LATIN AMERICA

NEW CHALLENGES TO GROWTH AND STABILITY

Editors
Dora Iakova, Luis M. Cubeddu, Gustavo Adler, and Sebastián Sosa
## Contents

Acknowledgments v

Introduction vii

*Dora Iakova*

### PART I LATIN AMERICA'S GROWTH PROSPECTS

1 Latin America: Rising to New Challenges .............................................................. 3

*Dora Iakova, Sebastián Sosa, and Alejandro Werner*

2 Potential Growth in Latin America ........................................................................ 17

*Sebastián Sosa, Evridiki Tsounta, and Hye Sun Kim*

3 After the Boom: Commodity Prices and Economic Growth in Latin America and the Caribbean .................................................... 39

*Bertrand Gruss*

### PART II MANAGING THE COMMODITY PRICE CYCLE:

**HAVE POLICIES IMPROVED?** ............................................................................... 69

4 Commodity Price Cycles: The Perils of Mismanaging the Boom .................. 71

*Gustavo Adler and Sebastián Sosa*

5 Terms-of-Trade Booms: Saving-Investment Patterns and a New Metric of Income Windfall .................................................... 95

*Gustavo Adler and Nicolas E. Magud*

6 External Conditions and Debt Sustainability in Latin America .................. 117

*Gustavo Adler and Sebastián Sosa*

7 Has Fiscal Policy Become Less Procyclical in Latin America? ...................... 149

*Alexander Klemm*

### PART III IS LATIN AMERICA VULNERABLE TO RISING CAPITAL FLOW VOLATILITY?


*Gustavo Adler and Camilo E. Tovar*
| Page | Title                                                                 | Authors                                                                 
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Global Financial Shocks and Gross Capital Flows in Latin America</td>
<td>Gustavo Adler, Marie L. Djigbenou, and Sebastián Sosa</td>
</tr>
<tr>
<td>10</td>
<td>Spillovers to Latin America from the</td>
<td>Alexander Klemm, Andre Meier, and Sebastián Sosa</td>
</tr>
<tr>
<td></td>
<td>Normalization of U.S. Monetary Policy</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Housing Markets in Latin America:</td>
<td>Luis Cubeddu, Camilo E. Tovar, and Evridiki Tsounta</td>
</tr>
<tr>
<td></td>
<td>Do We Need to Worry About a Bubble?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Index</td>
<td></td>
</tr>
</tbody>
</table>

©International Monetary Fund. Not for Redistribution
Acknowledgments

This book is based on research done by the Western Hemisphere Department’s Regional Studies team at the International Monetary Fund. Earlier versions of some of the chapters were published in the IMF’s *Regional Economic Outlook: Western Hemisphere* between 2012 and 2014.

The authors are grateful for comments and feedback from IMF colleagues, particularly Alejandro Werner, Nicolás Eyzaguirre, Miguel Savastano, Charles Kramer, Rodrigo Valdés, and Gian Maria Milesi-Ferretti. The chapters also benefited from comments from participants in seminars at the IMF and at Latin American central banks, academic institutions, the Latin American and Caribbean Economic Association, and the Center for Latin American Monetary Studies. Excellent research assistance was provided by Bennett Sutton, Alejandro Carrión, Marola Castillo, Andrea Lagerborg, Hye Sun Kim, Anayochukwu Osueke, and Carlos Rondón. Assistance in the production of this book was provided by Patricia Delgado Pino. Joanne Johnson of the Communications Department coordinated editing and production.
Introduction

DORA IAKOVA

Latin America had a remarkable economic performance in the first decade of the 2000s. Real output grew at a rapid pace, inflation was low and relatively stable, public debt declined significantly, and international reserves increased. The economic prosperity was broadly shared: income inequality declined in many countries and there was a sharp reduction in poverty rates. Although prudent policies and skillful economic management contributed to these achievements, exceptionally favorable external conditions played a key role, acting as a catalyst for growth. Strong demand for the region’s commodity exports led to a wave of investment and an unprecedented income windfall, while easy global financial conditions pushed financing costs to record lows. The global recession of 2009 made only a temporary dent in the region’s growth ascent. In the two years following the crisis, many countries posted record-high growth rates.

More recently, however, Latin America has faced rising economic challenges. The external tailwinds that helped propel growth in the past are fading. Commodity prices have eased based on concerns about China’s ability to sustain high rates of investment-led growth. In the months following the May 2013 announcement by the Federal Reserve that monetary policy in the United States would gradually normalize, global financial conditions tightened and volatility in financial markets increased. At the same time, domestic bottlenecks have constrained the pace of growth in many Latin American countries. As a result, economic activity has decelerated across the region, and real output growth is expected to be only 1¼ percent in 2014, compared with 6 percent in 2010.

The chapters in this book address questions that are currently at the heart of the economic policy debate on Latin America. Can the region maintain high rates of economic growth in the medium term? How vulnerable is Latin America to a reversal of commodity prices? Have countries saved a sufficient share of the income windfall from the commodity price boom? Are fiscal fundamentals strong enough to withstand a deterioration of external conditions? Will there be significant spillovers from the normalization of U.S. monetary policy? Is the region well prepared to deal with new global financial shocks and increased capital flow volatility? The insights from these studies have provided the basis of an ongoing and forward-looking policy dialog with authorities across Latin America in the context of regional surveillance by the International Monetary Fund’s Western Hemisphere Department.

Part I of this volume analyzes Latin America’s medium-term growth prospects. The opening chapter by Dora Iakova, Sebastián Sosa, and Alejandro Werner provides an overview of the main economic challenges faced by the region and discusses policies to address them. The key recommendation is that in order to achieve sustainable growth, policymakers need to give priority to microeconomic
reforms to help improve educational outcomes, close infrastructure gaps, and increase productivity growth.

In Chapter 2, Sebastián Sosa, Evridiki Tsounta, and Hye Sun Kim analyze the drivers of growth in Latin America during the period 1970–2012 from a supply-side perspective. The strong growth in the first decade of the 21st century was made possible by a significant increase in factor utilization, especially labor. However, in the coming years the pace of economic activity will depend increasingly on rising total factor productivity, as labor participation is already at relatively high levels and investment is likely to be affected by the expected tightening of financial conditions and the stabilization of commodity prices.

Turning to the effect of external conditions on growth, in Chapter 3 Bertrand Gruss presents an innovative empirical analysis of the effects of the end of the commodity price boom on Latin America’s economic prospects. His results suggest that medium-term growth for the region would be significantly lower than during the boom years, even if commodity prices were to remain flat at their current high levels.

Part II distills policy lessons from past episodes of terms-of-trade shocks and explores whether the region has built strong enough buffers during the boom years to guard against a deterioration in external conditions. In Chapter 4, Gustavo Adler and Sebastián Sosa assess the vulnerability of Latin America to a reversal in commodity prices. They document that the region remains heavily dependent on commodity exports, and find that a country’s vulnerability to swings in commodity prices is largely determined by the strength of its fundamentals and its macroeconomic policy framework. Limited exchange rate flexibility, large underlying current account deficits, and a weak fiscal position tend to amplify the effects of adverse terms-of-trade shocks on domestic output. Financial dollarization also appears to act as a shock amplifier. With improved fundamentals in many of these dimensions, the region today appears better placed to cope with commodity price volatility than it was in the past.

In Chapter 5, Gustavo Adler and Nicolas E. Magud present a new data set on terms-of-trade booms across the world over the last 40 years and develop a measure of the associated income windfall. They find that Latin America’s terms-of-trade shocks in the 2000s were of a similar magnitude to those observed during the 1970s. However, the associated income windfalls have been substantially larger in the 2000s because the region has become more open to trade. In some countries, such as Venezuela, Bolivia, and Chile, the additional income from the commodity price boom in the 2000s is estimated to have exceeded 150 percent of GDP. The chapter finds that aggregate savings during the recent boom in Latin America increased more than in past boom episodes, but that the share of the windfall saved (the marginal saving rate) was lower than in the past. The authors conclude that the marked improvement of economic fundamentals in the region largely reflects the sheer size of the positive income shock, rather than greater efforts to save that income.

Strong fiscal policy frameworks are critical for managing macroeconomic volatility triggered by external shocks. In Chapter 6, Gustavo Adler and Sebastián Sosa tackle the question of whether the region has built sufficient fiscal buffers to mitigate the effects of a less-favorable external environment in the coming years.

©International Monetary Fund. Not for Redistribution
They examine empirically the link between global factors (such as commodity prices, world growth, and global financial market conditions) and key domestic variables (GDP growth, trade balance, real exchange rate, and sovereign spreads) that drive public and external debt dynamics. The results suggest that several countries in the region (such as Bolivia, Chile, Paraguay, Peru) have sufficiently strong fiscal and external positions to withstand moderate to severe external shocks, but many countries would benefit from building stronger buffers.

In Chapter 7, Alexander Klemm shows that fiscal policy procyclicality remains an issue in the region, though several countries have strengthened their policy frameworks and reduced policy procyclicality over the last decade.

Part III focuses on Latin America’s ability to cope with renewed capital flow volatility, and offers policy advice informed by the experiences of emerging market economies during historical episodes of financial turbulence. In Chapter 8, Gustavo Adler and Camilo E. Tovar study the role of financial integration and macroeconomic fundamentals in mitigating or amplifying the output effects of global financial shocks on Latin America and other emerging market economies. They establish that better fundamentals, such as exchange rate flexibility and a robust external position, strengthen an economy’s resilience to shocks. Moreover, greater financial integration amplifies global financial shocks in countries with fixed exchange rate regimes, but mitigates them in countries with flexible exchange regimes.

When nonresident investors withdrew capital from Latin America during the global financial crisis of 2009, in some cases residents played a stabilizing role by repatriating capital. It is an open question whether local investors will continue to play such a stabilizing role in future periods of capital flow volatility. In Chapter 9, Gustavo Adler, Marie L. Djigbenou, and Sebastián Sosa find that residents tend to repatriate capital to their home countries in the face of global uncertainty shocks (possibly reflecting asymmetric information or a home bias), but less so in response to increases in U.S. interest rates.

In Chapter 10, Alexander Klemm, Andre Meier, and Sebastián Sosa discuss potential spillovers to Latin America in the process of normalization of U.S. monetary policy. They conclude that the effects would likely be limited in a gradual normalization scenario, driven by improving growth prospects in the United States. Nonetheless, important risks remain. Renewed volatility in U.S. bond yields could trigger large moves in emerging market bond prices, especially if it were to coincide with other negative shocks to investor sentiment, such as adverse political or economic developments in emerging markets. Based on evidence from the mid-2013 taper tantrum, countries with domestic or external weaknesses would be especially vulnerable.

Housing market busts have been a trigger or a major channel of propagation of financial crises in the advanced economies. In the final chapter, Luis Cubeddu, Camilo E. Tovar, and Evridiki Tsounta explore whether the housing market is a potential source of vulnerability in Latin America. Their results indicate that housing prices do not appear to be significantly overvalued, though the rapid growth of mortgage credit in recent years (some of it extended by public banks) is a potential source of concern, as interest rates are set to increase, while growth is moderating.
PART I

Latin America’s
Growth Prospects
CHAPTER 1

Latin America: Rising to New Challenges

DORA IAKOVA, SEBASTIÁN SOSA, AND ALEJANDRO WERNER

Over the past 15 years, the countries of Latin America have made tremendous progress in strengthening their economies and improving living standards. A growing and vibrant middle class has emerged. The weight of the region in global economic output increased from about 6 percent in the 1990s to 8 percent in 2012. The region has also achieved impressive gains in terms of macroeconomic and financial stability. Real output growth has been strong and steady, inflation has been low and well contained in most countries, and international reserves have increased significantly. Public debt has fallen, and most countries no longer suffer from “the original sin”—the inability to borrow abroad in their domestic currency—with government debt now issued mostly in local currency. The adoption of flexible exchange rate regimes has strengthened the resilience of countries to external shocks. Financial deepening has proceeded at a steady pace in the context of overall sound and resilient financial systems. These achievements helped the region weather the global financial crisis relatively unscathed. Although output fell temporarily, most countries staged a rapid recovery supported by countercyclical policy.

This success has owed much to good policies. The implementation of important structural reforms and the liberalization of trade in the 1990s, together with the establishment of stronger institutions and credible policy frameworks, provided the foundations for the economic resurgence. But good luck in the form of very favorable external conditions has also played a key role. Commodity prices rose sharply between 2003 and 2011, providing an unprecedented income windfall for Latin America’s commodity exporters. At the same time, global financial conditions eased progressively (apart from a temporary tightening during the 2009 global financial crisis), lowering the cost of debt for governments and corporations. These twin tailwinds helped propel economic growth and strengthen public finances.

More recently, however, Latin America has been facing rising challenges, both domestic and external. Externally, the favorable tailwinds that propelled growth in the recent past are turning into headwinds. Commodity prices have eased from their 2011 peaks and are expected to stay broadly flat or soften further in the medium term. Global financial conditions have started to tighten since mid-2013 when long-term interest rates in the United States increased from historically low levels.
Domestically, the pace of growth in Latin America has been increasingly constrained by supply-side bottlenecks, including low investment rates, inadequate infrastructure, slowing labor force growth, and skill mismatches. Several years of strong bank credit growth and bond issuance have resulted in some increase in private sector leverage, increasing vulnerability to a growth slowdown or tightening of financial conditions.

At the same time, with improved living standards and a growing middle class, demands for better public services are on the rise. Students are asking for better publicly funded education, firms expect infrastructure upgrades and a more business-friendly environment, and social pressures are mounting to alleviate poverty and provide greater opportunities for social mobility. Despite a marginal decline in income inequality in recent years, Latin American societies remain among the most unequal in the world.

Demographic developments will add another hurdle to economic prospects going forward. Latin America is currently reaping a demographic dividend, with very low dependency ratios and relatively low spending on pensions and health. However, this trend is projected to turn around by 2020, with dependency ratios rising quickly thereafter. This will constrain growth in living standards unless productivity increases substantially.

This chapter discusses how Latin America can build on its achievements to address these new challenges. With renewed commitment to growth-oriented reforms, the region can achieve lasting prosperity and stability.

**EXCEPTIONAL GAINS**

The period from 2003–12 was a time of exceptional gains in living standards for Latin America. Real GDP growth reached an annual average of 4.8 percent—close to two times higher than the growth rate in the 1980s and 1990s (Figure 1.1). The growth momentum was accompanied by an impressive strengthening of macroeconomic fundamentals and policy frameworks. Public sector balance sheets improved substantially, and external debt levels declined. Inflation remained low and relatively stable in most countries, in sharp contrast to the high inflation rates characteristic of the region in previous decades (Figure 1.2).

Most countries took advantage of the favorable economic conditions to improve their fiscal positions in the years prior to the global financial crisis. Chapter 6 in this volume documents that many countries ran substantial primary fiscal surpluses, leading to a marked reduction in public debt levels (amounting to 30 percentage points of GDP on average during 2003–08). At the same time, the currency composition and maturity structure of the debt improved significantly (Figure 1.3). The average share of foreign-currency debt in total public debt declined from 65 percent in the early 2000s to 45 percent in 2012. Moreover, average debt maturity increased, with the share of short-term debt in total public debt falling from over 10 percent of GDP in the early 2000s to about 6 percent by 2012.

External positions also strengthened across Latin America. In contrast with previous periods of rapid growth in the region, the high-growth episode prior to
Figure 1.1  Latin America: Real GDP Growth (Percent)
Source: IMF, April 2014 World Economic Outlook.
Note: Measured as a simple average of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

Figure 1.2  Latin America: Annual Inflation (Percent)
Source: IMF, April 2014 World Economic Outlook.
Note: Measured as a simple average of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela.
the global financial crisis was accompanied by a significant improvement in current account balances. The more financially integrated countries in the region went from an average current account deficit of 2½ percent of GDP during 1997–2002 to a surplus of ½ percent of GDP in 2004–07 (Figure 1.4).¹ Gross external debt levels declined by more than 30 percentage points of GDP on average during this period (though some of the decline was due to a trend

¹As indicated in Figure 1.4, the more financially integrated Latin American countries are defined here as Brazil, Chile, Colombia, Mexico, Peru, and Uruguay.
appreciation of local currencies). In addition, the composition of capital inflows improved in the 2000s, with foreign direct investment accounting for a much larger share of inflows than in the previous decade. Countries also used a greater share of these inflows to build up international reserves and private sector foreign assets. Along with a much greater role for flexible exchange rates to act as a shock absorber, this buildup of external buffers led to a notable reduction in the region’s vulnerability to negative external shocks.

Bank soundness indicators also generally improved during the period, despite relatively strong credit growth over a number of years. After a history of repeated banking crises in past decades, banks in the region have behaved relatively conservatively in the 2000s, maintaining high deposit-to-loan ratios and strong capital and liquidity ratios. Improving supervision and regulation have also helped maintain the soundness of the financial system.

