity prices, so there is less of a concern of omitted variable bias or endogeneity than would be the case if the analysis were using measures of export growth or openness (which could be affected by domestic factors that directly affect per capita income growth).

Annex Table 2.3.1. Estimation Results from Linear Panel Growth Regression

Dependent Variable: GDP per Capita Growth Rate	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Explanatory Variables								
External Demand Conditions	0.524**			0.421**	0.331			0.243
	(0.203)			(0.192)	(0.199)			(0.189)
External Financial Conditions		0.266***		0.186**		0.339***		0.289***
		(0.099)		(0.085)		(0.096)		(0.086)
Commodity Terms of Trade			0.453*	0.481*			0.539**	0.538**
			(0.238)	(0.249)			(0.220)	(0.218)
Estimation Details								
Estimation Method	GMM	GMM	GMM	GMM	OLS	OLS	OLS	OLS
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	505	517	509	497	587	601	592	578
Number of Economies	81	84	83	80	82	84	83	81
R^2					0.411	0.422	0.417	0.432
Specification Tests (p-values)								
Second-Order Correlation Test	0.863	0.913	0.567	0.507				
Hansen Test	0.149	0.173	0.197	0.201				

Source: IMF staff calculations.
Note: The dependent variable is the annual growth rate of GDP per capita in purchasing-power-parity terms, averaged over nonoverlapping five-year windows. One unit of external demand conditions corresponds to a 1 percentage point growth in domestic absorption of trading partners; one unit of external financial conditions corresponds to 1 percentage point of GDP in capital flows to regional economies; one unit of the commodity terms of trade corresponds to a 1 percent increase in the commodity terms of trade index (akin to a windfall income gain of 1 percent of GDP). The sample period is 1970–2014. Robust standard errors are reported in parentheses. GMM = generalized method of moments; OLS = ordinary least squares. ***,**, and * denote significance at the 1, 5, and 10 percent level, respectively.

Annex Table 2.3.2. Estimation Results from Linear Panel Growth Regression: Robustness Exercises

Dependent Variable: GDP per Capita Growth Rate	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory Variables						
External Demand Conditions	0.401**	0.361*	0.153	0.408**	0.400**	0.372*
	(0.194)	(0.204)	(0.322)	(0.191)	(0.196)	(0.214)
External Financial Conditions	0.204**	0.223**	0.194**	0.199**	0.244***	0.330***
	(0.087)	(0.101)	(0.089)	(0.086)	(0.093)	(0.111)
Commodity Terms of Trade	0.502**	0.454*	1.036***	0.195***	0.473*	0.954***
	(0.255)	(0.245)	(0.293)	(0.053)	(0.246)	(0.213)
Estimation Details						
Estimation Method	GMM	GMM	GMM	GMM	GMM	GMM
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	491	441	235	497	497	413
Number of Economies	79	71	36	80	80	80
Specification Tests (p-values)						
Second-Order Correlation Test	0.512	0.462	0.681	0.602	0.693	0.523
Hansen Test	0.198	0.235	1.000	0.138	0.327	0.207

Source: IMF staff calculations.
Note: The dependent variable is the annual growth rate of GDP per capita in purchasing-power-parity terms, averaged over nonoverlapping five-year windows. One unit of external demand conditions corresponds to a 1 percentage point growth in domestic absorption of trading partners; one unit of external financial conditions corresponds to 1 percentage point of GDP in capital flows to regional economies; one unit of the commodity terms of trade corresponds to a 1 percent increase in the commodity terms of trade index (akin to a windfall income gain of 1 percent of GDP). The sample period is 1970–2014. Robust standard errors are reported in parentheses. GMM = generalized method of moments. ***,**, and * denote significance at the 1, 5, and 10 percent level, respectively.

economies. To explore how the baseline results may be affected by this, the exercise reported in column (3) excludes the smallest economies, which collectively accounted for less than 5 percent of emerging market and developing economies' aggregate GDP in purchasing-power-parity terms in 2011.

Endogeneity of External Conditions Variables

A priori there is no reason to believe that country-specific external conditions variables used in the analysis are systematically affected by growth outcomes of the economy in question or by other variables that also directly affect medium-term growth in ways that would introduce reverse causality or omitted variable bias in the baseline estimation. Nonetheless, this exogeneity assumption may be questioned in some individual cases. The baseline estimation attempts to mitigate these concerns by simultaneously including all three external conditions in the specifications together with time fixed effects that capture unobservable common factors. The robustness exercise reported in column (2), which excludes large emerging market and developing economies, should also alleviate these concerns.

Columns (4) to (6) report additional robustness exercises related to potential endogeneity of the external financial conditions variable and the commodity terms of trade (CTOT) variable. Regarding the former, the regional criterion to select peer economies in the construction of the external financial variable may introduce spatial correlation in capital flows caused by omitted variables, potentially biasing the estimates. The external financial variable may also be affected by pull factors of other economies in the same region that are unrelated to the availability of external finance for the economy in question. In a first exercise, the external financial conditions variable was considered as potentially endogenous and instrumented in the difference GMM estimation with its own lags. The results in column (4) show that the coefficient is marginally larger and even more statistically significant than in the baseline estimation. In a second exercise, reported in column (5), a country-specific financial-flows-weighted average of interest rates in large advanced economies (France, Germany, Japan, United Kingdom, United States) is used as an additional instrument.[41] The coefficient estimates are somewhat different, as the time sample is also different (the financial flows data used to

weight interest rates start only in 1984), but the results are qualitatively unchanged and reinforce the finding that external financial conditions have a significant effect on medium-term growth in emerging market and developing economies.

To construct the CTOT index, individual commodity price fluctuations are weighted by net exports of each commodity as a share of GDP (Annex 2.1). While the weights are lagged, they could potentially be affected by growth outcomes averaged over five years in the economy in question. Even if there is some overlap between the window over which the dependent variable and the weights of individual commodity prices are constructed, it is not clear that this implies that the aggregate CTOT index is systematically affected by growth outcomes in a way that would bias the coefficient estimates. Nonetheless, an additional exercise is reported in column (6) based on an alternative CTOT index that uses overall commodity trade rather than GDP to weight individual price fluctuations. The coefficient is larger, given that the alternative index has larger variability, but the results are qualitatively unchanged.[42]

Annex 2.4. Identification of Growth Episodes

The procedure to identify growth acceleration episodes follows Hausmann, Pritchett, and Rodrik (2005). The trend growth rate of each economy at time t over horizon h, $g_{t,t+h}$, is defined as the least squares growth rate of real GDP per capita at constant national prices (y) from t to $t+h$ described by the following equation estimated over rolling windows of six years $[t,t+h]$[43]:

$$\ln(y_{t+i}) = \alpha + g_{t,t+h} \times i, i = 0, \ldots, h. \quad (2.9)$$

A growth acceleration episode is defined as a time interval spanning $[t,t+h]$ with the following attributes (in which the horizon h is set at five years in the baseline case):

- the trend growth rate of real GDP per capita is at least 3.5 percent a year $(g_{t,t+h} \geq 3.5)$;
- the trend growth rate during the episode exceeds the trend growth rate during the preceding equal-

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[41]The country-specific weights are constructed from cross-border flows from Bank for International Settlements data.