Gains in economic prosperity have been broadly shared. Employment rates for both males and females increased in most countries and there was a sharp reduction in poverty. Absolute poverty rates fell more than 10 percentage points between 2002 and 2010, lifting more than 55 million people out of poverty.2 Contrary to the trends in other emerging and advanced economies, income distribution improved over the past decade. The region’s robust output and employment growth, and its success in bringing down inflation, played a decisive role in reducing poverty and inequality. Other contributing factors include increased government transfers to the poor (especially through targeted programs such as Brazil’s Bolsa Familia, Chile’s Ingreso Etico Familiar, and Mexico’s Oportunidades), and a narrowing wage gap between skilled and low-skilled workers (Lopez-Calva and Lustig, 2010; Tsounta and Osueke, 2014).

This extraordinary success has been underpinned by an increased social consensus on the importance of macroeconomic stability. Macroeconomic policies remained prudent in most of the region, despite successive transfers of power between elected governments of different political orientations. Many countries strengthened policy institutions and established credible monetary and fiscal policy frameworks. Some countries introduced formal fiscal rules and established stabilization funds, entrenching fiscal discipline in the law and reducing the tendency to run procyclical fiscal policy, which had been very common in the past (see Chapter 7). The adoption of credible inflation-targeting regimes, accompanied by greater exchange rate flexibility, played a key role in anchoring inflation expectations and reducing vulnerability to external shocks.

The significant improvement in policies and fundamentals was rewarded by the market, with credit ratings improving across all countries during the decade. In 2012, six of the eight largest Latin American countries had investment-grade ratings, compared with only two in 2003. Bond spreads declined sharply and market access improved across the board.

---

Better macroeconomic management and stronger fundamentals also helped Latin America weather the global financial crisis of 2008–09 relatively unscathed.\(^3\) Improved government finances, reduced external debt, higher international reserves, more flexible exchange rates, and strengthened financial regulation and oversight all played a role in limiting the impact of the crisis on the region. In contrast to past crisis episodes (such as in 1982, 1998, and 2001), the region was well positioned to mitigate the external shock by implementing countercyclical stimulus. Practically for the first time in living memory, governments and central banks in many countries expanded public spending and reduced interest rates in the face of the global recession. Meanwhile, currency depreciations helped Latin American countries cope with the drop in external demand, without causing a spike in inflation or creating financial system turmoil.

While prudent policies explain part of Latin America’s success over the past decade, exceptionally favorable external conditions played an important role as well. Commodity prices almost tripled in U.S. dollar terms between 2003 and 2012, creating an unprecedented rise in the terms of trade for the region’s commodity exporters. As documented in Chapter 5, the income windfall associated with that commodity boom was much larger than in previous episodes. The average annual increase in income for the commodity exporters was 15 percent per year, with a cumulative average windfall over the episode of 100 percent of GDP. The largest gains accrued to Bolivia, Chile, and, especially Venezuela (for which the estimated cumulative income windfall was 300 percent of GDP). The terms-of-trade boom provided significant stimulus to domestic demand and output growth. Indeed, growth over the past decade was far stronger among South America’s net commodity exporters than it was in the rest of Latin America (Mexico and Central America) (Figure 1.5).

At the same time, the region enjoyed extremely favorable external financing conditions, with ample access to cheap credit, interrupted only temporarily by the 2008–09 crisis. Record low international interest rates, abundant liquidity in global financial markets, and strong risk appetite among global investors caused external spreads and interest rates to decline significantly across the region (Figure 1.6). This benefited not only sovereigns, but also private firms, which stepped up issuance of corporate bonds. Easier external financing conditions also spilled over into domestic-currency markets, fueling strong credit growth and providing further stimulus to economic activity. These two tailwinds helped propel growth and establish a virtuous cycle of strong growth, falling interest rates, and improving debt dynamics.

The countries were well-positioned to take advantage of these tailwinds given their cyclical position. In the early 2000s, most countries started from a position of substantial economic slack, with high unemployment rates and low labor participation rates. The favorable external environment stimulated growth without putting pressure on domestic resources.

\(^3\)See De Gregorio (2014) for a more detailed discussion.
Figure 1.5 Latin America: Commodity Exporters versus Noncommodity Exporters

Sources: IMF, April 2014 World Economic Outlook; and IMF staff calculations.
Note: Measured as a simple average of annual data. Commodity exporters include Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela. Noncommodity exporters include Costa Rica, El Salvador, Honduras, Mexico, and Nicaragua.

Figure 1.6 Latin America Bond Yields and U.S. 10-Year Treasury Bond Yield (Percent)

Sources: Board of Governors of the Federal Reserve System; and Bloomberg, L.P.
Note: Latest observation is from August 30, 2014. EMBI = Emerging Market Bond Index.
DARKER CLOUDS ON THE HORIZON

All of these positive developments notwithstanding, a note of caution is in order when interpreting developments during Latin America’s “golden decade.” Much of the improvement in economic fundamentals took place during the period 2003–08. Since the global financial crisis, some of these favorable trends have been reversed, with current account and fiscal balances deteriorating in a number of countries. It appears that in the initial years of the commodity price boom, governments acted on the belief that the gains were likely to be temporary and saved part of the windfall. This prudent approach paid off during the sharp global downturn in 2009. However, as commodity prices recovered and kept rising after the crisis, governments increasingly perceived the positive commodity price shock as permanent and adjusted their spending behavior. The adoption of more accommodative policies resulted in overheating pressures and a widening of external imbalances in a number of countries during 2010–13, increasing vulnerabilities to external shocks.

More recently, the external environment has turned less favorable for Latin America’s commodity exporters. Commodity prices have softened since their peak in 2011, and are projected to moderate further in the medium term as demand from large emerging market economies (EMEs) is expected to decelerate (Figure 1.7) (IMF, 2014a). Even though prices remain high by historical standards, countries can no longer count on the tailwinds from steadily improving terms of trade. Chapter 3 finds that even if commodity prices simply stop growing and stabilize at their current levels, average output growth of Latin America’s commodity exporters would be about one percentage point lower than in 2010–12.

At the same time, the strong tailwind from ultra-low external financing costs is also coming to an end. Long-term U.S. interest rates have started to rise, with knock-on effects for EMEs’ financing costs. After May 2013, when the Federal Reserve first raised the possibility of tapering its bond purchases, bond yields in Latin America and other EMEs increased, equity prices fell sharply, and

Figure 1.7  Commodity Prices (2005 = 100; index)
Sources: Haver Analytics; and IMF, April 2014 World Economic Outlook.
Note: Shaded area refers to projections.

©International Monetary Fund. Not for Redistribution
currencies weakened (Figure 1.8). There has been renewed appetite for emerging market assets since then, and financial conditions remained fairly benign as of mid-2014. However, volatility is likely to increase again when the Federal Reserve starts to raise interest rates.4

Against this backdrop, economic activity across the region has been cooling off. Growth in Latin America declined from about 6 percent in 2010 to below 3 percent in 2013, and is projected to drop further to 1.3 percent in 2014, the lowest rate in 12 years (excluding 2009). However, it would be incorrect to attribute all of the recent slowdown to external conditions. Domestic supply

---

4 As discussed in Chapter 10, a gradual increase in U.S. rates, driven by positive developments in the economy, should have a relatively moderate effect on Latin America, with some differences across countries. Close U.S. trading partners such as Mexico and Central America would benefit more from positive trade spillovers than would South America’s commodity exporters. Of greater concern is the risk of a pure U.S. interest rate shock, for example prompted by a rise in inflation in the United States, or a renewed bout of volatility affecting the prices of emerging market assets.
Constraints are playing an important role in a number of countries. During the golden decade, employment growth was a major driver of economic growth, but unemployment rates already reached historical lows in many countries by 2012. There is also limited room to further increase labor force participation rates, which are already relatively high by international standards (though there is scope to raise female labor participation rates in some cases). Looking further ahead, demographic factors will become an increasing constraint on employment growth. The dependency ratio is expected to start to rise in a number of countries around 2020.

Compounding these challenges, the region suffers a serious and chronic shortage of human capital, with only a small share of the labor force occupied in high-skill professions. Poor schooling outcomes appear to be the main culprit. Indeed, the proficiency of the average Latin American student lags well behind that of peers in the rest of the world. Latin American countries have scored persistently among the weakest 20 percent in the rankings of the Program for International Student Assessment, despite levels of education spending that do not appear to be unusually low compared to other economies at similar income levels (Figure 1.9).

In addition, Latin America continues to have relatively low investment rates, especially compared to EMEs in Asia. As a result, many countries have inadequate physical infrastructure, including in transport, energy, and telecommunications. For example, physical infrastructure bottlenecks have been a significant constraint on activity in Brazil, while energy shortages have curbed production in Argentina and Venezuela.

These persistent challenges point to a broader gap in microeconomic reform efforts in the region. There is a clear need to improve educational outcomes, increase government efficiency, address perceptions of corruption, strengthen

![Figure 1.9 Latin America: Structural Performance Indicators, Percentile Ranks](image)


Note: The scale reflects the percentile distribution of all countries for each respective survey; higher scores reflect higher performance.
security, and enhance the business environment. These deficiencies did not hold back growth during the commodity bonanza, but are clearly constraining it now. With output close to potential, maintaining growth requires greater investment and productivity gains, so emphasis on enabling reforms is critical.

Meanwhile, the macroeconomic fundamentals in much of the region have weakened somewhat compared to the period before the global financial crisis. First, current accounts have widened in many countries, increasing their vulnerability to a reversal of capital flows or to adverse terms-of-trade movements. Second, a prolonged period of high credit growth and strong external corporate bond issuance may have created pockets of financial vulnerability in the private sector. Third, the fiscal stimulus put in place during the crisis was not fully withdrawn in the following years. As a result, public debt stopped declining, and even increased in a few countries.

Looking at the fiscal accounts more closely, primary public expenditure has increased steadily as a share of GDP since 2009, while the growth in fiscal revenues has started to moderate. The slowdown of revenues is likely to persist in the medium term as a consequence of weaker commodity-related revenues and lower economic growth. At the same time, pressures to raise public spending remain high, reflecting increased demands for better public services and crucial infrastructure needs. The protests in Chile, Brazil, and elsewhere in recent years are a reflection of the increased social activism of the growing middle class. In the longer term, rising interest costs and aging-related spending would further add to spending pressures. Maintaining fiscal discipline will thus be a serious challenge, requiring difficult choices.

What Should Policymakers Do?

Addressing these challenges will require a clear focus on structural reforms to boost potential growth, while preserving the gains in macroeconomic stability. It will be important to preserve credible policy frameworks, carefully calibrate macroeconomic policies, and maintain strong external and fiscal buffers to cope with adverse shocks.

Calibrating macroeconomic policies appropriately to the new reality is a priority. Even though near-term growth is projected to remain below recent cyclical highs, output is generally close to potential. Still-tight labor markets, infrastructure bottlenecks, and sizable current account deficits all suggest limited spare capacity in most of the larger countries. The analysis in Chapter 2 suggests that potential growth in the medium term will also be significantly lower than growth during the boom years. In this context, countering the current slowdown with fiscal stimulus is not warranted. A neutral fiscal stance is appropriate in countries with strong public finances and low external current account deficits, while other countries should aim for gradual consolidation to put debt firmly on a downward path. Countercyclical fiscal stimulus would be recommended only in the event of a sharp slowdown in activity amid evidence of considerable economic slack, and only for countries with sufficient fiscal space.
Monetary policy and flexible exchange rates should provide the first line of defense to cope with external shocks and cyclical downturns. As demonstrated recently, countries with low inflation and well-anchored inflation expectations retain flexibility to ease monetary policy in response to a growth slowdown even in an environment of rising global interest rates. Large international reserve positions are an additional source of strength. All of the more financially integrated countries in Latin America have sufficient reserves to provide foreign exchange liquidity if faced with disorderly market conditions. Temporary interventions to smooth excessive exchange rate volatility could also be justified in some cases, although they should not be used to defend fundamentally misaligned exchange rates or as a substitute for macroeconomic policy adjustments. Indeed, exchange rate flexibility remains a critical instrument to facilitate the rebalancing of demand in response to shocks.

Similarly, strong and proactive financial sector regulation and supervision are crucial to safeguard financial stability in the region. Banks in the more financially integrated countries generally have sound capital and liquidity ratios, good asset quality, strict limits to open foreign exchange positions, and limited reliance on external financing. However, some of these buffers may be eroded in a scenario of weaker growth and tighter financial conditions. Targeted macroprudential measures could play a greater role in reducing financial vulnerabilities. Policymakers should strive to improve the quality of information and data collected to better understand changing patterns of interconnectedness among financial and nonfinancial institutions, and to identify potential risks early. The buildup of corporate debt in recent years bears close monitoring, especially where the debt is denominated in foreign currencies. More generally, maintaining credible policy frameworks, strong balance sheets, and adequate buffers are the best insurance against market pressures.

Early planning and prudent policies are critical to cope with long-term fiscal challenges. Countries would benefit from making long-term fiscal projections an integral part of the annual budget to help anchor medium-term fiscal goals (this is especially relevant for countries that rely heavily on fiscal revenues from exhaustible resources). Fiscal income windfalls from commodity booms should be used to increase public savings and for high-return investment projects. Many countries maintain highly inefficient and expensive energy subsidies, which should be eliminated and replaced with more targeted transfers to the most vulnerable (IMF, 2014b, Box 2.3).

The most critical task is to create conditions for sustainable and steady growth in the medium term. Continued convergence to a higher income level would not only increase living standards for the average person, but would also provide the foundation for further progress on the social agenda. Output growth in the past decade was driven mainly by factor accumulation, aided by favorable financing conditions and strong demographics. To sustain high growth rates in the medium term, policymakers need to boost productivity and competitiveness through structural reforms. Scarcie budgetary resources should be focused on upgrading domestic infrastructure and enhancing the quality of education. Consideration
should be given to mobilizing resources where tax burdens are low. In much of the region, there is also a need to further improve the business climate and reduce barriers to entry, including reforming anti-trust frameworks. Increasing domestic savings, which are relatively low in Latin America by international standards, would also support investment and long-term growth.

**Specific Challenges Facing the Less Financially Integrated Countries**

Some of the large countries in the region have resisted the general trend toward stability-oriented macroeconomic policies and are now facing increasingly urgent challenges. Argentina, and particularly Venezuela, have maintained highly expansionary fiscal and monetary policies for nearly a decade, helped by strong terms-of-trade windfalls. While these policies helped improve social indicators in the past, they have clearly become unsustainable, giving rise to significant fiscal and external imbalances.

These imbalances are especially acute in Venezuela, which suffered a sharp economic slowdown and a steep rise in inflation in 2013, together with widespread shortages of basic consumer goods as a result of price controls. Tight controls on trade and the foreign exchange market have failed to ease pressure on the external accounts, and reserves have declined to very low levels, prompting the authorities to introduce a third foreign exchange market segment (where the local currency is quoted well below the official parity, though still stronger than in the informal parallel market). In this environment, Venezuela is projected to suffer a recession in 2014, with significant risks of disorderly economic dynamics.

Argentina is also projected to see negative growth in 2014, as distortionary economic policies are taking a toll on activity. The authorities responded to growing economic imbalances by allowing a depreciation of the official exchange rate in early 2014, raising domestic interest rates, and reducing the level of certain utility subsidies. They have also made fresh efforts to normalize their relationship with international creditors, including the Paris Club, although the ongoing legal conflict with holdout bondholders remains a large source of uncertainty.

Overall, the recent policy measures in the two economies are steps in the right direction, but significant imbalances and distortions remain, as fiscal policy is not on a sustainable path, real interest rates are still negative, and a sizable gap persists between exchange rates in the official and the informal market. Thus, more fundamental policy adjustments are required to restore macroeconomic stability and lock in the social gains achieved over the past decade, especially in the context of less-favorable prospects for commodity prices. In particular, fiscal policy needs to be tightened on a sustained basis to address unfavorable public debt dynamics and reduce pressures on the current account. One important area for reform is energy subsidies, which are very high, especially in Venezuela. These fiscal efforts would need to be underpinned by sufficiently restrictive monetary policy to rein in inflationary pressures, regain central bank credibility, and allow a gradual move toward a market-determined foreign exchange regime. The phasing-out of distortionary
restrictions on trade, foreign exchange, and prices will have to be coordinated and managed carefully to avoid disorderly adjustment dynamics. Meanwhile, structural reforms are critically needed to raise potential growth, notably by improving the difficult business environment.

CONCLUSIONS

After a decade of impressive economic growth propelled by favorable external tailwinds, structural reforms, and good policies, Latin America is facing a more challenging period ahead. A continued rapid rise in living standards will be more difficult to achieve in an environment of flat or declining commodity prices and tighter financial conditions.

Even so, Latin America can rise to the challenge. The current environment provides an opportunity to reach consensus on targeted structural reforms that would help the region move to a new growth paradigm based on improved human capital, higher productivity growth, and more diversified and competitive economies. Policymakers in several countries are already implementing reforms in education, energy, and other sectors. More is needed, and more is possible, in Latin America’s quest to continue to improve living standards.

REFERENCES

International Monetary Fund (IMF), 2014a, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, April.
———, 2014b, Regional Economic Outlook: Western Hemisphere, World Economic and Financial Surveys, Washington, DC, April.
Highly favorable external conditions—interrupted only temporarily during the 2008–09 global financial crisis—coupled with prudent macroeconomic policies bolstered GDP growth in most of Latin America during the last decade. In contrast, growth in the Caribbean has been disappointing. On average, the Latin American and the Caribbean (LAC) region grew by 4 percent annually during 2003–12, compared with less than 2½ percent in 1980–2002 (Figure 2.1). But what were the (supply-side) drivers of this remarkable growth performance and will this momentum be sustainable moving forward?

This chapter addresses these questions by identifying the proximate causes of the recent strong growth performance and estimating potential growth rates for the period ahead based on standard (Solow-style) growth accounting methodologies. The analysis is based on a group of 19 LAC countries starting in 1980.\(^1\) First, we decompose the sources of output growth into accumulation of factors of production and total factor productivity (TFP). The results are compared with the region’s performance in the past as well as with other regional benchmarks. Then, potential growth rate ranges for each country for the period 2013–17 are projected using the production-function approach.\(^2\) Toward this end, a battery of commonly used filtering techniques are used to measure the trend of the subcomponents of output (namely, capital, labor, and TFP), smoothing out cyclical fluctuations. To investigate the sustainability of the recent growth momentum, possible constraints on factor accumulation for the region’s growth performance are explored.

The analysis of the sources of economic growth dates to the work of Robert Solow, who first decomposed U.S. output growth into a weighted average of the rate of growth of labor and capital, and a residual (the so-called “Solow residual” or TFP). For LAC, the most detailed recent study of the sources of growth is Loayza, Fajnzylber, and Calderón (2005), who analyze a sample of 20 LAC countries for the period during 1961–2000. The study builds on earlier work by Elias

---

\(^1\)The sample includes the LA6 (Brazil, Chile, Colombia, Mexico, Peru, and Uruguay), other South American countries (Bolivia, Ecuador, Paraguay, and Venezuela), Central America (Costa Rica, Dominican Republic, El Salvador, Honduras, Nicaragua, and Panama), and the Caribbean (Barbados, Jamaica, and Trinidad and Tobago). Argentina, Guatemala, and most of the small Caribbean islands are excluded due to data limitations.

\(^2\)Given uncertainties in estimating potential growth rates, we choose to deploy a battery of techniques and present a range of estimates rather than a point estimate.
Potential Growth in Latin America (1992), De Gregorio (1992), Bosworth and Collins (1996), and Easterly and Levine (2002). Overall, this literature points to two key results. First, TFP performance in LAC (both in terms of contribution to GDP growth and in level terms compared with other regions/economies) was very weak from 1980 through 2000, with TFP being a particular drag on growth in the 1980s. Second, the contribution of TFP to overall growth tends to be procyclical, and changes in output growth are explained, to a large extent, by movements in TFP.

This chapter contributes to this literature in several ways. To the best of our knowledge, this is the first analysis to examine the sources of growth in LAC with actual data extended to 2012, thus including the recent high-growth episode. In addition, while most existing studies focus on one country or a small group of countries (typically including Latin America’s largest countries), this chapter includes a larger number of countries from all subregions in Latin America (that is, South America, Mexico, and Central America), and it also adds the Caribbean into the analysis. Furthermore, while most studies restrict their attention to long-term developments (usually up to the mid-2000s), this analysis projects the future range of potential growth rates, thus answering the question of whether the current strong growth momentum can be sustained in the years ahead. To undertake this task, we created a new database that incorporates the latest available data from various sources from 1980 through 2012.

Figure 2.1 Latin America and the Caribbean: Real GDP Growth (Percent)

Sources: IMF, World Economic Outlook database; and authors’ calculations.
Note: Weighted average of the Latin American and Caribbean countries.

The main findings of the chapter are:

- Factor accumulation (especially labor), rather than TFP growth, remains the main driver of output growth in LAC. The strong labor contribution to growth in recent years is mostly stemming from increased employment.

- Higher TFP accounts for most of the recent growth pickup in Latin America. Indeed, after declining in most of the region in previous decades, TFP turned mostly to positive growth in the last decade.

- There are large output-growth disparities within the LAC region, with growth in the Caribbean particularly disappointing. In general, growth in the LAC region remains below that of emerging Asia, with most of the growth differential being explained by differences in TFP performance.

- If recent historical trends continue for capital and TFP, and given some natural constraints on labor, the current strong growth momentum is unlikely to be sustainable. Improvements in TFP will be pivotal to sustain the high growth rates in the region.

The chapter first describes the growth accounting exercise and its results, then estimates potential growth rate ranges and discusses the sustainability of the recent strong growth momentum before presenting conclusions.

**WHAT FACTORS EXPLAIN THE RECENT STRONG GROWTH PERFORMANCE?**

Although there is consensus that the robust growth performance in Latin America in recent years has been to a great extent driven by favorable external conditions such as strong global growth, high commodity prices, and easy external financing that fueled external and domestic demand, it is less clear what the main drivers were from a supply-side perspective. \(^4\) To study this, a simple accounting framework is used here to decompose output growth into the contributions from accumulation of capital and (quality-adjusted) labor, and changes in TFP.

**Methodology and Data**

The following standard Cobb-Douglas production function is assumed:

\[
Y_t = A_t K_t^{\alpha} (L_t h_t)^{1-\alpha},
\]

where \(Y_t\) represents domestic output in period \(t\), \(K_t\) the physical capital stock, \(L_t\) the employed labor force, \(h_t\) human capital per worker, and \(A_t\) total factor productivity. The assumptions for \(\alpha\), the capital share of output, are country-specific and based on Loayza, Fajnzylber, and Calderón (2005).\(^5\)

---


\(^5\)Our assumptions on \(\alpha\) are broadly in line with those in Gollin (2002). Our main findings are robust to a range of reasonable values for this parameter.
Annual data for most variables are taken from Penn World Table 7.1 (PWT) for the period 1980 until 2010 and from other sources—mainly the IMF’s World Economic Outlook (WEO) database for subsequent years. Specifically, data on output, measured by real GDP, are obtained from PWT until 2010 and extended up to 2012 using the WEO. The capital stock series is constructed with investment data from the PWT using the perpetual inventory method until 2010 and investment data from the WEO for 2011–12. It is assumed that the country is on a balanced growth path at time zero, and the initial capital stock, $K_0$, is computed according to the expression:

$$K_0 = \frac{I_0}{(1 + g)(1 + n) - (1 - \delta)}.$$  (2.2)

where $I_0$ is the initial investment expenditure, $g$ is the technological progress rate, $n$ is the population growth rate, and $\delta$ is the rate of capital depreciation. Following Ferreira and others (2013) the average investment of the first five years is used as a measure of $I_0$ in order to minimize the impact of economic fluctuations, with 1950 being the initial year. It is assumed that $g$ is equal to 1.53 percent; $\delta$ is equal to 3.5 percent (as in Ferreira, De Abreu Pessoa, and Veloso, 2013, and FIEL, 2002); and $n$ is equal to the average annual growth rate of population for each country between 1960 and 2012, using PWT data up to 2010 and WEO data afterward.

The labor input series (measured by employment) refers to inputs effectively used in the production process. By considering the employed labor force rather than the entire stock of labor available for production (that is, the labor force), we ensure that changes in the unemployment rate are not reflected into changes in TFP. Employment series are obtained using the labor force series from PWT (up to 2010) and the employment rate (one minus unemployment rate) from the WEO. For 2011–12, it is assumed that the labor force rises in line with U.N. Population Projections (constant fertility scenario) for persons aged 15 and over. To get quality-adjusted labor, we follow Bils and Klenow (2000) and Ferreira and others (2013) and model human capital as a function of the average years of schooling:

$$h = \exp \varphi(s) - \exp \left( \frac{\theta}{1 - \psi} s \right).$$  (2.3)

where $s$ stands for years of schooling of the population aged 15 years old and over, using data from Barro and Lee (2010).
Using equation (2.1), GDP growth can be decomposed as follows (denoting by \( \hat{x} \) the growth rate of a variable \( x \)):

\[
\hat{Y} = \hat{A} + \alpha\hat{K} + (1 - \alpha)\hat{L} + (1 - \alpha)\hat{b},
\]

(2.4)

where changes in GDP are explained by changes in factor accumulation (quality-adjusted labor and capital) and TFP.

It is worth mentioning a few caveats about the estimation of TFP that imply that the results should be interpreted with some caution.\(^9\) The TFP measure is by definition a residual—the difference between output growth and growth in the quantity (and quality) of inputs. Thus, any measurement errors in the labor and capital series are automatically imputed to TFP. For instance, changes in the quality of the capital and labor stocks that we fail to account for,\(^10\) changes in the level of capital utilization, and/or changes in the use of land (a factor our methodology does not account for) would be reflected in TFP.

Results

The key findings are presented in the stylized facts below.

**Stylized fact 1.** Factor accumulation (especially labor), rather than TFP growth, remains the main driver of output growth. In Latin America, total factor accumulation explained 3¾ percentage points of annual GDP growth over 2003–12, compared with ¾ percentage points explained by TFP (Figure 2.2). Although factor accumulation was also the main driver of growth in the Caribbean, growth performance in this subregion during the recent period has been weaker than in the previous decade.

**Stylized fact 2.** The recent growth pickup in Latin America is mainly explained by higher TFP. Since 2003, TFP has increased in most countries, in contrast to the lukewarm performance of the 1990s. The estimates suggest that TFP explains about 1–1½ percentage points of the higher growth performance during 2003–12 compared with the 1990–2002 period (Figure 2.3). The contribution of physical capital also increased, though to a lesser extent, partly reflecting improved macroeconomic policies, favorable external financial conditions, and high investment (including foreign direct investment) in the primary sector associated with the commodity price boom. In fact, the increase in the capital contribution was larger in the commodity exporters of the region (South America) than in noncommodity exporters (Mexico, Central America, and the Caribbean), as illustrated in Figure A2.1, and Tables A2.1 and A2.2 in Annex 2.1. In the Caribbean, the GDP growth deceleration during the past decade has been mainly driven by a lower labor input contribution.

---

\(^9\)TFP measures how efficiently factors of production are used in the production process, and captures technological progress as well as efficiency in the allocation of inputs.

\(^10\)For example, if the increase in the capital stock is driven mainly by additional machinery and equipment rather than buildings and structures, then a “higher-quality” stock of capital should produce higher output—and thus, the contribution from TFP would be lower (Roldós, 1997).
Figure 2.2  Contribution to Real GDP Growth (Annual average, percent)

Sources: Penn World Table 7.1; IMF, World Economic Outlook database; and authors’ calculations.
Note: Simple average of countries within each group. Latin America includes all Latin American countries in our sample. Emerging Asia includes Indonesia, Malaysia, Philippines, Thailand, and China. Advanced commodity exporters includes Australia, Canada, New Zealand, and Norway. The Caribbean includes Barbados, Jamaica, and Trinidad and Tobago. TFP = total factor productivity.

Figure 2.3  Growth Decomposition: Gap between 2003–12 and 1990–2002 (Annual average, percent)

Sources: Penn World Table 7.1; IMF, World Economic Outlook database; and authors’ calculations.
Note: Simple average of countries within each group. LA6 includes Brazil, Chile, Colombia, Mexico, Peru, and Uruguay. Other South America (SA) includes Bolivia, Ecuador, Paraguay, and Venezuela. Central America (CA) includes Costa Rica, Dominican Republic, El Salvador, Honduras, Nicaragua, and Panama. The Caribbean includes Barbados, Jamaica, and Trinidad and Tobago. TFP = total factor productivity.

Stylized fact 3. The contribution of TFP to overall growth is larger in countries with higher growth. Countries that experienced a stronger pick-up in output growth (Panama, Peru, and Uruguay) exhibited a higher contribution from TFP. In contrast, 2003–12 GDP growth rates in Chile, El Salvador, and Mexico were lower than in the previous decade, partly reflecting negative TFP growth during the last 10 years (see Figure A2.1 and Table A2.1 in Annex 2.1).

Stylized fact 4. Growth in LAC remains below that of emerging Asia, with most of the growth differential explained by differences in TFP performance. On the positive side, Latin America’s growth gap vis-à-vis emerging Asia has narrowed in the past decade compared with the 1990s on account of reduced differences in capital contributions (Figure 2.4). However, large TFP growth differentials remain, accounting for most of the GDP growth gap over 2003–12. The labor contribution, in contrast, has historically been larger in Latin America (especially in Central America) than in emerging Asia.

Stylized fact 5. Increased employment is behind Latin America’s strong labor contribution to growth in recent years. Much like in the 1990s, labor remained the main contributor to growth during 2003–12. However, the factors explaining this high contribution to growth changed markedly. While increases in the working-age population and higher participation rates were the main drivers during 1990–2002, their contribution (while still positive) declined significantly during 2003–12 (Figure 2.5). Instead, increases in the rate of employment—a factor hindering growth in the previous period—played a key role starting in

Figure 2.4 Growth Decomposition: Gap between Latin America and the Caribbean and Emerging Asia (Annual average, percent)\(^1\)

Sources: Penn World Table 7.1; IMF, World Economic Outlook database; and authors’ calculations.
Note: Simple average of countries within each group. LA6 includes Brazil, Chile, Colombia, Mexico, Peru, and Uruguay. Other South America (SA) includes Bolivia, Ecuador, Paraguay, and Venezuela. Central America (CA) includes Costa Rica, Dominican Republic, El Salvador, Honduras, Nicaragua, and Panama. The Caribbean includes Barbados, Jamaica, and Trinidad and Tobago. TFP = total factor productivity.

2003, consistent with near-record low unemployment levels in many countries.\textsuperscript{11} The contribution of improvements in human capital to output growth has typically been positive and broadly stable over time, accounting for about ½ percentage point of annual GDP growth. The labor contribution has declined in the Caribbean since 2003, despite an increase in the working-age share of the population. This deterioration reflects lower employment rates than in the past and further declines in labor force participation rates.

\textbf{Stylized fact 6.} \textit{TFP performance generally improved in 2003–12, although important differences across countries remain}. After exhibiting declines in most of the region in previous decades, TFP mostly turned to positive growth (particularly strong in Panama, Peru, and Uruguay) (Figure 2.6). This partly reflects the expansionary phase of the economic cycle in most of these countries over 2003–12, as well as idiosyncratic factors in some cases (such as the canal expansion in Panama).\textsuperscript{12} In Chile—one of the few countries with positive TFP growth in Latin America during the 1980s and 1990s, TFP performance turned negative over

\textsuperscript{11}The increase in the employment rate reflects not only cyclical but also structural factors. For instance, the strong performance of the services sector has played an important role. This sector continued to employ an increasing number of workers, with its relative share in total employment increasing significantly in this period. See World Bank (2012).

\textsuperscript{12}As discussed in the previous section, our capital stock measure does not capture changes in the level of capital utilization due to the lack of adequate measures for most of the region. To the extent that capacity utilization has been generally above average in the recent period, our TFP estimates may be an upper bound.
2003–12, partly reflecting declining productivity in the mining sector. This is in line with the experience in commodity-exporting advanced economies (such as Australia, Canada, and Norway) in the recent past, and could be related to the expansion of energy and mining production to areas (fields or mines) of lower marginal productivity where production has become profitable due to the commodity price boom (Figure 2.2). In the Caribbean, with the exception of Trinidad and Tobago, TFP performance has been disappointing over the last 30 years.

The results are generally consistent with those of previous studies. First, the growth decomposition estimates, in line with those in the literature, find that factor accumulation, rather than TFP, accounts for most of the output growth observed in the region (IDB, 2010; Loayza, Fajnzylber, and Calderón, 2005; and Solimano and Soto, 2004). Second, the results suggest that TFP performance in LAC has lagged compared to other regions (in line with IDB, 2010, and Ferreira, De Abreu Passoa, and Veloso, 2013, among others). Third, similar to Easterly and Levine (2001) and Loayza, Fajnzylber, and Calderón (2005), the analysis finds that (1) the contribution of TFP to overall growth is larger in countries with higher growth, and (2) regardless of the size of the TFP contribution to growth, its changes account for most of the variation in output growth across periods.

**Robustness Tests**

The sensitivity of the results can be examined by conducting a number of robustness checks. First, it is assumed that $\alpha$, the capital share of output, is equal to 0.4
(as in Ferreira, De Abreu Passoa, and Veloso, 2013) rather than taking a country-specific value. Second, it is assumed that $\delta$ is equal to 5 percent for all countries (as in Bosworth and Collins, 2003) rather than 3.5 percent. Third, as the results could be affected by our measure of the capital stock, the sensitivity of the former is tested to an alternative measure. Specifically, for countries where such data were readily available from national sources (Brazil and Chile), we use the capital stock series from that source instead of our own estimates. The main findings do not change significantly in any of the robustness tests performed (Figure A2.2 in Annex 2.1). Finally, we also compare our estimated TFP series with those of the Conference Board’s Total Economy Database. For most countries in the sample, the TFP series are broadly similar (see lower panel in Figure A2.2 in Annex 2.1).