[42]The interquartile range for the average annual change in the alternative CTOT index across all countries and periods is −2.8 to 3 percent, while it is −0.4 to 0.3 percent in the case of the baseline CTOT index.

[43]Episodes are identified up to the year 2010 using real income per capita from PWT 9.0 through 2014 and extended to 2015 using the growth rate of real income per capita from the WEO database.

Annex Table 2.4.1. Persistent Acceleration Episodes

Economy	Year	Economy	Year
Albania	1995	FYR Macedonia	2003
Algeria	2000	Malawi	2005
Argentina	2003	Malaysia	2002
Armenia	2000	Mali	1974
Azerbaijan	2003	Mauritius	1973, 1985
Belarus	1999, 2002	Mozambique	1994
Benin	1977	Myanmar	1993, 1998
Bosnia	1995	Namibia	2002
Botswana	1970, 1986, 1994, 2003	Nigeria	2000
Bulgaria	2003	Oman	1975
Burkina Faso	1994	Pakistan	2002
Cambodia	2003	Panama	2003
Cameroon	1970, 1976	Paraguay	2000, 2009
Chad	2000	Peru	2003
Chile	2002	Philippines	2003
China	1980, 2000	Poland	1995, 2003
Colombia	2004	Rwanda	1975, 2003
Costa Rica	2003	Sierra Leone	2009
Czech Republic	2003	Singapore	1977, 1986, 2003
Dominican Republic	1994, 2004	Slovak Republic	2003
Ecuador	1970	Slovenia	1995
Egypt	2004	Sri Lanka	1976, 1990, 2003
Estonia	2002, 2010	Sudan	1997
Ethiopia	2003	Swaziland	1985
Ghana	2008	Syria	1972, 1993
Honduras	2003	Taiwan Province of China	1984
Hong Kong SAR	1976, 2003	Tanzania	2000
Hungary	1997	Thailand	1986, 2002
India	1993, 2002	Trinidad and Tobago	1996, 2001
Indonesia	1988, 2002	Tunisia	1995
Jordan	1975, 2001	Turkey	2002
Korea	1982	Turkmenistan	2004
Lao P.D.R.	1979	Uzbekistan	2003
Lesotho	1987, 2005	Vietnam	1975, 1981
Lithuania	2002		

Source: IMF staff calculations.

length interval by at least 2 percentage points $(g_{t,t + h} - g_{t,t - h} \geq 2)$; and

- the level of real GDP per capita at the end of the episode is at least as large as the maximum level recorded prior to the onset of the episode $(y_{t,t + h} \geq \max\{y_i\}, \forall i \leq t)$.

The set of acceleration episodes identified is in line with those in Hausmann, Pritchett, and Rodrik (2005) for the period during which the samples overlap.

Starting with the set of identified acceleration episodes, a *persistent* acceleration episode is defined as an acceleration that is not associated with a subsequent reversal (defined below) or a banking crisis (as defined by Laeven and Valencia 2013) within three years before or after the end of the acceleration episode. Annex Table 2.4.1 lists the 95 episodes of persistent accelerations identified

through this procedure. Their distribution by region and decade is shown in Annex Figure 2.4.1.

A reversal episode, in turn, is defined as an interval spanning $[t,t+h]$ during which

- the trend growth rate during the reversal is at least 2 percentage points lower than during the preceding interval $(g_{t,t - h} - g_{t,t + h} \geq 2)$; and
- real GDP per capita declines such that the average level of real GDP per capita during the episode $[t,t+h]$ is lower than the average level of real GDP per capita during $[t-h,t]$, or $(\bar{y}_{t,t + h} \leq \bar{y}_{t - h,t})$.

Annex Table 2.4.2 lists the 125 episodes identified as reversals, and Annex Figure 2.4.2 shows the distribution of reversal episodes by region and decade.

Annex Figure 2.4.1. Persistent Acceleration Episodes by Region
(Number of episodes)
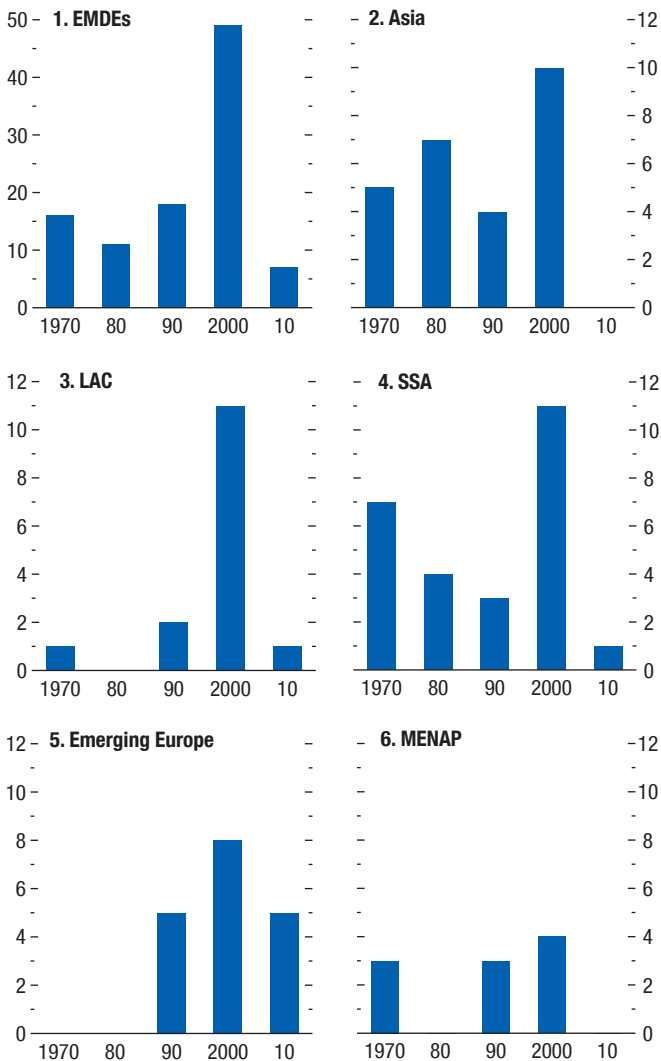
Annex Figure 2.4.2. Reversal Episodes by Region
(Number of episodes)
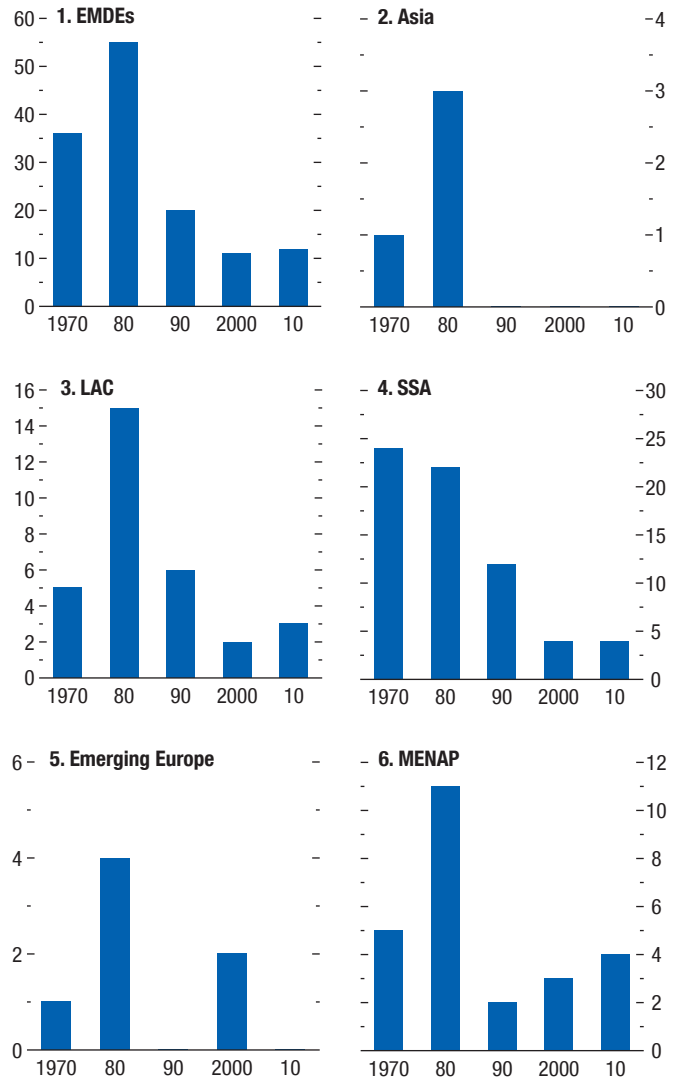
Source: IMF staff calculations.
Note: *X*-axis labels indicate the start year of a 10-year period. EMDEs = emerging market and developing economies; LAC = Latin America and the Caribbean; MENAP = Middle East, North Africa, Afghanistan, and Pakistan; SSA = sub-Saharan Africa.

Source: IMF staff calculations.
Note: *X*-axis labels indicate the start year of a 10-year period. EMDEs = emerging market and developing economies; LAC = Latin America and the Caribbean; MENAP = Middle East, North Africa, Afghanistan, and Pakistan; SSA = sub-Saharan Africa.

Annex Table 2.4.2. Reversal Episodes

Economy	Year	Economy	Year
Albania	1988	Lesotho	1980
Algeria	1985	Liberia	1979, 1989, 2003
Angola	1976, 1989	Madagascar	1973, 1979, 1990, 2009
Argentina	1980, 1999	Malawi	1980, 1999
Bahrain	1981, 2006	Mauritania	1979
Bangladesh	1971	Mexico	1983
Bolivia	1981	Mongolia	1989
Brazil	1989	Mozambique	1981
Bulgaria	1989	Myanmar	1985
Burkina Faso	1981	Namibia	1981
Burundi	1992	Nicaragua	1976, 1985
Cameroon	1985	Niger	1971, 1982
Central African Republic	1970, 1978, 2000, 2010	Nigeria	1979
Chad	1977, 1991	Oman	2010
Chile	1971	Panama	1985
Democratic Republic of the Congo	1974, 1989	Paraguay	1983, 1996
Republic of Congo	1986	Peru	1980, 1987
Costa Rica	1980	Philippines	1981
Croatia	2009	Poland	1979, 1988
Côte d'Ivoire	1979, 1989, 1999	Qatar	1979
El Salvador	1978	Rwanda	1985, 1990
Ethiopia	1973, 1982, 1988	Saudi Arabia	1980, 1994
Gabon	1978, 1983, 1997	Senegal	1976, 1989
The Gambia	1984	Sierra Leone	1994
Ghana	1973, 1979	Slovenia	2009
Guatemala	1982	South Africa	1982
Guinea	1989	Sudan	1978
Guinea-Bissau	1978, 1997	Syria	1985, 2010
Haiti	1981, 1990, 2000	Tanzania	1979
Honduras	1981	Togo	1972, 1979, 1989, 1998
Hungary	1988	Trinidad and Tobago	1982
Iran	1976, 1984	Uganda	1976
Iraq	1980, 1987	United Arab Emirates	1984, 2005
Jamaica	1975, 1996, 2007	Uruguay	1981, 1999
Jordan	1986	Venezuela	1979, 1998
Kenya	1990	Zambia	1970, 1976, 1990
Kuwait	1979, 1986, 1998, 2007	Zimbabwe	1974, 1983, 2001
Lebanon	1987		

Source: IMF staff calculations.

Annex 2.5. Estimation of the Influence of External Conditions on the Likelihood of Experiencing Persistent Accelerations and Reversals

This annex provides additional details on the empirical approach used to explore the influence of external conditions on the occurrence of growth accelerations and reversals and reports the main results as well as robustness analyses.

Data and Methodology

Two dummy variables are constructed to implement the empirical analysis on growth episodes: one dummy takes a value of 1 for the economy-years identified as persistent acceleration episodes (Annex Table 2.4.1) and zero otherwise; and the other dummy takes a value of

1 for the economy-years identified as reversal episodes (Annex Table 2.4.2) and zero otherwise. Given the empirical challenge of accurately dating growth episodes, following Hausmann, Pritchett, and Rodrik (2005) the dummy variables also take a value of 1 in the first lead $(t+1)$ and lag $(t-1)$ around each identified episode.