**IS THE STRONG PERFORMANCE OBSERVED DURING 2003–12 SUSTAINABLE?**

To address this question, the analysis estimates potential growth rate ranges for 2013–17 in LAC countries. Various methodologies have been employed in the literature to estimate potential growth rates, such as constructing measures of the trend in actual GDP that smooth out business-cycle fluctuations, or computing the trend of the various subcomponents of GDP—typically using a production-function approach or econometric models (including structural vector autoregressions and Kalman filters). In this chapter the production-function method was chosen given two important advantages:

- **Flexibility and intuitiveness.** The production-function approach relates inputs to outputs, a quite intuitive and accepted fact by economists. The method is flexible, since it can incorporate different assumptions about technological progress and the importance of capital and labor in the production process, and can include changes in quality of inputs (for example, human capital).

- **Estimating TFP.** During the estimation of potential GDP, TFP estimates can be obtained—an important factor in explaining cross-country growth disparities.

**Estimating Potential Growth Rate Ranges**

To estimate potential growth rates, we first estimate TFP using equation (2.1) which can be rewritten as:

$$A = \frac{Y}{K^{\delta}(Lh)^{1-\gamma}}.$$

We then obtain trend series for capital, labor, human capital, and TFP ($K^T$, $L^T$, $h^T$, $A^T$) for the period 1980–2017 using the Hodrick-Prescott filter (for both $\lambda = 6.25$ and $\lambda = 100$) and the Baxter and King (1999) and Christiano and

---

13The national sources are the Institute of Applied Economic Research (IPEA) for Brazil and the Central Bank for Chile.
Fitzgerald (2003) filters. To avoid end-of-sample bias, projections are included through 2017, based on the following assumptions about $K$, $L$, $h$, and $A$:

- Both capital and TFP grow at the 2000–12 average annual rate (see Table A2.2); 14
- To project the labor input we use projected unemployment rates (from WEO) and assume that the labor force grows in line with the working-age population from the UN’s Population Projections database, while labor force participation rates are assumed to remain constant at their latest observation; and
- Our measure of human capital increases at the 2005–10 average annual rate.

Potential output growth ($\hat{Y}^p$) is then computed as follows, (where $\hat{x}$ denotes the growth rate of a variable $x$):

$$\hat{Y}^p = \hat{A}^I + \alpha \hat{K}^I + (1 - \alpha) \hat{L}^I + (1 - \alpha) \hat{b}^I$$

(2.5)

Figure 2.7 presents the average annual potential growth rate ranges for the period 2013–17 by estimating equation (2.5) using all four filtering techniques. The potential ranges vary significantly across countries. Panama, Peru, and the Dominican Republic exhibit the highest growth potential across the region. Some Central American countries and the Caribbean (particularly El Salvador, Barbados, and Jamaica) tend to show a more modest potential growth rate, with upper limits below 1½ percent. While this chapter does not attempt to explain

---

14This period covers a full economic cycle in most countries in the region, whereas 2003–12 includes mainly the expansionary phase of the cycle.
cross-country differences in growth potential, these often reflect differences in
economic institutions (for example, barriers to entry and innovation), natural
resource endowments, geography, financial sector deepening, and trade openness.

Is the strong growth momentum sustainable moving forward? The analysis
finds that, assuming that capital and TFP grow at their 2000–12 average annual
rates in the next five years and given some natural constraints on labor, the cur-
rent strong growth momentum is unlikely to be sustainable. While LAC grew on
average by 4 percent during 2003–12, the estimates suggest that the average
potential GDP growth rate in 2013–17 is closer to 3¼ percent. Indeed, the
strong GDP growth rates observed in recent years for most of Latin America are
higher than (or close to the upper bound of) the potential output growth ranges
for 2013–17 in most countries. In addition, the recent disappointing growth
performance in much of the Caribbean appears to be in line with the region's
production capacity, implying that significant efforts will be needed to unlock the
region's growth potential.

The envisaged growth deceleration in LAC (from the recent high growth to
projected potential growth rates) reflects lower contributions from all sources, as
the growth performance of capital stock and TFP in the last few years has been
generally stronger than the 2000–12 average, while labor will be hindered by some
natural constraints (see Table A2.2 in Annex 2.1). Specifically, in the years ahead:

- Growth of physical capital is expected to moderate somewhat, reflecting a
  normalization of the easy external financing conditions and the stabilization
  of commodity prices—both key factors driving the recent strong domestic
  and foreign direct investment in the region.

- The contribution of labor to output growth will likely decline due to some
  natural constraints, including (1) population aging, as the dependency ratio
  is expected to reach its minimum over the next few years in several countries
  (Figure 2.8); (2) limited room to further increase labor force participation
  rates (including for females), which are already relatively high by interna-
  tional standards (Figure 2.9);16 and (3) limited space for further increases in
  employment rates, as unemployment rates have declined significantly and
  now hover near record low levels. In addition, a large increase in the contribu-
  tions from human capital is unlikely unless significant improvements are
  made in the quality of schooling, and any impact of such improvements
  would be limited in the short term.17

---

15 Exceptions are Mexico, which was strongly affected by the 2008–09 global financial crisis given its
tight linkages with the U.S. economy, and Paraguay, owing to some idiosyncratic shocks.
16 In fact, the contributions to output growth of both changes in the working-age population and the
labor force participation rate narrowed significantly over 2003–12 compared with the 1990s. It is
worth noting that these constraints on labor are less binding in countries with a large informal sector
(for example, Colombia, Mexico, Peru, and several Central American countries).
17 Although LAC's performance in terms of average years of schooling is relatively good compared with
economies with similar levels of income per capita, the quality of education has ample room for
improvement (the region generally underperforms on standard international tests).
The baseline projections also entail a slowdown in TFP growth for most countries (down to the 2000–12 average growth rates), consistent with the normalization in the business cycles.\footnote{TFP performance is typically procyclical, and—as output gaps close and growth moderates to potential—TFP would grow at rates closer to its 2000–12 average.}

In sum, given the expected moderation of capital accumulation and the existence of natural constraints on labor, the strong growth momentum in LAC is unlikely to...

---

\figure[2.8] Selected Latin American Economies: Year with Dependency Ratio at Its Minimum (Greatest demographic dividend)

\source{CELADE.}

\note{Dependency ratio = \( \frac{\text{population aged 0–14 + population aged 65 and over}}{\text{population aged 15–64}} \times 100 \). Country names are Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Costa Rica (CRI), Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Guatemala (GTM), Honduras (HND), Mexico (MEX), Nicaragua (NIC), Panama (PAN), Paraguay (PRY), Peru (PER), Uruguay (URY), Guatemala (GTM) and Venezuela (VEN).}

\figure[2.9] Constraints to Labor Growth (Simple average, percent)

\source{World Bank, World Development Indicators, Penn World Table 7.1; and IMF staff calculations.}

\footnote{1 LAC = Latin America and the Caribbean.}

\footnote{2 Emerging market economies (EMEs) include China, Czech Republic, Estonia, Hungary, India, Indonesia, Poland, Russia, Slovak Republic, Slovenia, and Turkey.}

---

...
be sustainable unless TFP performance improves significantly in the future. Thus, TFP performance, which remains a concern despite its recent improvement, will be pivotal to sustain high growth rates in the region in the future.

**Alternative Scenarios**

As noted earlier, the behavior of TFP going forward is critical to determining growth performance in the years to come. In fact, in the event that TFP performance proves to be weaker than envisaged in the baseline estimation (that is, below the 2000–12 average) the impact on the potential growth rate could be substantial. To investigate the extent of such an impact, a counterfactual (downside) scenario is considered in which TFP is projected to increase at a lower rate than in the baseline scenario by a margin equal to the difference between the 2005–12 and 1990–2004 averages (see Table 2.1). This assumption builds on the idea that 2005–12 was a period of historically high TFP (and GDP) growth in most countries, while 1990–2004 was characterized by more “normal” TFP growth rates. Similarly, we examine an alternative downside scenario with the stock of capital growing at a lower rate than in the baseline—again subtracting the difference between 2005–12 and 1990–2004 average growth rates of capital stock from the baseline growth rates.19

Figure 2.10 illustrates the magnitude of the deviation (from the baseline) of potential growth under the two downside scenarios. The scenario with weaker

---

19 Capital increased at a strong pace in 2005–12 on account of easy external financing conditions and very high commodity prices.

---

**TABLE 2.1**

<table>
<thead>
<tr>
<th>Scenario Assumptions for Potential Growth Projections, 2013–17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capital (K)</strong></td>
</tr>
<tr>
<td>Baseline scenario</td>
</tr>
<tr>
<td>Downside scenario: lower K growth</td>
</tr>
<tr>
<td>Downside scenario: lower TFP growth</td>
</tr>
</tbody>
</table>

Source: Authors’ assumptions.

Note: K = capital; TFP = total factor productivity.
TFP entails significantly lower potential growth rates for most countries. The impact of a slower accumulation of capital stock on potential growth is also significant, although of smaller magnitude than the negative TFP shock for most countries. This suggests that, if the growth rate of capital decelerates from the recent relatively high levels, TFP performance would need to improve further to reach the baseline potential output growth rates.

**Strengthening Capital and TFP Growth**

Improvements in the baseline scenario cannot be ruled out if the performance of TFP and capital stock surprise us on the upside. For example, domestic savings (and thus investment) as a share of GDP is low in LAC by international standards, so mobilizing higher domestic savings could enhance the contribution of capital to long-term growth. Moreover, the region could improve its TFP performance by:

- Further strengthening the business climate
- Enhancing competition in product and labor markets
- Strengthening entry and exit regulations to facilitate the reallocation of resources to new and high-productivity sectors
- Improving infrastructure
- Promoting deeper and more efficient financial markets

---

20 Exceptions are Chile, El Salvador, and the Caribbean, where TFP performance was actually weaker in recent years compared with the historical average.
• Enhancing research and development and innovation, and
• Strengthening institutions to secure property rights and stamp out corruption (Figure 2.11).

Finally, improving the quality of education would not only affect labor input directly, but also indirectly via its effect on TFP. Designing a policy agenda to unleash productivity is, however, a difficult task and entails country-specific measures. In the Caribbean, efforts are needed to tackle high debt levels and weak competitiveness, which have held back growth.

CONCLUSION

This chapter examined the proximate causes of the recent high GDP growth in Latin America and the Caribbean based on standard growth accounting methodologies. The analysis finds that growth of capital and labor, rather than TFP, remains the main driver of GDP growth. It also shows that higher growth in TFP accounts for most of the recent acceleration in output growth. Despite the recent improvement in TFP performance, however, its contribution remains modest, especially considering cyclical issues, and in comparison with other regions.

The chapter also analyzed the sustainability of the strong growth momentum by estimating potential growth rate ranges for the years ahead. The results suggest that, in light of the likely stabilization of the capital contribution to output growth and the existing natural constraints on labor, the current strong growth momentum is unlikely to be sustainable going forward unless TFP performance improves significantly. Thus, fostering TFP growth remains a key challenge and priority for the LAC region.
ANNEX 2.1. ADDITIONAL FIGURES AND TABLES

Figure A2.1  Latin America and the Caribbean: Contribution to Real GDP Growth (Annual average; percent)

Sources: Penn World Table 7.1; IMF, World Economic Outlook database; and authors’ calculations.
Note: LA6 = Brazil, Chile, Colombia, Mexico, Peru, and Uruguay; TFP = total factor productivity.
### TABLE A2.1

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LA6</td>
<td>1.3</td>
<td>1.7</td>
<td>1.9</td>
<td>2.0</td>
<td>−0.1</td>
<td>0.7</td>
<td>3.1</td>
<td>4.4</td>
<td>3.1</td>
<td>4.4</td>
</tr>
<tr>
<td>Brazil</td>
<td>1.2</td>
<td>1.3</td>
<td>2.3</td>
<td>1.9</td>
<td>−1.6</td>
<td>0.1</td>
<td>2.0</td>
<td>3.3</td>
<td>2.0</td>
<td>3.3</td>
</tr>
<tr>
<td>Chile</td>
<td>2.1</td>
<td>2.5</td>
<td>1.3</td>
<td>2.5</td>
<td>2.4</td>
<td>−0.5</td>
<td>5.9</td>
<td>4.5</td>
<td>5.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Colombia</td>
<td>1.6</td>
<td>2.1</td>
<td>2.2</td>
<td>1.9</td>
<td>−1.5</td>
<td>0.5</td>
<td>2.3</td>
<td>4.4</td>
<td>2.3</td>
<td>4.4</td>
</tr>
<tr>
<td>Mexico</td>
<td>1.4</td>
<td>1.2</td>
<td>2.4</td>
<td>2.0</td>
<td>−0.7</td>
<td>−0.8</td>
<td>3.2</td>
<td>2.4</td>
<td>3.2</td>
<td>2.4</td>
</tr>
<tr>
<td>Peru</td>
<td>0.9</td>
<td>2.0</td>
<td>2.5</td>
<td>1.9</td>
<td>−0.2</td>
<td>2.4</td>
<td>3.2</td>
<td>6.3</td>
<td>3.2</td>
<td>6.3</td>
</tr>
<tr>
<td>Uruguay</td>
<td>0.7</td>
<td>1.1</td>
<td>0.4</td>
<td>1.6</td>
<td>0.9</td>
<td>2.7</td>
<td>2.0</td>
<td>5.4</td>
<td>2.0</td>
<td>5.4</td>
</tr>
<tr>
<td>Other South America</td>
<td>1.0</td>
<td>1.3</td>
<td>2.3</td>
<td>2.2</td>
<td>−1.0</td>
<td>0.6</td>
<td>2.3</td>
<td>4.1</td>
<td>2.3</td>
<td>4.1</td>
</tr>
<tr>
<td>Bolivia</td>
<td>0.8</td>
<td>1.0</td>
<td>3.6</td>
<td>2.6</td>
<td>−1.0</td>
<td>0.7</td>
<td>3.4</td>
<td>4.3</td>
<td>3.4</td>
<td>4.3</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1.1</td>
<td>2.0</td>
<td>1.7</td>
<td>1.4</td>
<td>−0.1</td>
<td>1.5</td>
<td>2.6</td>
<td>5.0</td>
<td>2.6</td>
<td>5.0</td>
</tr>
<tr>
<td>Paraguay</td>
<td>1.8</td>
<td>0.9</td>
<td>1.5</td>
<td>2.7</td>
<td>−2.0</td>
<td>0.2</td>
<td>1.3</td>
<td>3.7</td>
<td>1.3</td>
<td>3.7</td>
</tr>
<tr>
<td>Venezuela</td>
<td>0.4</td>
<td>1.3</td>
<td>2.4</td>
<td>2.3</td>
<td>−0.9</td>
<td>0.0</td>
<td>2.0</td>
<td>3.5</td>
<td>2.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Central America</td>
<td>1.5</td>
<td>1.4</td>
<td>2.9</td>
<td>2.4</td>
<td>−0.7</td>
<td>0.6</td>
<td>3.8</td>
<td>4.4</td>
<td>3.8</td>
<td>4.4</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1.3</td>
<td>1.5</td>
<td>2.9</td>
<td>2.3</td>
<td>−0.2</td>
<td>0.8</td>
<td>4.0</td>
<td>4.5</td>
<td>4.0</td>
<td>4.5</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>2.0</td>
<td>1.5</td>
<td>2.2</td>
<td>2.1</td>
<td>1.9</td>
<td>1.6</td>
<td>6.2</td>
<td>5.2</td>
<td>6.2</td>
<td>5.2</td>
</tr>
<tr>
<td>El Salvador</td>
<td>1.5</td>
<td>1.2</td>
<td>2.3</td>
<td>1.7</td>
<td>0.0</td>
<td>−1.2</td>
<td>3.7</td>
<td>1.7</td>
<td>3.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Honduras</td>
<td>2.2</td>
<td>1.7</td>
<td>3.0</td>
<td>2.6</td>
<td>−2.9</td>
<td>−0.1</td>
<td>2.3</td>
<td>4.2</td>
<td>2.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>0.7</td>
<td>0.8</td>
<td>3.9</td>
<td>2.6</td>
<td>−2.2</td>
<td>−0.3</td>
<td>2.3</td>
<td>3.1</td>
<td>2.3</td>
<td>3.1</td>
</tr>
<tr>
<td>Panama</td>
<td>1.3</td>
<td>1.7</td>
<td>3.2</td>
<td>3.0</td>
<td>−0.6</td>
<td>3.2</td>
<td>4.0</td>
<td>7.9</td>
<td>4.0</td>
<td>7.9</td>
</tr>
<tr>
<td>The Caribbean</td>
<td>0.6</td>
<td>0.7</td>
<td>1.5</td>
<td>1.1</td>
<td>0.0</td>
<td>0.1</td>
<td>2.1</td>
<td>1.9</td>
<td>2.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Barbados</td>
<td>0.7</td>
<td>0.6</td>
<td>0.8</td>
<td>1.1</td>
<td>−1.2</td>
<td>−0.6</td>
<td>0.3</td>
<td>1.1</td>
<td>0.3</td>
<td>1.1</td>
</tr>
<tr>
<td>Jamaica</td>
<td>1.1</td>
<td>0.7</td>
<td>1.4</td>
<td>1.0</td>
<td>−0.8</td>
<td>−1.2</td>
<td>1.8</td>
<td>0.5</td>
<td>1.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>0.1</td>
<td>0.8</td>
<td>2.2</td>
<td>1.3</td>
<td>2.0</td>
<td>2.1</td>
<td>4.4</td>
<td>4.1</td>
<td>4.4</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Sources: Penn World Table 7.1; IMF World Economic Outlook database; and authors’ calculations.
Note: TFP = total factor productivity.
Figure A2.2  Robustness Checks

Note: Country names are Barbados (BRB), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Costa Rica (CRI), Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Honduras (HND), Jamaica (JAM), Mexico (MEX), Nicaragua (NIC), Panama (PAN), Paraguay (PRY), Peru (PER), Trinidad and Tobago (TTO), Uruguay (URY), and Venezuela (VEN).
Figure A2.2  (Continued)

Sources: Penn World Table 7.1; IMF, World Economic Outlook database; national authorities; The Conference Board, Total Economy database; and authors’ calculations.