Using these dummy variables, the influence of country-specific external conditions on the likelihood of growth episodes can be tested by the following distribution function:

$$\Pr(episode_{it} = 1) = \Phi(\gamma Z_{it}), \qquad (2.10)$$

in which Z_{it} is the vector of moving averages (between $t+1$ and $t+h$) of the three country-specific external conditions variables described in Annex 2.1, and Φ is

Annex Table 2.5.1. Logistic Estimates of the Effects of External Conditions Variables on the Odds Ratio of Persistent Accelerations

Specification	No Country or Time Fixed Effects	Country Fixed Effects and Other Controls	Time Fixed Effects Only	Country and Time Fixed Effects	Random Effects	Probit Random Effects	Baseline Country Fixed Effects
External Demand	1.248***	1.607***	1.095	1.158**	1.330***	1.165***	1.384***
	(0.087)	(0.151)	(0.097)	(0.085)	(0.119)	(0.052)	(0.088)
External Financial	1.209***	1.227***	1.103**	1.098**	1.243***	1.123***	1.240***
	(0.045)	(0.050)	(0.050)	(0.044)	(0.049)	(0.021)	(0.034)
Change in Terms of Trade	0.970	1.042	0.935	1.040	1.007	1.009	1.052
	(0.047)	(0.091)	(0.046)	(0.076)	(0.063)	(0.030)	(0.066)
Model Chi-Squared Test	43.4***	98.2***	31,482.8***	245.5***	45.8***	51.8***	103.6***
Country Fixed Effects	No	Yes	No	Yes	No	No	Yes
Time Fixed Effects	No	No	Yes	Yes	No	No	No
Other Controls	No	Yes	No	No	No	No	No
Number of Economies[1]	110	110	110	110	110	116	110
Number of Observations	4,176	1,325	4,176	2,279	4,176	4,322	2,279

Source: IMF staff calculations.
Note: ***,**, and * denote significance at the 1, 5, and 10 percent level, respectively; other controls not reported include de jure measures of trade and financial openness, the level of inflation, and deep institutional characteristics. The coefficients report changes in the odds ratio of persistent accelerations. Value greater (smaller) than 1 indicates increase (decrease) in the odds ratio relative to the unconditional odds. Robust standard errors are reported in parentheses.
[1]Maximum number of economies. For estimations with country fixed effects, economies without episodes are excluded.

Annex Table 2.5.2. Logistic Estimates of the Effects of External Conditions Variables on the Odds Ratio of Reversals

Specification	No Country or Time Fixed Effects	Country Fixed Effects and Other Controls	Time Fixed Effects Only	Country and Time Fixed Effects	Random Effects	Probit Random Effects	Baseline Country Fixed Effects
External Demand	0.818***	0.738***	0.841***	0.793***	0.736***	0.851***	0.655***
	(0.047)	(0.067)	(0.046)	(0.061)	(0.055)	(0.033)	(0.038)
External Financial	0.822***	0.710***	1.014	0.977	0.788***	0.876***	0.774***
	(0.037)	(0.043)	(0.061)	(0.055)	(0.041)	(0.023)	(0.028)
Change in Terms of Trade	0.933*	0.851*	0.976	0.973	0.935**	0.963**	0.941**
	(0.039)	(0.074)	(0.041)	(0.028)	(0.031)	(0.017)	(0.027)
Country Fixed Effects	No	Yes	No	Yes	No	No	Yes
Time Fixed Effects	No	No	Yes	Yes	No	No	No
Other Controls	No	Yes	No	No	No	No	No
Number of Economies[1]	110	110	110	110	110	116	110
Number of Observations	4,176	1,184	4,176	2,835	4,135	4,322	2,835

Source: IMF staff calculations.
Note: ***,**, and * denote significance at the 1, 5, and 10 percent level, respectively; other controls not reported include de jure measures of trade and financial openness, the level of inflation, and deep institutional characteristics. The coefficients report changes in the odds ratio of persistent accelerations. Value greater (smaller) than 1 indicates increase (decrease) in the odds ratio relative to the unconditional odds. Robust standard errors are reported in parentheses.
[1]Maximum number of economies. For estimations with country fixed effects, economies without episodes are excluded.

a nonlinear function representing how Z_{it} affects the probability $\Pr(episode_{it} = 1)$. The nonlinear binary dependent model is then empirically estimated using either a probit or a logit functional form to replace $\Phi(\cdot)$.[44] To establish an appropriate baseline specification, country and time fixed effects as well as additional control variables are considered. The benchmark specification is given by the following equation:

$$\log\left(\frac{\Pr(episode_{it} = 1)}{1 - \Pr(episode_{it} = 1)}\right) = \gamma Z_{it} + \beta X_{it} + \alpha_i + \epsilon_{it}, \quad (2.11)$$

[44]As a robustness check, the linear probability model was also tested, and the significance of the variables are robust to this estimation method.

in which X_{it} is a vector of controls (using moving averages between t–3 and t–1) that includes domestic covariates associated with medium-term growth (for example, de jure integration, credibility of policy frameworks), and α_i captures time-invariant country fixed effects.

Logit Estimates

The coefficient estimates of several variations of the model in (2.11) are reported in Annex Tables 2.5.1 (persistent accelerations) and 2.5.2 (reversals) and in Annex Figure 2.5.1, panels 1 and 2. They indicate a robust positive association between the odds ratio of persistent accelerations and external demand and

financial conditions in all specifications. In turn, the commodity terms-of-trade variable is not significant in any of the specifications estimated on the full sample of countries (including commodity exporters and non-commodity exporters).

In the case of reversals, external financial conditions are not statistically significant when time fixed effects are included in the regression (columns (3) and (4) in Annex Table 2.5.2 and Annex Figure 2.5.1, panel 2). This is likely due to the importance of common factors in explaining capital flows to emerging markets, as documented in Chapter 2 of the April 2016 *World Economic Outlook* and Figure 2.10. The effect of commodity terms of trade on the likelihood of reversals is also statistically insignificant when time fixed effects are included, which likely capture common drivers of commodity prices, while they are statistically significant in all other specifications.

In sum, Annex Tables 2.5.1 and 2.5.2 and Annex Figure 2.5.1 show that the statistically significant association between external conditions and the increase in the odds ratio of persistent accelerations and reversals is robust to different specifications, including when country fixed effects are not included (column (1) of the tables), or estimating the model with random effects using logit or probit approaches (columns (5) and (6) of the tables). The baseline specification used in the analysis (equation 2.11) includes only country fixed effects.

Marginal Effects

The logit estimates of the previous section can be used to compute the average *marginal effect* of a one-unit change in a given variable on the likelihood of a growth episode. This is the statistic used in the text and figures of the chapter to discuss the impact of external conditions as well as domestic attributes on the likelihood of growth episodes. Using equations (2.10) and (2.11), the average marginal effects can be represented by

$$\frac{\partial \mathrm{Pr}(episode_{it} = 1)}{\partial z_{1,it}} = \gamma_1 \Phi'(\gamma_1 z_{1,it} + \gamma_2 z_{2,it} + \gamma_3 z_{3,it}$$
$$+ \beta_1 x_{1,it} + \ldots + \beta_n x_{n,it} + \alpha_1$$
$$+ \ldots + \alpha_N). \qquad (2.12)$$

Marginal effects in nonlinear binary dependent models depend not only on γ_1, but also on the value

Annex Figure 2.5.1. Change in the Odds Ratio of Occurrence of Growth Episodes, 1970–2015
(Percent)
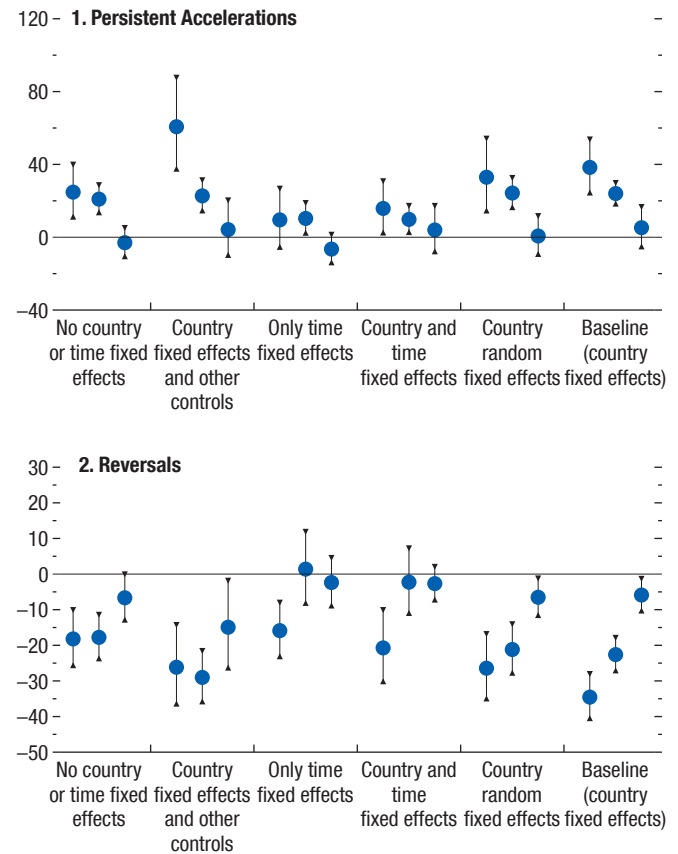
Source: IMF staff calculations.
Note: For each estimation procedure, the first estimation point refers to external demand conditions; the second estimation point refers to external financial conditions; and the third estimation point refers to commodity terms of trade. "Other controls" include de jure measures of trade and financial openness, the level of inflation, and deep institutional characteristics. Vertical lines denote 90 percent confidence intervals.

of $z_{1,it}$ and all other variables in equation (2.11)—and hence the need for parsimony in the number of explanatory variables. The baseline results reported in Figure 2.17 are based on a specification that includes only the external conditions variables, which are evaluated at their sample means.

Robustness Tests

The baseline results for the effects of external conditions on the likelihood of growth episodes are compared with those based on different country samples. Annex Figure 2.5.2 reports the change in the odds ratio (in percent) of a one-unit increase in

Annex Figure 2.5.2. Change in the Odds Ratio of Occurrence of Growth Episodes by Subsamples, 1970–2015
(Percent)

Annex Figure 2.5.3. Change in the Probability of Occurrence of Growth Episodes (Marginal Effect) Using Seven-Year Durations, 1970–2015
(Percentage points)

Source: IMF staff calculations.
Note: Vertical lines denote 90 percent confidence intervals. CTOT = commodity terms of trade.
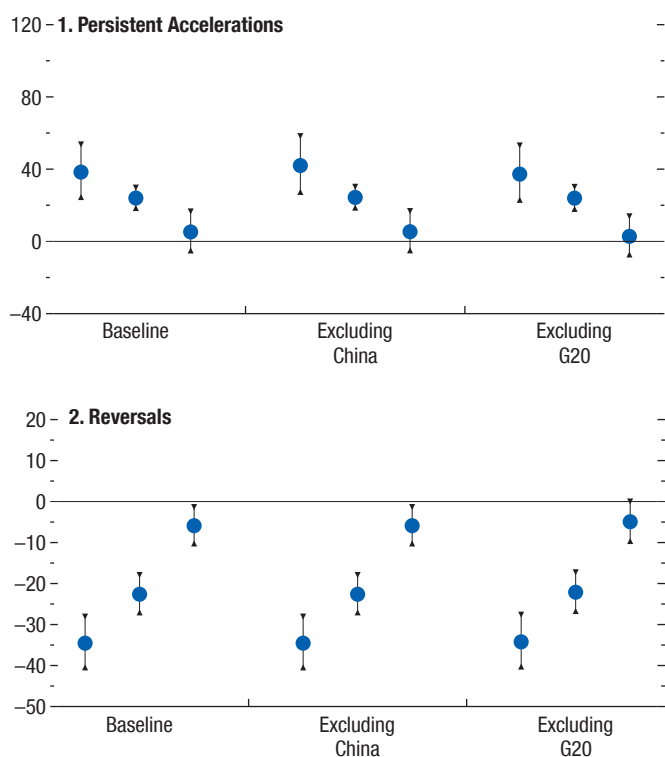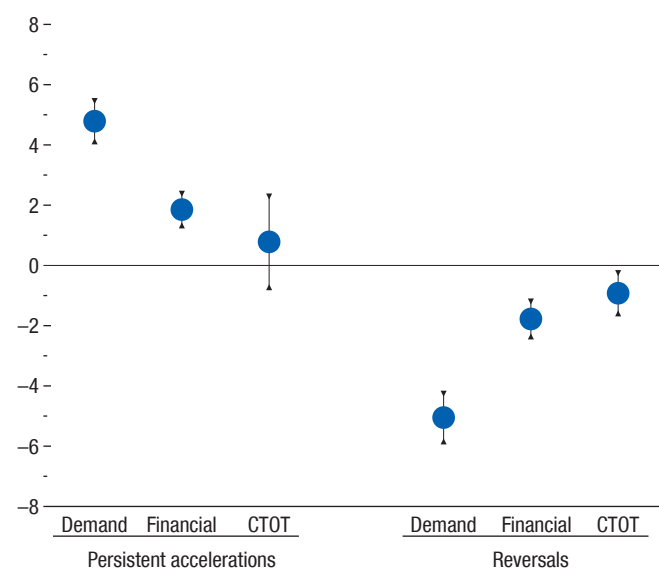
Source: IMF staff calculations.
Note: For each estimation procedure, the first estimation point refers to external demand conditions; the second estimation point refers to external financial conditions; and the third estimation point refers to commodity terms of trade. Vertical lines denote 90 percent confidence intervals. G20 = Group of Twenty.

each external condition for different sample splits. For both persistent accelerations and reversals, the results of the baseline specification of Annex Tables 2.5.1 and 2.5.2 are robust to the sample splits (that is, samples excluding China or Group of Twenty economies).

A second robustness test extends the horizon of the growth episode identification criteria of Annex 2.4 to seven years (thus, $h = 7$ instead of $h = 5$ in equation (2.9) as well as in all identification criteria in that section). The logit model (2.11) and its marginal effects represented by equation (2.12) are reestimated using the seven-year span for episodes. Annex Figure 2.5.3 reports the marginal effects of those reestimations. It shows that the marginal effects of external conditions are robust in terms of statistical significance to the change in the span of the episode. The point estimates

change slightly relative to those for the five-year episodes, but the pattern of statistical significance of the results is unchanged.