Note: TFP = total factor productivity.

1 Using capital stock series provided by the national authorities; Central Bank for Chile and IPEA for Brazil. GDP from IMF’s World Economic Outlook is used instead of data from Penn World Table 7.1. Same labor contribution is used as with authors’ calculations.

2 Data for Paraguay, El Salvador, Honduras, Nicaragua, and Panama are not available in Total Economy database.
| TABLE A2.2 | Growth Rates  
| (Annual average, percent) |
| --- | --- |
| | Capital | Labor, Adjusted with Education | TFP | Real GDP |
| **LA6** | | | | | | | | |
| LA6 | 3.2 | 3.7 | 4.0 | 3.3 | 3.1 | 3.4 | −0.1 | 0.4 | 0.7 | 3.1 | 3.7 | 4.4 |
| Brazil | 2.7 | 2.7 | 2.7 | 4.3 | 3.3 | 3.6 | −1.6 | 0.1 | 0.1 | 3.0 | 3.2 | 3.3 |
| Chile | 5.3 | 6.0 | 6.4 | 2.2 | 3.6 | 4.1 | 2.4 | −0.3 | −0.5 | 5.9 | 4.2 | 4.5 |
| Colombia | 3.6 | 4.0 | 4.7 | 4.0 | 3.4 | 3.4 | −1.5 | 0.3 | 0.5 | 2.3 | 4.0 | 4.4 |
| Mexico | 3.6 | 3.2 | 2.9 | 4.1 | 3.3 | 3.4 | −0.7 | −0.8 | −0.8 | 3.2 | 2.4 | 2.4 |
| Peru | 2.0 | 3.9 | 4.6 | 4.4 | 3.0 | 3.3 | −0.2 | 2.0 | 2.4 | 3.2 | 5.5 | 6.3 |
| Uruguay | 1.9 | 2.3 | 2.7 | 0.7 | 1.8 | 2.7 | 0.9 | 1.1 | 2.7 | 2.0 | 3.1 | 5.4 |
| **Other South America** | 2.3 | 2.6 | 2.9 | 4.0 | 4.2 | 4.0 | −1.0 | 0.1 | 0.6 | 2.3 | 3.6 | 4.1 |
| Bolivia | 2.3 | 2.8 | 3.0 | 5.4 | 3.9 | 3.9 | −1.0 | 0.4 | 0.7 | 3.4 | 3.9 | 4.3 |
| Ecuador | 1.9 | 3.4 | 3.7 | 3.8 | 4.0 | 3.2 | −0.1 | 1.3 | 1.5 | 2.6 | 4.9 | 5.0 |
| Paraguay | 3.7 | 1.7 | 1.8 | 3.0 | 4.8 | 5.2 | −2.0 | −0.4 | 0.2 | 1.3 | 2.9 | 3.7 |
| Venezuela | 1.1 | 2.7 | 3.1 | 4.0 | 3.9 | 3.8 | −0.9 | −0.9 | 0.0 | 2.0 | 2.6 | 3.5 |
| **Central America** | 4.4 | 4.2 | 4.2 | 4.5 | 3.5 | 3.6 | −0.7 | 0.3 | 0.6 | 3.8 | 4.0 | 4.4 |
| Costa Rica | 4.8 | 5.3 | 5.4 | 4.0 | 3.2 | 3.1 | −0.2 | 0.2 | 0.8 | 4.0 | 4.0 | 4.5 |
| Dominican Republic | 5.7 | 5.0 | 4.4 | 3.4 | 3.1 | 3.2 | 1.9 | 1.3 | 1.6 | 6.2 | 5.0 | 5.2 |
| El Salvador | 3.5 | 3.0 | 2.8 | 4.0 | 2.9 | 3.0 | 0.0 | −1.1 | −1.2 | 3.7 | 1.8 | 1.7 |
| Honduras | 5.3 | 4.1 | 4.1 | 5.2 | 3.9 | 4.4 | −2.9 | 0.3 | −0.1 | 2.3 | 4.2 | 4.2 |
| Nicaragua | 1.8 | 2.4 | 2.3 | 6.0 | 4.5 | 4.0 | −2.2 | −1.0 | −0.3 | 2.3 | 2.8 | 3.1 |
| Panama | 5.2 | 5.7 | 6.4 | 4.3 | 3.7 | 4.1 | −0.6 | 2.3 | 3.2 | 4.0 | 6.5 | 7.9 |
| **The Caribbean** | 1.6 | 1.7 | 1.7 | 2.5 | 1.9 | 1.8 | 0.0 | 0.1 | 0.1 | 2.1 | 1.9 | 1.9 |
| Barbados | 1.6 | 1.6 | 1.4 | 1.4 | 1.7 | 1.8 | −1.2 | −1.3 | −0.6 | 0.3 | 0.4 | 1.1 |
| Jamaica | 2.7 | 1.8 | 1.7 | 2.4 | 1.8 | 1.6 | −0.8 | −1.1 | −1.2 | 1.8 | 0.6 | 0.5 |
| Trinidad and Tobago | 0.3 | 1.6 | 1.9 | 3.7 | 2.3 | 2.1 | 2.0 | 2.6 | 2.1 | 4.4 | 4.6 | 4.1 |

Sources: Penn World Table 7.1; IMF World Economic Outlook database; and authors’ calculations.  
Note: TFP = total factor productivity.
REFERENCES


©International Monetary Fund. Not for Redistribution
CHAPTER 3

After the Boom: Commodity Prices and Economic Growth in Latin America and the Caribbean

BERTRAND GRUSS

Following a decade of rapid, broad-based gains, international commodity prices peaked in mid-2011 and have fallen somewhat since then (Figure 3.1). Many analysts now argue that the upward phase of the commodity “super cycle” that started in the early 2000s has run its course.¹ Indeed, market futures show commodity prices softening further in the near term, reflecting an anticipated increase in commodity supply along with weaker demand from some of the major commodity-importing economies, notably China.² While these projections are subject to large uncertainty, there is nonetheless wide consensus that the period of ever-increasing commodity prices has come to an end.

What would this imply for the commodity exporters of Latin America and the Caribbean (LAC)? The region is highly dependent on commodities and has certainly benefited from the recent commodity boom.³ Average annual output growth in the region increased from less than 2.5 percent between 1980 and 2002 to more than 4 percent in 2003–11 (Figure 3.2). More recently, however, growth has decelerated considerably. Average output growth fell from 4.6 percent in 2011 to 3.1 percent in 2012 and 2.7 percent in 2013. Some observers claim that the recent economic slowdown across the region is primarily linked to the end of the upswing in commodity prices, raising obvious concerns for the future (Roubini, 2013). Others have downplayed these concerns, pointing out that commodity prices are still higher than in the mid-2000s, let alone in the 1990s (Figure 3.1).

This chapter explores the possible consequences of weaker commodity prices on economic growth in LAC over the medium term (defined here as the period 2014–19). The chapter starts by constructing a country-specific commodity price index aimed at capturing the impact of variations in commodity prices at the country level. Analysis of the recent commodity price boom finds that, for most LAC commodity exporters, the period does indeed stand out in a historical perspective. The chapter then uses prices of commodity futures to characterize

¹See Erten and Ocampo (2013a), Goldman Sachs (2014), and Jacks (2013).
³Adler and Sosa (2011) show that the degree of commodity dependence in LAC is not only high compared with other regions, such as emerging Asia, but also has increased over the last four decades.

©International Monetary Fund. Not for Redistribution
Figure 3.1 Commodity Price Indices, 2000–19 (In U.S. dollars; 2005 = 100)
Sources: IMF, World Economic Outlook database; and author’s calculations.
Note: Based on international prices in current U.S. dollars. Values in shaded areas correspond to projections based on
the prices of commodity futures prevailing at end-February 2014.

Figure 3.2 Latin America and the Caribbean: Real GDP Growth (Percent)
Sources: IMF, World Economic Outlook (WEO) database.
Note: Purchasing power parity GDP-weighted averages of all LAC countries. GDP growth in 2014 corresponds to April 2014 WEO projections.
the country-specific commodity price outlook for the medium term. For most countries in the region, the outlook is for a sharp decline in the growth rates of their country-specific commodity price indices. The level of these indices is nonetheless projected to remain well above the averages attained during the boom years.

The chapter then investigates whether it is the lower growth of commodity prices or their still-high levels that will matter most for output growth in the region in the coming years. To this end, the chapter uses a variant of the dynamic multi-country global vector autoregression (GVAR) model originally proposed by Pesaran, Schuermann, and Weiner (2004), an approach especially designed to model the interactions between many countries. In a first stage, individual vector error correction models are estimated for a large set of countries. These country-specific models are linked to each other by including foreign variables and, in the second stage, stacked into a global model, so that national and global variables are determined jointly. The model specification considers 13 LAC countries, including the 12 largest commodity exporters in the region, and includes a broad set of global variables related to commodity prices. The model is estimated using annual data starting in 1970 and ending in 2013, and is used to generate conditional out-of-sample GDP growth forecasts under different commodity price scenarios over 2014–19. The model is also used to assess the potential impact of slower-than-expected growth in China on commodity prices and output growth in LAC.

The quantitative exercise suggests that the end of the commodity price boom will imply a significant drag on growth for the commodity exporters of LAC. Even if prices were to remain stable at the relatively high levels attained in 2013, the annual average output growth rate over the medium term (2014–19) would be almost 1 percentage points lower than in 2012–13, and more than 1½ percentage points lower than during the boom years. Projected growth is even somewhat weaker when conditioning on the path for spot commodity prices suggested by futures prevailing at end-February 2014. The simulations also confirm that a slowdown in China’s growth represents a key downside risk for LAC commodity-exporting countries.

The work in this chapter is mainly related to two strands of the literature. The first strand includes several studies that analyze the macroeconomic effects of terms-of-trade disturbances. Some recent examples include Ahmed (2003), Broda (2004), Raddatz (2007) and Izquierdo, Romero, and Talvi (2008). A particularly close link exists with studies focused on the macroeconomic effects of shocks to commodity prices (De Gregorio and Labbé, 2011; Céspedes and Velasco, 2012) and on the link between commodity price fluctuations and economic growth (Deaton and Miller, 1996; Dehn, 2000; Collier and Goderis, 2012; Cavalcanti, Mohaddes, and Raissi, 2014).

The second strand to which this study is related is a growing literature using the GVAR framework to address a variety of issues, including forecasting economic variables for a large number of countries in the global economy (Pesaran, Schuermann and Smith, 2009) and analyzing the transmission of the
After the Boom: Commodity Prices and Economic Growth

international business cycle to Latin America (Cesa-Bianchi and others, 2011). To our knowledge, this is the first application of the GVAR methodology to analyze the link between commodity prices and growth. While most applications in the GVAR literature include one global variable (for example, oil prices), typically modeled as endogenous in the U.S. model, the application used here includes 14 global variables, including 13 country-specific commodity price indices, that are ultimately related to 33 underlying international commodity prices. These commodity price variables are not modeled as endogenous in any particular country model but in auxiliary non-country models within the GVAR. The model is extended to cover a large number of commodity exporters (especially in LAC, but also in other regions). Overall, the model covers 30 economies, accounting for more than 80 percent of world GDP.

CHARACTERIZING THE COMMODITY BOOM AND ITS AFTERMATH IN LATIN AMERICA AND THE CARIBBEAN

While the increase in commodity prices during the recent boom was quite generalized, the magnitude of the increase differed considerably across categories (Figure 3.1): oil prices in current U.S. dollars almost quadrupled between 2003 and 2013 and metal prices tripled, while food prices doubled and prices of agricultural products rose “only” by about 50 percent. Before analyzing the linkages between commodity prices and economic growth in LAC countries, a metric is needed that captures the effects of commodity price variations at the country level. These, in turn, depend on the specific mix of commodities that the countries export and import. This section describes the country-specific net commodity price index (NCPI) used in this chapter, documents how it evolved during the recent boom for individual LAC countries, and uses commodity futures to infer how the NCPIs might evolve over the medium term.

A Country-Specific Net Commodity Price Index

With a few exceptions (for example, Deaton and Miller, 1996; Dehn, 2000; Céspedes and Velasco, 2012), most studies on the macroeconomic effects of commodity-price fluctuations have used either prices of individual commodities, aggregate (that is, not country-specific) indices of commodity prices, or standard terms-of-trade measures. None of these alternatives, however, is particularly suited for the purposes here. First, few commodity exporters are so specialized that focusing on just one commodity price is enough (except maybe for the case of some oil producers). Second, there tends to be substantial heterogeneity in price variations...
within aggregate commodity categories, so even if a country specializes in commodities that mostly belong to one given category (for example, metals), an aggregate price index is likely to poorly track the price variations of the specific commodities it trades. Third, broad terms-of-trade measures capture noncommodity price influences and are affected by the composition of exports (Deaton and Miller, 1996). Moreover, international commodity prices have been shown to be better at capturing the exogenous component of terms-of-trade shocks for commodity exporters than standard measures (Chen and Rogoff, 2003).

The country-specific commodity export price index proposed by Deaton and Miller (1996), which combines international prices and country-level data on export volumes for individual commodities, provides a better alternative. However, shocks to the price of imported commodities are also likely to matter for growth. For instance, an increase in the price of imported commodities (such as oil or primary intermediate inputs) is likely to reduce profit margins for firms and disposable income for households, weighing on domestic demand and output growth. In order to capture the net income effects from changes in commodity prices, the weights in the net index are based on net exports of each commodity. Accordingly, a commodity price increase that would imply a positive (negative) income shock if the country is a net exporter (net importer) of that commodity would be captured by an increase (decrease) of its NCPI.

To illustrate that looking at net commodity exports can make a difference in some cases, Figure 3.3 compares the NCPI with an export-based commodity price index for Colombia and Uruguay during 2000–13. For Colombia, both indices track each other very closely. In the case of Uruguay, however, the export-based index shows a gain of more than 20 percent over 2003–11, while the NCPI decreased by about 15 percent over the same period, mainly reflecting Uruguay’s high reliance on crude imports.

Deaton and Miller (1996) argue in favor of using fixed weights to construct the price index so as to ensure that endogenous supply responses to price changes do not affect the analysis. But the commodity mix traded by many countries has changed significantly over the last four decades (see Table A3.1 in Annex 3.1). For instance, coffee accounted for more than 40 percent of Brazil’s commodity exports in the early 1970s, but its share was less than 6 percent toward the end of the 2000s, falling from the first to the fifth position in the country’s commodity exports. Accordingly, the net income effect for Brazil from an increase in the international price of coffee is much lower now than what it was in the 1970s. Similarly, none of the top three commodities that represented 70 percent of Argentina’s exports in

---

5 The approach in Deaton and Miller (1996) has been used in many studies on the macroeconomic effects of commodity price fluctuations. Some examples are Dehn (2000) and Cashin, Céspedes, and Sahay (2004).

6 The price index in Collier and Goderis (2012) also takes into account net exports of each commodity, but excludes those goods for which the country is a net importer, while they are kept in the NCPI.

7 Using a different metric, Adler and Magud (2013) also consider that Uruguay did not experience a terms-of-trade boom in the 2000s.
1970–72 were among its top three commodity exports in 2010–12. In order to take this into account, the weights used in the index are allowed to vary over time. They are based on three-year rolling averages of trade values (to smooth fluctuations) and lagged one year (so that changes in the price index reflect variations in commodity prices rather than endogenous changes in volumes).