Channels through Which External Conditions Help Emerging Market and Developing Economies Narrow Income Differentials with Respect to Advanced Economies

The analysis in this section aims at understanding the role of external conditions in influencing the channels of physical capital deepening and other factors (documented in Annex 2.2) through which income gaps between emerging market and developing economies and advanced economies are narrowed. To this end, the persistent acceleration episodes listed in Annex Table 2.4.1 are further split into capital-led and non-capital-led accelerations.

Capital-led accelerations are those in which the contribution to growth during the episode from capital deepening (measured as described above using the capital-output ratio rather than capital per worker)[45]

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[45]See Klenow and Rodríguez-Clare (1997); Hall and Jones (1999); and Jones (2016).

Annex Figure 2.5.4. Change in the Probability of Occurrence of Persistent Accelerations (Marginal Effect) by Type of Acceleration, 1970–2015
(Percentage points)
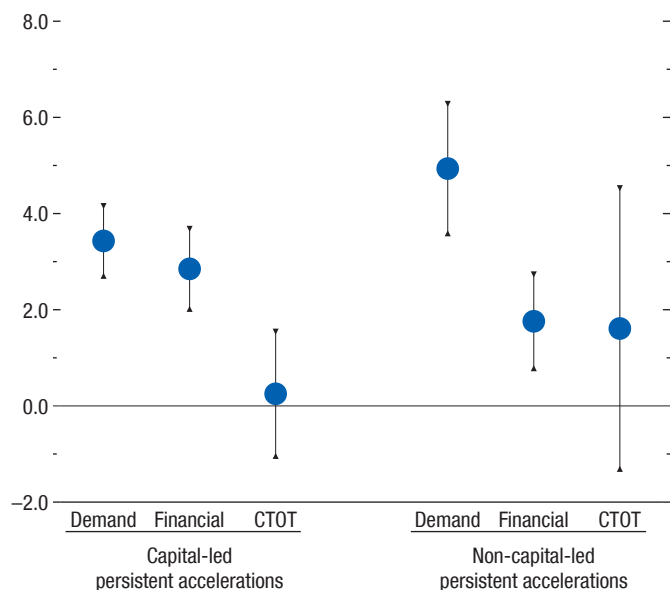
Source: IMF staff calculations.
Note: Vertical lines denote 90 percent confidence intervals. CTOT = commodity terms of trade.

exceeds the average contribution to growth from capital deepening for that country in the entire sample. The remaining acceleration episodes are classified as non-capital-led. Based on this criterion, there are 61 capital-led and 34 non-capital-led acceleration episodes in the set of identified persistent accelerations.

Annex Figure 2.5.4 reports the marginal effect of external conditions on the two episode probabilities. Favorable external demand raises the probability of non-capital-led acceleration episodes relatively more than the probability of capital-led episodes, whereas favorable external financing raises the probability of capital-led episodes more than the probability of non-capital-led episodes.

Annex 2.6. Analysis of Domestic Attributes in Mediating the Impact of External Conditions

This annex provides additional details on the empirical analysis carried out in the chapter's section on the role of policies and structural attributes. The analysis explores how policies and other domestic attributes may influence the impact of external conditions on the likelihood of acceleration of reversal episodes.

Free trade agreements: Data on flows of agreements by year of signature are obtained from the October 2016 *World Economic Outlook* (Chapter 2) using the Design of Trade Agreements database. This data set is complemented with the stock of free trade agreements in effect from the World Trade Organization Regional Trade Agreements database. The former builds on the latter, supplementing it with data from other multilateral institutions and national sources.

Financial depth: Financial depth is proxied by total assets held by deposit money banks as a share of GDP from the World Bank's Global Financial Development database.

Sound credit growth: While a deeper financial system is associated with increased access to finance and greater support for economic activity, a too-rapid expansion of credit may lead to vulnerabilities that end up undermining growth. The identification of excessive credit growth—or credit booms—follows Dell'Ariccia and others (2016).

Capital account openness: The index of de jure capital account openness is an update of the Quinn (1997) measure of capital controls, which draws from the narrative portion of the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. A higher value denotes fewer restrictions.

Current account balance: The current account balance as a share of GDP is from the IMF World Economic Outlook database.

Exchange rate flexibility: The degree of exchange rate flexibility is based on the de facto index developed by Aizenman, Chinn, and Ito (2010).

Public debt: The ratio of public debt to GDP from Mauro and others (2013) is used as a proxy for fiscal prudence.

Sound monetary framework: The quality of the monetary framework is proxied by the sound money index from Gwartney, Lawson, and Hall (2016). The index is a standardized measure that combines indicators on the growth of money supply, the level and volatility of inflation, and the possibility of owning foreign currency bank accounts, based on data from the *World Developments Indicators* (World Bank), *International Financial Statistics* and *Annual Report on Exchange Arrangements and Exchange Restrictions* (IMF), and United Nations National Accounts.

Regulation, legal system, and property rights: The indices on the quality of regulation, the legal system, and protection of property rights are from Gwartney, Lawson, and Hall (2016). A higher value is associated

with better quality of institutions. Each index compiles indicators from several sources, including the *Global Competitiveness Report* (World Economic Forum), *International Country Risk Guide* (Political Risk Services Group), *Doing Business* and *World Developments Indicators* (World Bank), and *International Financial Statistics* (IMF). Some individual indicators may be vulnerable to perception-based rankings and measurement uncertainties. However, by combining several indicators—including from international financial institutions that compile their data from national official sources—the constructed indices potentially have more comprehensive data coverage than a single indicator and may also be less sensitive to outliers and concerns about subjectivity.

Direct Effect of Domestic Policies and Attributes on the Likelihood of Growth Episodes

Before analyzing how policies and other domestic attributes affect the impact of external conditions on the likelihood of acceleration of reversal episodes, the direct effect of these domestic attributes on the likelihood of growth episodes is explored. To this end, a variation of the logit regression (2.11) described in Annex 2.5 is used in which X_{it} includes the moving average (between t–3 and t–1) of one domestic policy or attribute at a time. This allows for testing of whether the policy or domestic attribute variable significantly affects the likelihood of growth episodes—once the external conditions and country fixed effects are controlled for.