Taking these considerations into account, the annual change in country $i$’s NCPI is given by:

$$
\Delta \log(\text{NCPI})_{it} = \sum_{j} \Delta p_{ijt} \tau_{ijt},
$$

(3.1)

where $p_{ijt}$ is the logarithm of 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),\(^8\) and $\Delta$ denotes first differences.\(^9\) Country $i$’s weights for each commodity price ($\tau_{ijt}$) are given by:

$$
\tau_{ijt} = \frac{x_{ijt-1} - m_{ijt-1}}{\sum_{j-1} x_{ijt-1} + \sum_{j-1} m_{ijt-1}},
$$

(3.2)

\(^8\)Using an international manufacturing trade price index as a deflator is standard in the literature (Deaton and Miller, 1996; Erten and Ocampo, 2013b). It is preferred to the alternative of using consumer price indices from major economies, as these also include nontradables, which may distort price trends.

\(^9\)We use international prices from the IMF’s International Financial Statistics database for 33 commodities with data availability since 1970. See data sources in Annex 3.1 for more detail.
where \( x_{ij,t-1} \) (\( m_{ij,t-1} \)) denote the average exports (imports) value of commodity \( j \) by country \( i \) between \( t - 1 \) and \( t - 3 \) (in U.S. dollars).\(^\text{10}\)\(^\text{11}\)

The Mid-2000s Commodity Boom

The average annual NCPI growth rate across the 12 largest commodity exporters in LAC turned positive in 2003, reached double digits in 2004, and remained positive and large until 2011, with the exception of 2009.\(^\text{12}\) The sustained increases in NCPIs along these years also stand out in a historical perspective (Figure 3.4). Given this, 2003–11 is referred to here as a “commodity boom” period for LAC.

\(^\text{10}\) We use country-level trade values from UN Comtrade. Typically, more than one Standard International Trade Category is associated with each commodity price. For instance, the price of crude oil is linked with “crude petroleum” but also with “petroleum, partly refined (including topped crude)” and other similar categories.

\(^\text{11}\) There are two variations of the NCPI used in the chapter, based on different specifications for the weights in equation (3.2). In the export-based index shown in Figure 3.3, \( r'_{ij,t} = \frac{x_{ij,t-1}}{\sum_{j'} x_{ij',t-1}} \) is used. The weights for the adjusted NCPI series used in the scatter plots in Figure 3.8 are given by \( r'_{ij,t} = \frac{x_{ij,t-1} - m_{ij,t-1}}{\text{GDP\_USD}_{ij,t-1}} \), where GDP\_USD\_t-1 denotes lagged GDP in U.S. dollars. This adjusted index is similar to the “commodity terms-of-trade” index used in some studies (for example, Spatafora and Tytell, 2009).

\(^\text{12}\) For the purposes of this chapter, we refer to commodity exporters as those countries whose share of commodity exports in total exports is higher than the average for a sample of 169 countries during 2000–12.

Figure 3.4 Net Commodity Price Indices of Commodity Exporters in Latin America and the Caribbean, 1970–2013. (Average annual growth of NCPI across LAC countries; percent)

Sources: UN Comtrade database; IMF, World Economic Outlook database; World Bank, Global Economic Monitor; and author’s calculations.

Note: Simple average of net commodity price index (NCPI) annual growth rate of Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Honduras, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.
During the recent commodity boom, NCPIs in the region grew on average by 5½ percent per year (Figure 3.5). This increase is similar to that recorded by commodity exporters of other regions, such as Australia and Indonesia. But there are important differences across countries. For instance, Uruguay did not experience NCPI gains during this period. Other countries that also export mainly food commodities, such as Honduras and Paraguay, experienced a lower-than-average NCPI growth rate of about 3½–4 percent. On the other end, Bolivia, Ecuador, Colombia, and Chile experienced average annual increases in their NCPIs of more than 6 percent and, in the case of Venezuela, of close to 11 percent per year (similar to pure oil producers outside the region).

The commodity price boom of the last decade is considered to have been unprecedented in its magnitude and duration (Erten and Ocampo, 2013b). But was it also unprecedented from the perspective of LAC commodity exporters? Comparing the average NCPI growth rate in 2003–11 (5½ percent per year), with its long-term average (−1.4 percent over 1970–2002) suggests that this is the case (Figure 3.4). Another way to see this is to compare the increase in NCPIs during 2003–11 with comparable periods since 1970.¹³ The left panel of Figure 3.6 shows the distribution of average NCPI growth rates over rolling nine-year windows for these commodity exporters. In all cases except Uruguay, the average annual NCPI growth rate during the recent boom was above the eighth decile of the distribution. Moreover, in many cases average NCPI growth during 2003–11

¹³Identifying the timing, duration, and magnitude of succeeding super cycles for LAC economies is beyond the scope of this chapter. See Erten and Ocampo (2013b) and Jacks (2013) for recent analysis of commodity price cycles.
was at, or very close to, the sample maximum. By contrast, average NCPI levels observed during the last decade do not typically stand out in a historical perspective, except for Chile and Venezuela (Figure 3.6, right panel). In fact, in some countries (such as Honduras and Uruguay) the average NCPI level during 2003–11 is close to the sample minimum. 14

Is the Commodity Boom Over for Latin America and the Caribbean?

Commodity prices seem to have passed their peaks within the current “super cycle” (Figure 3.2). Nominal fuel prices peaked in mid-2008, while the prices of metals, food, and agricultural raw materials peaked sometime in the first half of 2011. In the last quarter of 2013, in fact, 46 of 51 international commodity prices were more than 10 percent below the maximum values attained between 2000 and 2013—and eight of them were more than 50 percent below their peaks.

Going forward, most forecasts suggest that overall commodity prices will soften somewhat over the medium term. For instance, the prices of commodity futures prevailing at end-February 2014 suggested that the spot prices of fuel, food, and metals in 2019 will be 15, 12, and 6 percent lower, respectively, than

14 Figure A3.1 in Annex 3.1 shows the NCPI time series for LAC commodity exporters since 1970. Figure A3.2 shows the NCPIs for commodity exporters from other regions, as well as the time series for (real) oil prices.
After the Boom: Commodity Prices and Economic Growth

in 2013, although they would still be 30, 23, and 17 percent higher than their average prices over 2003–11.

What does this general price outlook imply for the commodity exporters of LAC? Figure 3.7 shows the average projected NCPI growth rates over the medium term based on the current prices of commodity futures. The current market-based outlook for 2014–19 projects a sharp decline in NCPI growth rates across LAC, with an annual growth rate (averaged over time and across countries) about 6½ percentage points lower than during the commodity boom—and actually negative for most countries.

Nevertheless, average NCPI levels during 2014–19 would remain about 13 percent higher than during the boom years according to commodity futures (Figure 3.7). Even by the end of the forecast horizon in 2019, the projected NCPIs in LAC countries are, on average, about 10 percent higher than the 2003–11 average, and more than 30 percent higher than in the 1990s.

There is considerable uncertainty surrounding commodity price projections, and the ability of futures to forecast commodity spot prices has often been

---

15 We used prices of commodity futures prevailing as of February 28, 2014 to construct projected NCPIs. The only international price among the 33 commodities considered for which there were no data from futures was coconut oil, for which we assumed the price would remain constant at its average price in 2013. In any case, its share in commodity exports for the LAC countries in the sample is very low (and in all cases below 0.1 percent).
questioned. Still, taking these market-based price projections as a benchmark, the question in terms of the impulse to economic growth seems to boil down to what will predominate. Will it be the potential positive effect from the still relatively high levels of commodity prices, or the negative effect from the sharp deceleration in price growth? The sections that follow address this question.

GROWTH IN LATIN AMERICA AND THE CARIBBEAN AFTER THE COMMODITY BOOM

Before examining the evidence, it is useful to briefly review the potential links between commodity prices and growth. Consider a commodity exporter that is growing at its steady-state rate and suddenly faces a positive commodity price shock that is expected to persist. The higher income resulting from the improved terms of trade would boost demand for consumption, supporting domestic output (along with an increase in imports). This positive cyclical impulse would be reinforced by the rise of investment in the commodity sector in response to improved profitability, as well as in sectors that face higher demand from the commodity sectors (for example, transportation, logistics, and so on). Higher investment, in turn, would expand the productive capacity of the economy. Thus, both potential and actual output would grow faster than in the absence of the commodity price shock.

This effect, however, will be temporary. Once investment and consumption have adjusted to the new commodity price outlook after the price shock, output growth would revert to its pre-shock level—unless the new investment leads to permanently higher productivity growth. Of course, the distinction between the shock period and the subsequent one can be diffuse in practice (due, for instance, to investment gestation lags). And other effects could play an important role in shaping the dynamics (for example, an intensification of capital inflows triggered by the commodity price shock, an appreciation of the real exchange rate, alternative policy responses to these phenomena, and so on). But the outlined mechanism would suggest that moving from a period of ever-increasing commodity prices to a period of still-high but nongrowing prices entails a deceleration of output growth.

What does the empirical evidence say about the link between commodity prices and growth in LAC? Before moving to a more formal framework, simple evidence is reported from the unconditional bivariate correlations between NCPI levels and NCPI growth rates on one side, and output growth on the other, for a sample of commodity exporters in LAC. The data in the left panel of Figure 3.8 do not point to any significant relationship between NCPI levels and output growth in LAC, at least since the 1970s. By contrast, the right panel suggests there may have been a positive relationship between the growth in NCPIs and

---

16 Many studies have nonetheless found that futures prices can be a reasonable guide for forecasting commodity prices. See, for instance, Chinn and Coibion (2010), Reichsfeld and Roache (2011), and Reeve and Vigfusson (2011).
output growth in these countries. We checked whether this relationship is weaker after the mid-1990s, when many countries in LAC started improving their policy frameworks (which could have lessened the link between commodity prices and economic activity). But this is not the case. In fact, the relationship is slightly stronger in the subsample starting in the mid-1990s.

This simple pattern provides a prima facie indication that nongrowing commodity prices could be a drag on growth in LAC in the next few years, even if they were to remain steady at their current high levels. But this simple analysis does not control for other factors that might have affected output growth (for example, demand from trading partners, variations in external financing, and so on). Moreover, even if we take this evidence as suggesting that nongrowing commodity prices could be a drag on growth, a more relevant question is: how much of a drag? The next sections turn to a multivariate framework to investigate the underlying relationships and obtain quantitative predictions for concrete commodity price scenarios.

**A Global Vector Autoregression Model for Commodity Prices and Output Growth**

The multivariate analysis of the relationship between commodity prices and output growth is based on a variant of the GVAR model proposed by Pesaran, Schuermann, and Weiner (2004) and further developed by Dees and others (2007). The GVAR modeling strategy involves two main steps. In the first step, each country/region is modeled as a small open economy by estimating a country-specific augmented vector autoregressive model (VARX*) in which domestic variables are related to country-specific foreign variables (constructed as the cross-section averages of the domestic variables of the other economies) and global
variables, both assumed to be weakly exogenous at this stage. In a second step, the estimated country-specific models are combined into a global model and linked consistently using a matrix of predetermined (that is, nonestimated) cross-country linkages.

Given that the main objective is to generate out-of-sample forecasts, conditioning on specific paths for commodity prices, this coherent framework for modeling international linkages has many advantages. First, the country-specific models allow for the possibility of cointegration and hence long-term relationships between domestic variables, and between domestic and foreign variables (including the commodity price variables). This is particularly suitable to capture the effects of both commodity price levels and commodity price changes on output growth—which is particularly relevant given the current commodity outlook. At the same time, by modeling these relationships at the country level, the model can cope with idiosyncratic differences across countries related, for instance, to the structure of the commodity sector (private versus public property, domestic versus foreign shareholders, and so on).

Second, combining the individual models into a global model ensures that key cross-country interdependencies (owing to observed and unobserved common factors, but also to trade and policy spillover effects) and general equilibrium dynamics are taken into account. It also implies that predictions for domestic and foreign variables are simultaneously determined. This ensures that the forecast exercise takes into account not only the direct effects from conditioning on a given commodity price scenario (through the implications it entails for the terms of trade), but also the indirect effects from the outcomes of such a scenario on output growth in other economies, exchange rates, capital flows to the region, and so on.

**Model Specification**

The version of the GVAR model developed here covers 30 economies, five of which (France, Germany, Italy, Spain, and the United Kingdom) are modeled as a group. The other 25 economies include 13 LAC countries, covering the 12 largest commodity exporters (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Honduras, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela) and Mexico; other commodity exporters outside the region (Australia, Indonesia, Iran, Nigeria, Norway, Qatar, and Saudi Arabia); and other large economies (Canada, China, India, Japan, and the United States). Altogether these economies account for more than 80 percent of world GDP.

In order to capture as many commodity cycles as possible, the model is estimated using annual data over the period from 1970 to 2013. This, however, conditions data availability and limits the number of observations, making it necessary to keep the country models as parsimonious as possible. All models

---

After the Boom: Commodity Prices and Economic Growth

include real GDP ($y_{it}$), which is the main focus in the simulation exercises. The extent to which an income shock from rising commodity prices affects domestic output would depend, among other things, on how much of the bonanza is used to accumulate foreign assets or reduce external debt. It would also depend on how the commodity price shock affects relative prices. With this in mind, the country models also include the current-account-to-trend-GDP ratio ($ca_{it}$) to proxy for changes in net foreign assets excluding valuation effects, and the real exchange rate, defined as the nominal exchange rate in terms of U.S. dollars deflated by domestic consumer prices ($e_{it} - p_{it}$, as in Pesaran, Schuermann, and Weiner, 2004, and Dees and others, 2007).  

(See Table 3.1 for a summary of the model specifications and Annex 3.1 for data sources.)

All country models include foreign real GDP as a country-specific foreign variable ($y^*_i$). As is common in the GVAR literature, the set of real exchange rates constitutes a closed system and therefore this variable is included as a country-specific foreign variable in the U.S. model and as an endogenous variable in all the other country models (Pesaran, Schuermann, and Weiner, 2004).

The weights used to construct the country-specific foreign variables ($y^*_i$) are derived from bilateral trade data. Given that trade linkages have varied considerably over the sample period, we use rolling three-year moving averages of annual trade shares to compute these weights.  

The weights used to link the country-specific models within the GVAR are based on the trade shares at the end of the sample (averages over 2010–12).

Most of the GVAR literature uses one global variable, typically the price of oil.  

<table>
<thead>
<tr>
<th>TABLE 3.1</th>
<th>Specification of the Country-Specific VARX* Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Models for Commodity Exporters</strong> (excluding Pure Oil Producers)</td>
<td><strong>Models for Pure Oil Producers and Noncommodity Exporters</strong></td>
</tr>
<tr>
<td><strong>Domestic</strong></td>
<td><strong>Foreign</strong></td>
</tr>
<tr>
<td>$y_{it}$</td>
<td>$y^*_i$</td>
</tr>
<tr>
<td>$e_{it} - p_{it}$</td>
<td>$e_{it} - p_{it}$</td>
</tr>
<tr>
<td>$ca_{it}$</td>
<td>$ca_{it}$</td>
</tr>
<tr>
<td>$NCPI_{it}$</td>
<td>$NCPI_{it}$</td>
</tr>
<tr>
<td>$poil_i$</td>
<td>$poil_i$</td>
</tr>
</tbody>
</table>

Source: Author’s estimates.

18 The current account ratio is defined as a ratio of trend GDP (expressed in U.S. dollars), instead of actual GDP, in order to avoid the measure to be contaminated by contemporaneous movements in GDP.

19 For example, the share of China in total trade of goods among the 30 economies in the sample for the average LAC commodity exporter has increased from less than 1 percent in 1970 to 14.7 percent in 2012.

20 For instance, Pesaran, Schuermann, and Weiner (2004), Dees and others (2007) and Cesa-Bianchi and others (2011) include only one global variable, the price of oil, which is modeled as endogenous to the U.S. model. Cashin and others (2014) add the quantity of oil produced in the world, which is modeled as endogenous to the Gulf Cooperation Council group of countries.
commodity price cycles, we augmented the model significantly along this dimension, including 14 global variables related to commodity prices. More precisely, we include a country-specific commodity price index (\(NCPI_{it}\)) as a global variable in the models for nonpure-oil commodity exporters (Argentina, Australia, Bolivia, Brazil, Chile, Colombia, Ecuador, Honduras, Indonesia, Peru, Paraguay, Trinidad and Tobago, and Uruguay).\(^{21}\) The models for pure oil exporters (Iran, Nigeria, Norway, Qatar, Saudi Arabia, and Venezuela) and for noncommodity exporters (all the remaining countries in the model), instead, include real oil prices (\(poil_t\)) as a global variable.