Annex Tables 2.6.1 and 2.6.2 report the results for persistent acceleration and reversal episodes, respectively. The coefficients on the domestic attribute variables indicate their impact, in percent, on the odds ratio of experiencing a growth episode versus not experiencing one: values below (above) 1 indicate lower (higher) odds of experiencing an episode versus not experiencing an episode for higher values of the domestic attribute variable. The results suggest that more financial depth, a sound monetary framework, and better quality of institutions significantly increase the odds ratio of a persistent acceleration episode (Annex Table 2.6.1). A sound monetary framework and more financial depth also significantly reduce the odds ratio of a reversal episode, whereas lower exchange rate flexibility increases the odds ratio of experiencing a reversal (Annex Table 2.6.2). To assess the economic relevance of these results, Annex Figure 2.6.1 shows the marginal effect (that is, the change

in the likelihood of a growth episode, in percentage points) when the policy or domestic attribute changes by an amount equivalent to moving from the 25th percentile to the 75th percentile of its sample distribution (in the case of the exchange rate regime, the 25th percentile corresponds to a fully flexible exchange rate regime, while the 75th percentile corresponds to a fixed exchange rate regime).

Exploring How the Impact of External Conditions on the Likelihood of Growth Episodes Depends on Policies and Other Domestic Attributes

To explore how domestic attributes affect the impact of external conditions on the likelihood of growth episodes, the baseline empirical specification (2.11) is modified to include interaction terms as follows:

$$\log\left(\frac{\Pr(episode_{it} = 1)}{1 - \Pr(episode_{it} = 1)}\right) =$$
$$\gamma z_{it} + \beta x_{it} + \delta(z_{it} \times x_{it}) + \alpha_i + \epsilon_{it}, \qquad (2.13)$$

in which z_{it} is one of the three country-specific external conditions; x_{it} is the moving average between t–3 and t–1 of the domestic policy or attribute in question; and α_i captures time-invariant country fixed effects. The estimates from the logit regression with interaction terms in (2.13) are then used to derive the marginal effects reported in Figures 2.19 and Annex Figure 2.6.2:[46]

- The exercise reported in Figure 2.19 is based on two sets of marginal effects: one in which the domestic attribute variable is set at a low value (the 25th percentile of its sample distribution) and one in which it is set at a high value (the 75th percentile of its sample distribution). In both cases, however, the external conditions variable is set at its sample median (interpreted as neutral external conditions). The bars in Figure 2.19 correspond to the difference between these two sets of marginal effects, interpreted as the change in the marginal effect of the external conditions variable as the domestic attribute improves; in the case of some variables, such as the exchange rate stability index, the credit boom indicator, and the external and public debt variables, the

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[46]The use of marginal effects is particularly relevant for exploring how domestic attributes affect the impact of external conditions on the likelihood of growth episodes, given that the coefficient of the interaction term in the nonlinear logit estimation using odds ratios (2.13) is not sufficient to infer how the effect of one independent variable depends on the magnitude of another independent variable (Ai and Norton 2003).

Annex Table 2.6.1. Logistic Estimates of the Effects of Policy Variables on the Odds Ratio of Persistent Accelerations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
External Demand	1.266***	1.296***	1.234***	1.382***	1.275***	1.285***	1.264***	1.268***	1.282***	1.352***	1.279***	1.293***	1.401***
	(0.088)	(0.094)	(0.091)	(0.110)	(0.088)	(0.093)	(0.097)	(0.090)	(0.104)	(0.109)	(0.104)	(0.103)	(0.143)
External Financial	1.200***	1.217***	1.209***	1.193***	1.223***	1.213***	1.224***	1.195***	1.204***	1.218***	1.213***	1.215***	1.215***
	(0.041)	(0.042)	(0.041)	(0.044)	(0.040)	(0.039)	(0.040)	(0.040)	(0.040)	(0.045)	(0.049)	(0.047)	(0.055)
Change in Terms of Trade	0.970	0.950	0.945	0.955	0.967	1.016	0.985	0.981	0.995	1.005	1.066	1.024	1.318
	(0.082)	(0.044)	(0.062)	(0.049)	(0.049)	(0.053)	(0.060)	(0.051)	(0.070)	(0.070)	(0.080)	(0.081)	(0.223)
Number of Trading Partners (Log)	0.928												0.916
	(0.088)												(0.112)
Financial Openness Index	0.813												
	(0.312)												
Deposit Money Banks' Assets to GDP		1.007**											1.009**
		(0.003)											(0.004)
Capital Account Openness				1.190									0.919
				(0.523)									(0.674)
Credit Booms					0.599								0.643
					(0.308)								(0.339)
Current Account Balance to GDP						0.979							0.960
						(0.022)							(0.024)
External Debt to GDP							1.000						1.002
							(0.001)						(0.002)
Exchange Rate Stability Index								0.586					1.539
								(0.204)					(0.768)
Public Debt to GDP									0.999				0.998
									(0.002)				(0.004)
Sound Monetary Framework Regulation										1.120**	1.018		0.975
										(0.063)	(0.101)		(0.155)
Legal System and Property Rights												1.189**	1.037
												(0.102)	(0.133)
Constant	0.017***	0.011***	0.011***	0.010***	0.011***	0.011***	0.011***	0.017***	0.013***	0.004***	0.011***	0.005***	0.008***
	(0.007)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.006)	(0.004)	(0.002)	(0.007)	(0.003)	(0.010)
Model Chi-Squared Test	44.99***	51.42***	49.63***	40.97***	56.28***	56.67***	54.39***	48.60***	48.73***	47.14***	37.43***	47.29***	45.49***
Number of Economies	113	116	114	92	115	116	116	114	115	103	103	105	81
Number of Observations	3,044	3,793	3,203	3,292	4,159	4,048	3,880	4,138	3,643	3,353	2,871	2,780	1,699

Source: IMF staff calculations.