At the end of the day, all variables are endogenous to the global model. The common approach in the literature has been to model the global variable (for example, oil prices) as endogenous in the model of the United States.\(^{22}\) With 14 global variables, however, including them in the U.S. model is not an option given the number of observations. Moreover, while the United States is a large consumer of oil, it is not the main consumer of many of the other 32 commodities used in the construction of the NCPIs—in fact, it is the largest world exporter of some of them, such as corn and wheat. Instead, we model the global commodity price variables in three auxiliary VARX* models (labeled Model A, B, and C in Table 3.2).\(^{23}\) The “domestic” variables in these models include the 13 NCPI series and the (real) oil price series (in Model A). The foreign variables in these models are the real output of the economies in the model weighted by their share in global trade (\(y'_{At}\), which is the same for all three additional models), and the real price of oil (\(poil_t\)) in two of these three auxiliary models (Models B and C).

\(^{21}\) An alternative strategy is to directly use the international prices of individual commodities. But this has at least two drawbacks: it is unfeasible (it would be impossible to include 33 global variables in each country-specific model); and it would implicitly assume that the basket of commodities traded by each country is constant over time.

\(^{22}\) A notable exception is the GVAR model in Gauvin and Rebillard (2014), in which metal and oil prices are not endogenous to the U.S. model or to any other country model, but are modeled in two auxiliary models for commodity prices.

\(^{23}\) The NCPIs were grouped in three models according to similarities in the commodity mix among countries (whether they mainly specialized in energy, metals, or food commodities).
The lag orders $p_i$ and $q_i$ of the VARX* models were selected on the base of the Schwartz Bayesian criterion. All models are either (2,1) or (1,1). We first used Johansen’s trace and maximum eigenvalue statistics to select the number of cointegrating relations, but then reduced the number of relations for a number of models to ensure the stability of the GVAR (similar to Dees and others 2007 and Cesa-Bianchi and others, 2011). The final specification has one cointegration relation in each model.

Overall, and despite data limitations given the broad nature of the sample, the validity of the assumptions made to specify the GVAR is supported by a number of specification tests. For instance, the weak exogeneity assumption can only be rejected for one out of the 58 country-specific foreign variables and global variables (and this could be by chance, as one would expect about three tests to fail using a 5 percent significance level, even if the hypothesis were valid in all cases). Importantly, the weak exogeneity assumption is not rejected for any of the NCPI variables, or for the foreign variables in the models of large economies such as the United States or China.

Assessing the Goodness of Fit of the Model

In order to get a sense of the adequacy of the model for purposes here (that is, to obtain out-of-sample growth projections under alternative commodity price scenarios), we compared the projections in the IMF’s World Economic Outlook (WEO) with the model’s unconditional out-of-sample forecasts for output growth.

Toward this end, we first computed the root mean squared error between the model unconditional forecast for each country and forecast horizon, from one to six years ahead, and the corresponding WEO projection for all six vintages between 2003 and 2008. The set of differences between the model and WEO projections was computed in the following way. The model was first estimated with data up to 2002 and its unconditional output growth forecasts for each country for 2003 through 2008 were compared with the April 2003 WEO growth projections for those years. Next, the model was estimated with data up to 2003 and its output growth forecasts were compared with WEO projections from the April 2004 vintage for 2004 through 2009. The process was repeated for all remaining vintages up to that of April 2008. The root mean squared error considering all countries, forecast horizons, and vintages was 2.9 percent, which is reasonably small, especially given that we are considering forecast horizons of up to six years ahead.

Second, we computed the root mean squared error with respect to actual data both for the model and for the WEO projections. As expected, the root mean squared error of the WEO projections was lower than the one of the model, but only by 0.8 percentage points. Again, this difference is quite small considering the simplicity of the underlying country models.

See Gruss (2014) for detailed evidence from the model specification tests.
Results from the Global Vector Autoregression Model

This section reports the results from the two main exercises conducted with the GVAR model: producing conditional output growth forecasts for the commodity exporters of LAC over the medium term, and simulating the response of commodity prices and GDP growth in LAC to a potential shock to China’s GDP.25

Conditional Growth Forecasts—Scenarios

The model is used to generate forecasts for output growth over 2014–19 conditioning on certain assumed paths for the country-specific NCPIs and oil prices.26 These paths, in turn, correspond to three alternative scenarios for individual commodity prices. The first scenario simply assumes that commodity prices in current U.S. dollars remain constant over 2014–19 at their 2013 average levels. This simple scenario, labeled stable prices, is a key benchmark aimed at answering what could happen to economic growth in LAC if commodity prices were to remain high but stop increasing.

However, even if a scenario of stable prices is deemed to be likely, assuming constant prices for each individual commodity may be a stretch because it ignores important existing information regarding the different commodity markets. In particular, it may ignore plausible relative price variations over the medium term associated with developments that are already known (for example, the maturing of investment projects that would increase commodity supply). To take this into account, the second scenario (called futures) assumes that commodity prices evolve in line with the market price of commodity futures (prevailing at end-February 2014).27 As shown in Figure 3.1, commodity futures suggest that spot prices for broad commodity aggregates will remain stable or decrease moderately over the coming years.

The third and final scenario (called adverse) preserves the relative price variations implied by the futures scenario but assumes lower price growth, such that all commodity prices under the adverse scenario are 10 percent below those implied by the futures scenario by the end of the forecast horizon.

Figure 3.9 shows the average growth rate of the country-specific NCPIs and the (real) oil price assumed under the three alternative commodity price scenarios. It also reports their average growth rates over 2003–11 and, as a reference, the model’s unconditional NCPI growth forecasts for 2014–19. It is worth noting that in most cases the unconditional forecasts for the NCPIs imply relatively

25 For the purpose of the applications in this chapter, the GVAR model is estimated using the toolbox by Smith and Galesi (2011).
26 To compute conditional output forecasts under alternative future paths for a set of endogenous variables in the model (all NCPIs and the oil price), we use the Kalman filter approach proposed by Camba-Mendez (2012).
27 Although this market-based scenario could be thought of as a neutral scenario, it has been argued that using futures to forecast spot prices may imply a downward bias. See “Special Feature: Commodity Price Forecasting” in the April 2014 World Economic Outlook (IMF, 2014).
After the Boom: Commodity Prices and Economic Growth

stable prices over the medium term and, in all cases except Uruguay, a sharp deceleration compared to the boom years.

**Conditional Growth Forecasts—Results**

What would these commodity price scenarios imply for economic growth in LAC commodity exporters? The main result from the conditional forecast exercise is that even if commodity prices were to remain stable at the relatively high levels attained in 2013, as implied by the stable prices scenario, output growth in the LAC commodity exporters would be substantially lower than in recent years. On average, output growth would be about 0.8 percentage points lower than in 2012–13 and 1.8 percentage points lower than during the commodity boom (Figure 3.10).

The slowdown vis-à-vis the boom period would be quite generalized (Figure 3.11). In all countries except Paraguay, average projected growth over 2014–19 is lower than in 2003–11. The projected slowdown is particularly large in the case of Trinidad and Tobago and, to a somewhat lesser extent, in Argentina and Venezuela. Excluding these four cases, the slowdown under the stable prices scenario in the other eight countries ranges from 0.8 percentage points in Chile

---

28This mostly reflects the difficulty of obtaining a good model fit for Paraguay, given the still-large weight of the agricultural sector in this economy and the strong swings in its GDP tied to weather-related supply shocks.

29In the case of Argentina, the results could be contaminated by measurement issues in official GDP data. Alternative data sources have indeed reported significantly lower real GDP growth than the official data since 2008 (Coremburg, 2014).

©International Monetary Fund. Not for Redistribution
to about 2 percentage points in Peru. In all of these eight cases, the conditional projections under the stable prices scenario is within about ½ percentage point of the model’s unconditional growth forecast (except for Uruguay, were the unconditional growth forecast is 1.2 percent lower). Although the region slowed considerably in 2012–13 vis-à-vis the boom years, the model still

©International Monetary Fund. Not for Redistribution
predicts lower average GDP growth in 2014–19 for all counties except Brazil and Paraguay.

Output growth for the average commodity exporter in LAC under the futures scenario would be about $\frac{3}{4}$ of a percentage point lower than under the stable prices scenario (Figure 3.10). If, instead, commodity prices evolve as in the adverse scenario, growth would be even lower by an additional $\frac{1}{2}$ percentage point (with country-specific differences ranging from −0.1 to −1.2 percent), highlighting further downside risk.

The results in this section suggest that output growth in LAC commodity exporters over the next few years will be more affected by the lower projected growth of commodity prices than by the still-high levels of those prices. This means that even if commodity prices do not revert to their long-term trends anytime soon, the end of the period of ever-increasing prices is likely to imply a significant drag on growth for the region.30

**Assessing the Effects of Lower Output Growth in China**

Demand from China has been a key driver of global commodity prices in recent years (Erten and Ocampo, 2013b) and, consequently, of the favorable economic performance in many LAC countries during the 2000s. A key question, then, is what might be the impact on commodity prices and more generally on economic growth in commodity exporters of LAC if China’s economy slows down more than currently expected.

This section reports results from simulating the effects that shocks to China’s GDP may have on NCPI series’ and on output for the average commodity exporter in LAC. Given the difficulty of identifying the structural shocks in a GVAR framework, and as it is commonly done in the literature, we rely on the generalized impulse response function (GIRF) analysis developed in Pesaran and Shin (1998).31

Figure 3.12 shows a summary of the results from this exercise. A 1 percent decline in China’s GDP (relative to baseline) would lower the average NCPI of LAC commodity exporters by about 3 percent on impact—and in some cases the decline in the NCPI would be about 8 percent. Moreover, the average NCPI

---

30 Although our quantitative exercise is grounded in very specific price scenarios, the results overall are consistent with Dehn (2000) and Collier and Goderis (2012), who find that commodity price booms have positive short-term effects on output growth but either no long-term effects or even negative effects in some cases.

31 Having 91 variables in the model, exact identification would require imposing an incredibly high number of restrictions, so we do not attempt to identify the ultimate source of the disturbance. The GIRF approach reports how shocks to one variable (say, China’s GDP) affect the other variables of the system on impact and over time regardless of the source of the change, but taking into account the possibility that the error terms of the GVAR are contemporaneously correlated.
would still be more than 1½ percentage points below trend two years after the shock.\textsuperscript{32}

The relevance of China for commodity prices is likely to reflect its large (and increasing) weight in global demand, but also its relatively higher commodity intensity of demand.\textsuperscript{33} To try to assess whether the effects of a shock to China are different from those of a shock to global demand, Figure 3.13 compares the effect on the NCPI from a 1 percent decline in China’s GDP (relative to baseline) with

\begin{figure}
\centering
\includegraphics[width=\textwidth]{Figure3.12.png}
\caption{Response of Net Commodity Price Indices and GDP in Latin American and Caribbean Countries to a 1 Percent Decrease in China’s GDP (Relative to Trend) (\textit{Percentage deviation from trend})}
\label{fig:figure3.12}
\end{figure}

\begin{itemize}
\item Source: Author’s calculations.
\item Note: The shaded area reports the range of deviations from trend of the net commodity price indices (NCPIs) for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Honduras, Paraguay, Peru, Trinidad and Tobago, and Uruguay. The red solid line shows the simple average of the NCPI responses for these countries. The blue dashed line corresponds to the simple average of the deviations from trend of GDP for all LAC commodity exporters in the model (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Honduras, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela) and is reported in the right scale.
\end{itemize}

\textsuperscript{32}While differences in the construction of variables, samples, and so on make it difficult to do direct comparisons with results in other studies in the literature, the results reported here appear quantitatively plausible and in line with previous findings. For instance, the IMF Spillover Report on China (IMF, 2011) finds that a shock to real activity in China of 1 percent of GDP would lead to an increase in metals prices (in current U.S. dollars) of about 6 percent after six months. In our model, a similar shock would lead to an increase in the net commodity price index of metal exporters, such as Chile and Peru, of about 3.9 percent in the first year after the shock.

\textsuperscript{33}China’s consumption accounted for about 20 percent of global nonrenewable energy production, 23 percent of major agricultural crops, and 40 percent of base metals (Roache, 2012).
that of an equivalent shock to the United States.\(^{34}\) While a U.S. output shock also has a large effect on the average NCPI in the region, the effect from the shock to China’s output is roughly 50 percent larger, even if China’s share in total trade is about 30 percent lower.

Turning to the response of output in LAC to a shock to China’s GDP, the model suggests that, for the average commodity exporter in the region, GDP would be about a ½ percentage point below trend three years after the shock. The output level would still be 0.3–0.4 percentage point below trend even six years after the shock. Figure 3.14 shows the cumulative drop in GDP with respect to the baseline, by country, three years after the shock. The model suggests a bigger-than-average drop in GDP for Honduras and Peru of about 0.9 percent. Brazil, a much less open economy, shows a smaller response, of about 0.1 percent.

Overall, the results in this section confirm that slower growth in China represents a key downside risk for LAC commodity exporters, and that commodity prices are a key channel through which such a shock would affect the region.

\(^{34}\)The share of China in total trade has increased dramatically in the last few decades. Considering only trade of goods among the 30 economies included in the model, China’s share in total trade increased from about 1½ percent in 1990 to 14½ percent in 2010–12. The U.S. share decreased from 23 percent to 21 percent in the same period.
CONCLUSION

International commodity prices skyrocketed during the first decade of the 2000s, boosting economic growth of commodity exporters around the world. But after peaking around mid-2011, commodity prices have since moved along a slightly decreasing path, and most projections suggest they are not likely to resume the upward trend observed in the past decade. This chapter analyzed what this turn in the commodity price cycle may imply for output growth in LAC using a GVAR model extended to include the 12 largest commodity exporters in the region and a rich set of country-specific commodity price indices. The model is also used to explore the potential effects of slower-than-expected economic growth in China.

The results suggest that the end of the commodity price boom will entail a significant drag on growth for the average LAC commodity exporter. Even in a context of still-high but nonincreasing commodity prices—which, ex ante, would appear as a rather benign scenario—these economies would grow significantly less than in the past decade. More precisely, if prices were to remain stable at the average levels attained in 2013, average annual GDP growth over the medium term (2014–19) would be almost 1 percent lower than in 2012–13 and more than 1½ percentage points lower than over 2003–11. If commodity prices were to evolve as was implied by commodity futures in early 2014, output growth would be on average even lower, by about ¾ of a percentage point.

The results also confirm that slower-than-expected economic growth in China represents a key downside risk for the region. A 1 percent decline in China’s GDP relative to trend would be associated with a decrease in the average commodity price

Figure 3.14  Response of GDP in Latin American and Caribbean Countries to a 1 Percent Decrease in China’s GDP (Relative to Trend) (Cumulative response after three years; percent)

Source: Author’s calculations.
Note: The red line denotes the simple average across countries.

©International Monetary Fund. Not for Redistribution
index in LAC of about 3 percent—and even 8 percent in some cases. In the case of such an event, GDP in the average commodity exporter in LAC would fall by more than \( \frac{1}{2} \) a percentage point below trend about three to four years after the shock.

The results from this exercise are nonetheless subject to important caveats. First, the estimated model assumes stable relations (including policy responses to external shocks) over the period 1970–2013, but in fact most LAC economies underwent important structural transformations during that period. Moreover, many have significantly strengthened their policy frameworks more recently (for instance, by allowing greater exchange rate flexibility and reducing the procyclicality of fiscal policy). Second, the model does not take into account future developments that are already foreseen but not readily captured by key macroeconomic relationships (for example, planned structural reforms aimed at raising future potential output). To the extent that these changes have a direct bearing on future growth, the projections from the model used here are likely to have a downward bias.

Despite these caveats, the model results carry important policy implications for LAC commodity exporters. First, the recent slowdown in many LAC economies could be the result, to a large extent, of having passed the peak of the commodity “super cycle.” If that is indeed the case, using demand-side stimulus to keep growth at recent high rates would not be warranted and could give rise to problematic macroeconomic imbalances. Policies should focus instead on structural reforms to raise productivity and potential output growth. Second, policymakers in these economies should work to weaken the link between commodity prices and economic activity to avoid the boom-bust dynamics often associated with past commodity cycles. Fiscal policy needs to play a critical role in this regard by striking the right balance between building buffers and frontloading capital spending to raise potential growth. A formal fiscal framework that explicitly accounts for natural resource revenues, potentially including a stabilization fund, can support this effort. Exchange rate flexibility, underpinned by credible monetary and macroprudential frameworks, provides an additional buffer for shocks to the terms of trade.
ANNEX 3.1. DATA SOURCES

The source for real GDP \( y_{it} \) for all 30 economies is Penn World Table Version 8.0 (GDP at constant national 2005 prices, “q_gdp”). Real GDP growth rates from the IMF’s April 2014 World Economic Outlook (WEO) database were used to extend the real GDP series to 2013. The real exchange rate \( (e_{it} - p_{it}) \) is constructed using data from the April WEO database as the nominal exchange rate in terms of U.S. dollars deflated by domestic consumer prices. The current account variable \( (ca_{it}) \) is the ratio of the current account balance in U.S. dollars from the April 2014 WEO database to the Hodrick-Prescott trend component of GDP in current U.S. dollars. The latter is constructed using nominal GDP from Penn World Table Version 8.0 (GDP at current national prices, “v_gdp”) and the nominal exchange rate from the April 2014 WEO database.