Note: Estimations do not include country fixed effects. ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively. The coefficients report changes in the odds ratio of persistent accelerations. Value greater (smaller) than 1 indicates increase (decrease) in the odds ratio relative to the unconditional odds. Robust standard errors are reported in parentheses.
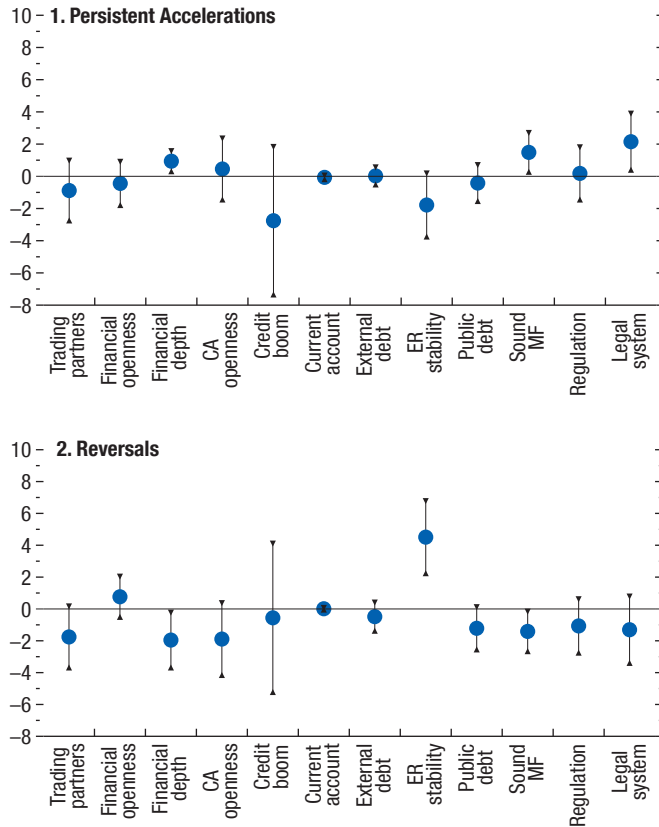
Annex Table 2.6.2. Logistic Estimates of the Effects of Policy Variables on the Odds Ratio of Reversals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
External Demand	0.820**	0.694***	0.686***	0.705***	0.806***	0.731***	0.717***	0.694***	0.755***	0.700***	0.702***	0.749***	0.607***
	(0.063)	(0.052)	(0.057)	(0.059)	(0.049)	(0.048)	(0.051)	(0.048)	(0.057)	(0.055)	(0.067)	(0.083)	(0.097)
External Financial	0.783***	0.774***	0.740***	0.786***	0.804***	0.804***	0.779***	0.809***	0.784***	0.790***	0.715***	0.691***	0.701***
	(0.050)	(0.040)	(0.046)	(0.048)	(0.036)	(0.037)	(0.038)	(0.038)	(0.039)	(0.043)	(0.053)	(0.043)	(0.053)
Change in Terms of Trade	0.842	0.943	0.946	0.896**	0.940	0.953	0.960	0.936*	0.967	0.983	0.969	1.024	0.777
	(0.097)	(0.043)	(0.066)	(0.049)	(0.038)	(0.049)	(0.046)	(0.036)	(0.055)	(0.060)	(0.075)	(0.091)	(0.149)
Number of Trading Partners (Log)	0.827												0.768
	(0.098)												(0.152)
Financial Openness Index		1.315											
		(0.364)											
Deposit Money Banks' Assets to GDP			0.988*										0.987
			(0.007)										(0.011)
Capital Account Openness				0.504									1.183
				(0.242)									(1.128)
Credit Booms					0.926								2.289
					(0.363)								(1.532)
Current Account Balance to GDP						1.003							0.967
						(0.007)							(0.036)
External Debt to GDP							0.999						1.005***
							(0.001)						(0.002)
Exchange Rate Stability Index								2.783***					2.410
								(0.865)					(1.834)
Public Debt to GDP									0.997				0.992
									(0.002)				(0.007)
Sound Monetary Framework										0.925*			
										(0.039)			
Regulatory System											0.907		0.723
											(0.084)		(0.144)
Legal System and Property Rights												0.913	1.165
												(0.081)	(0.183)
Constant	0.383***	0.566*	1.030	0.701	0.359***	0.481***	0.614*	0.268***	0.567*	0.979	1.181	0.955	3.205
	(0.131)	(0.165)	(0.322)	(0.241)	(0.088)	(0.122)	(0.169)	(0.093)	(0.170)	(0.387)	(0.648)	(0.471)	(5.641)
Model Chi-Squared Test	42.95***	45.73***	55.70***	50.31***	39.71***	45.60***	50.82***	61.38***	42.21***	40.44***	43.97***	50.45***	72.65***
Number of Economies	113	116	114	92	115	116	116	114	115	103	103	105	81
Number of Observations	3,044	3,793	3,203	3,292	4,159	4,048	3,880	4,138	3,643	3,353	2,871	2,780	1,699

Source: IMF staff calculations.
Note: Estimations do not include country fixed effects. ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively. The coefficients report changes in the odds ratio of persistent accelerations. Value greater (smaller) than 1 indicates increase (decrease) in the odds ratio relative to the unconditional odds. Robust standard errors are reported in parentheses.
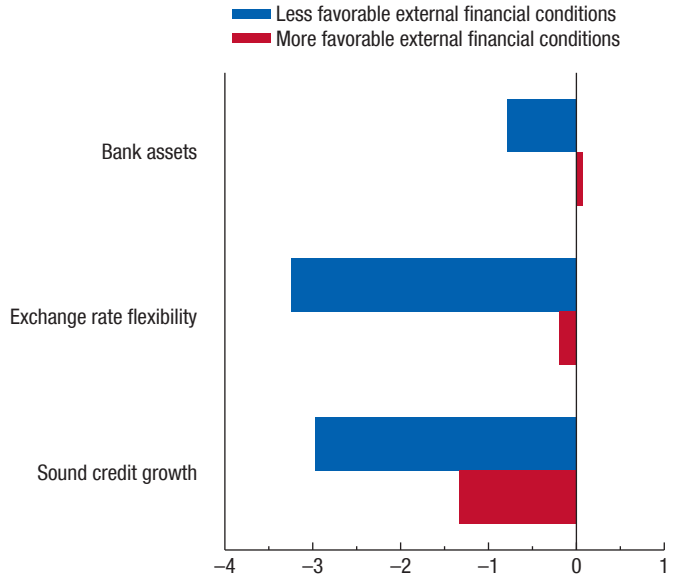
Annex Figure 2.6.1. Change in the Probability of Occurrence of Growth Episodes (Marginal Effect), 1970–2015
(Percentage points)

Annex Figure 2.6.2. Reversals: Change in the Marginal Effect of External Financial Conditions When Selected Domestic Attributes Improve
(Percentage points)

Source: IMF staff calculations.
Note: The figure shows the change in the marginal effect of external financial conditions on the likelihood of reversal episodes when the domestic attribute variable is evaluated at the 75th versus at the 25th percentile of its distribution. Less (more) favorable external financial conditions correspond to the 25th (75th) percentile of their sample distribution. A negative value implies a further reduction in the probability of a reversal.

Source: IMF staff calculations.
Note: Vertical lines denote 90 percent confidence intervals. The figure shows the marginal effect of a given change in each domestic attribute evaluated at its mean. The magnitude of the change corresponds to an increase from the 25th to the 75th percentile of its sample distribution. CA = capital account; ER = exchange rate; MF = monetary framework.

comparison is reversed to represent an improvement in the domestic attribute. The test of the difference in marginal effects assumes a *t*-distribution.
• The exercise reported in Annex Figure 2.6.2 shows the change in the marginal effect of external financial conditions as selected domestic attributes

improve, but when external financial conditions are relatively favorable or unfavorable—rather than neutral. To this end, additional marginal effects are computed with the external conditions variable evaluated at two alternative values (for each value of the domestic attribute variable): a low value (the 25th percentile of its sample distribution) representing relatively adverse external conditions, and a high value (the 75th percentile of its sample distribution) representing relatively favorable external conditions.

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