The source for commodity prices is the IMF’s International Financial Statistics (IFS) database. Due to data availability, 33 commodities prices with data since 1970 were used: aluminum, bananas, barley, beef, coal, cocoa, coconut oil, coffee,

<table>
<thead>
<tr>
<th>TABLE A3.1</th>
<th>Latin America and Caribbean: Main Commodity Exports in the 1970s and 2000s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970–72</td>
<td>First</td>
</tr>
<tr>
<td>ARG</td>
<td>Beef</td>
</tr>
<tr>
<td>BOL</td>
<td>Tin</td>
</tr>
<tr>
<td>BRA</td>
<td>Coffee</td>
</tr>
<tr>
<td>CHL</td>
<td>Copper</td>
</tr>
<tr>
<td>COL</td>
<td>Coffee</td>
</tr>
<tr>
<td>ECU</td>
<td>Bananas</td>
</tr>
<tr>
<td>HND</td>
<td>Bananas</td>
</tr>
<tr>
<td>PER</td>
<td>Fishmeal</td>
</tr>
<tr>
<td>PRY</td>
<td>Beef</td>
</tr>
<tr>
<td>TTO</td>
<td>Crude oil</td>
</tr>
<tr>
<td>URY</td>
<td>Rice</td>
</tr>
<tr>
<td>VEN</td>
<td>Crude oil</td>
</tr>
<tr>
<td>2010–12</td>
<td>First</td>
</tr>
<tr>
<td>ARG</td>
<td>Soybean meal</td>
</tr>
<tr>
<td>BOL</td>
<td>Gas</td>
</tr>
<tr>
<td>BRA</td>
<td>Iron ore</td>
</tr>
<tr>
<td>CHL</td>
<td>Copper</td>
</tr>
<tr>
<td>COL</td>
<td>Crude oil</td>
</tr>
<tr>
<td>ECU</td>
<td>Crude oil</td>
</tr>
<tr>
<td>HND</td>
<td>Coffee</td>
</tr>
<tr>
<td>PER</td>
<td>Copper</td>
</tr>
<tr>
<td>PRY</td>
<td>Soybeans</td>
</tr>
<tr>
<td>TTO</td>
<td>Gas</td>
</tr>
<tr>
<td>URY</td>
<td>Beef</td>
</tr>
<tr>
<td>VEN</td>
<td>Crude oil</td>
</tr>
</tbody>
</table>

Sources: UN Comtrade database; and author’s calculations.
Note: The table reports the average share of each country’s three main commodity exports in their total exports of the 33 commodities considered here.

©International Monetary Fund. Not for Redistribution
Figure A3.1  Net Commodity Price Index Series for Latin American and Caribbean Commodity Exporters, 1970–2019

Sources: UN Comtrade database; IMF, World Economic Outlook database; World Bank, Global Economic Monitor; and author’s calculations.

Note: The net commodity price indices for 2014–19 (shaded area) are constructed from prices of commodity futures prevailing at end-February 2014.
Figure A3.2 Net Commodity Price Index Series for Other Commodity Exporters, 1970–2019

Sources: UN Comtrade database; IMF, World Economic Outlook database; World Bank, Global Economic Monitor; and author’s calculations.

Note: The net commodity price indices and the real oil prices for 2014–19 (shaded area) are constructed from prices of commodity futures prevailing at end-February 2014.

copper, corn, cotton, crude oil, fishmeal, hides, iron ore, lamb, lead, natural gas, natural rubber, nickel, palm oil, rice, shrimp, soybean meal, soybean oil, soybeans, sugar, sunflower, tea, tin, wheat, wool, and zinc. The price of crude oil is the simple average of three spot prices: Dated Brent, West Texas Intermediate, and the Dubai Fateh and *poil* is this average divided by the IMF’s unit value index for manufactured exports. The World Bank’s Global Economic Monitor database was used to extend the following IFS commodity price series back to 1970: barley, coal, iron ore, and natural gas.
The source for the export and import value data for individual commodities used to weight the commodity price series for each country is the UN Comtrade database (SITC Revision 1).

REFERENCES


———, 2013, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, October.

———, 2014, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, April.


PART II

Managing the Commodity Price Cycle: Have Policies Improved?
This page intentionally left blank
Commodity Price Cycles: The Perils of Mismanaging the Boom

GUSTAVO ADLER AND SEBASTIÁN SOSA

Commodity-exporting countries have benefited significantly from the commodity price boom of recent years. At the current juncture, however, uncertain global economic prospects raise questions about these countries’ vulnerability to a sharp fall in such prices and the policies that can shield them from such a shock.

This chapter sheds light on these issues by (1) documenting long-term (four-decade) trends and cross-country differences in the degree of commodity dependence; (2) examining the behavior of different commodity prices and, especially, their sensitivity to global economic conditions; and (3) drawing lessons from the history of episodes of sharp drops in terms of trade. The chapter pays particular attention to the role of macroeconomic policies and fundamentals in shaping the economic impact of negative terms-of-trade shocks.

A number of interesting stylized facts arise from the historical perspective:

• The recent price boom is remarkable in historical terms, but less so for food prices, which remain significantly below their 1960s–70s levels, after trending downward for several decades.

• While some commodity prices are sensitive to global output, others (for example, food prices) are less so, forcing a distinction when assessing vulnerability across exporters of different commodities.

• In contrast to previous price cycles, the current one has shown a high co-movement of prices, mainly reflecting the dominant role of global demand as a key common driver of prices.

• Despite shifting trade structures in some countries, Latin America is—on average—as dependent on commodities today as it was 40 years ago, although within the region, Mexico and Central America have significantly reduced such dependence. At the same time, most countries have followed a trend toward more diversified export structures, with the exception of the heavy metal and energy exporters.

• Latin America’s sustained dependence on commodities contrasts starkly with the trends in emerging Asia, which has evolved from being a strong net commodity exporter in 1970 to being a net importer in 2010, while also recording a marked export diversification.
The study of episodes of terms-of-trade busts also offers some interesting insights. While a country’s degree of reliance on commodities is a key determinant of the economic impact of commodity price shocks (that is, terms-of-trade shocks), the degree of dependence on commodities can hardly explain, by itself, how countries fare during episodes of sharp trade price busts. In fact, this chapter finds that policies in the run-up to sharp terms-of-trade drops—especially when those are preceded by booms—play an important role in shaping their economic impact. In particular, limited exchange rate flexibility, a weak external position, and loose fiscal policy tend to amplify the negative effects of these shocks on domestic output. Financial dollarization also appears to act as a shock “amplifier.” Interestingly, the analysis finds that a higher degree of financial integration with the rest of the world helps to buffer the shock when country fundamentals are relatively good, but not necessarily otherwise.

The chapter first presents key stylized facts on commodity prices in historical perspective and provides insights about the idiosyncratic behavior of different commodities and their co-movement. It then documents the extent of Latin America’s commodity dependence, studies the role of policies and fundamentals in determining the impact on domestic output of the subsequent negative terms-of-trade shocks, and presents key conclusions and policy implications.

A HISTORICAL PERSPECTIVE ON COMMODITY PRICES

A historical analysis of commodity prices is not straightforward. With high world inflation in the 1970s and 1980s, nominal series can give a distorted picture of the behavior of these prices. At the same time, given that commodities are normally priced in U.S. dollars, marked movements in the value of the U.S. dollar vis-à-vis other currencies can have a numeraire effect on commodity prices that does not reflect an intrinsic change in the relative price of these goods at a global level. To correct for these two factors, we construct series’ of prices in real terms that also strip the changes in the value of the U.S. dollar relative to other major currencies.1

Except for a brief interruption during the 2008–09 global crisis, commodity prices have increased sharply over the past decade, with the IMF broad

---

1 Commodity prices in U.S. dollars are deflated by a weighted average of the wholesale price indices (WPIs) of five countries (France, Germany, Japan, the United Kingdom, and the United States) whose currencies comprise the IMF’s Special Drawing Right (SDR) basket (with the euro succeeding the French franc and German mark in the euro era). Each country’s WPI is converted to U.S. dollars using the average exchange rate of the period, and the average is computed using the weights of the SDR basket. Thus, our measure of real commodity prices is stripped of the mechanical impact of changes in the U.S. dollar exchange rate vis-à-vis other currencies (a numeraire effect due to the fact that commodity prices are quoted in U.S. dollars). References to commodity prices in the rest of the chapter are always in real terms.
commodity price index reaching levels similar to those recorded during the price booms in the 1970s (Figure 4.1). This boom has been remarkable in historical perspective not only for its magnitude, but also because—unlike most previous booms—it has been broad-based. Energy and metal prices have tripled (in the latter case from record low levels) since 2003, and current prices are around the historic peaks of the 1970s. Food prices have also increased markedly, although their surge has been less spectacular (about 50 percent since 2003), and has only partly reversed the pronounced downward trend seen for several decades. Indeed, current prices are still about 50 percent below their average level of the 1970s.²

The evolution of agricultural raw material prices is similar to that of food prices, though the long-term decline has been less marked. Interestingly, food prices have also been less volatile and their shocks more persistent than those of metals and energy (Table 4.1), although there are also marked differences within the food category, as prices for cereals tend to display relatively higher volatility and lower persistence than those of meat and fish (to a large extent reflecting weather-related idiosyncratic shocks).

²This pattern is common to most cereals (corn, wheat, rice, soybeans, and so on).
Commodity Price Cycles: The Perils of Mismanaging the Boom

A look at the co-movement across commodity prices suggests that the relationship between them has changed significantly over time, reflecting the varying nature of underlying shocks. Prices across all categories have tended to move in the same direction in the past decade on account of the dominant role of global demand as a key common driver of price changes. Prices have also shown pronounced co-movement in response to financial shocks. In previous decades, and particularly during past commodity boom-bust cycles, the correlation was lower, and even negative in some cases. Clear examples are the first and second oil price shocks in the 1970s and the Gulf War shock in the early 1990s, when oil supply shocks triggered a slowdown in global economic activity, negatively affecting the demand for oil and the prices of other commodities.\(^3\)

The importance of common (global) underlying factors in driving prices across different categories of commodities is confirmed by a statistical analysis of principal components. In the past decade, the first principal component accounted for almost 85 percent of the variance of commodity prices, and prices of all categories were positively correlated with this underlying common force. This reflects to a great extent the increasing importance of China in global demand for commodities.\(^4\) In the 1970s and 1980s, in contrast, the first principal component accounted for about 65 percent of the variance of commodity prices, and whereas it was positively correlated with prices of metals and food, the correlation with energy prices was negative.

Finally, despite the high correlation among commodity prices—especially recently—a glance at their behavior during global recessions suggests that there

---

\(^3\)See details in Adler and Sosa (2011).

are notable differences across commodities in their sensitivity to the global cycle. Food prices, in particular, are significantly less sensitive to global output—possibly reflecting higher supply elasticity and lower income elasticity of demand. This lower impact was visible during the 2008–09 Great Recession as well as during other slowdowns in the last four decades (Figure 4.2). These differences across categories suggest that the degree of vulnerability to a global slowdown may vary significantly within the group of commodity-exporting countries, depending on the specific commodities in which countries specialize.

COMMODITY DEPENDENCE AND CONCENTRATION

We gauge a country’s reliance on commodity exports with two different measures that provide distinct information:

- A measure of commodity dependence, defined as total net exports of these goods relative to the country’s GDP. This indicator provides information on the potential effect that a commodity price shock would have on domestic output.\(^5\)

- A measure of commodity (export) concentration, defined as gross commodity exports in percent of total exports of goods and services. This second measure

\(^5\)Alternatively, one could focus on the size of the commodity sector in terms of its share of domestic output. Whether such a measure would be preferable is not clear, however, as our focus is on the income effect of changes in international prices. Such an effect may net out in the case of commodities produced and consumed domestically.
can provide information about the country’s ability to adjust to a given commodity price shock.6

Commodity Dependence

A historical perspective unveils interesting patterns regarding Latin America’s reliance on commodities along both of these dimensions (Figures 4.3 and 4.4, and Annex 4.1). South America is the most commodity-dependent subregion, and this feature has become more pronounced over time. Net commodity exports there represented 10 percent of GDP in 2010, compared with 6 percent in 1970. Although the increase has been broad-based, metals and energy still account for the largest shares of net commodity exports. In contrast, Mexico and Central America have recorded sharp declines in net commodity exports, primarily as a result of falling agriculture exports and increasing energy imports. The subregion was a large commodity exporter in 1970 (8 percent of GDP) and currently shows balanced trade in commodities (still being a net exporter of agriculture goods but now also a net importer of energy).

Latin America’s trends contrast markedly with those of emerging Asia, as the latter has evolved from being a net commodity exporter (reaching about 6 percent of GDP in 1970) to being a net importer (almost 3 percent of GDP) in 2010.7,8

Commodity Export Concentration

While increasing dependence on commodities has made some countries in South America more sensitive to commodity price shocks, even larger increases in non-commodity exports (resulting from a marked increase in trade openness) have led, in many cases, to a more diversified export structure, arguably making these countries more flexible to withstand such shocks (Figures 4.3 and 4.4, and Annex 4.1).

Several countries in South America (Argentina, Brazil, Uruguay) have displayed some degree of diversification away from commodities over the last four decades, although commodities still account, on average, for 60 percent of total exports of goods and services. There is no such evidence in the case of heavy metal/energy exporters. Metal exporters (Chile and Peru) and energy exporters (Colombia, Ecuador, and Venezuela) still display very high commodity shares, with metals

---

6This potential source of strength has been pointed out by some authors (Calvo and Talvi, 2005) who have stressed the role of the relative size of the tradable sector (vis-à-vis the nontradable sector) in determining the country’s ability to adjust to an external shock. In concrete terms, a larger tradable sector would entail a smaller real exchange rate depreciation in order to restore external sustainability in the event of a negative shock. In this vein, the higher vulnerability due to a growing share of commodity exports in GDP would be mitigated by an even more pronounced increase in exports of other goods.

7This shift has been mostly due to a sharp decline in exports of raw materials and an increase in imports of energy and metals. Most large emerging economies in Asia are now net importers of energy.

8A comparison with some large commodity-exporting advanced economies (Australia, Canada, New Zealand, and Norway) also yields some interesting insights. As in the case of South America, dependence is high and has increased markedly in these advanced economies (from an average of 6 percent of GDP in 1970 to 13 percent in 2010). See Adler and Sosa (2011) for further details.
(energy) accounting, on average, for about 60 percent (80 percent) of total exports. These countries also exhibit a higher degree of commodity dependence, with commodity exports averaging 20 percent and 17 percent of GDP, respectively, compared to only 8 percent in other countries in the region. 9 In Mexico and Central America, Argentina, Brazil, Colombia, Ecuador, Peru, Uruguay, and Venezuela. Two cases show particularly interesting shifts: Colombia has exhibited a marked shift in the composition of commodity exports over the last four decades, although the overall share of commodities has remained quite stable. Agricultural exports—which accounted for more than 5 percent of total exports in 1970–80—represent less than 10 percent today. In contrast, the share of energy exports has increased from less than 5 percent to 50 percent over the same period. Venezuela, on the other hand, has recorded a substantial decline in net energy exports, from 30 percent of GDP in 1990 to about 15 percent in 2010. However, diversification has declined markedly in Venezuela, with commodity exports rising from 75 percent of total exports in 1980 to about 90 percent in 2010.

Figure 4.3 Commodity Dependence: A Regional and Historical Comparison

Sources: World Integrated Trade Solutions database; and authors' calculations.

1 Simple average for Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Uruguay, and Venezuela.
2 Simple average for Mexico, Costa Rica, El Salvador, and Guatemala.
3 Simple average for China, India, Indonesia, Korea, Malaysia, Philippines, and Thailand.
America, the importance of commodity exports also halved between 1970–80 and 2010 (from 50 percent of total exports to about 25 percent).10

Again, Latin America’s trends contrast sharply with those in emerging Asia, where commodity exports fell from about 60 percent of total exports in the 1970s to less than 20 percent in 2010.11

In sum, Latin America remains on average as exposed to commodity-related risk as it was four decades ago, making it vulnerable to a sharp decline in commodity prices. At the same time, higher export diversification has arguably made some countries more flexible to withstand such shocks. Key exceptions are the energy and metal exporters, which are today particularly vulnerable to a global slowdown, given both their higher commodity dependence and their greater concentration in commodities—heightened by their exposure to commodities that are more sensitive to the global economic cycle.

ECONOMIC PERFORMANCE IN THE FACE OF TERMS-OF-TRADE BUSTS

Although high commodity dependence can make emerging market economies vulnerable to sharp movements in commodity prices, the link between commodity price shocks and economic performance is not direct, as economic fundamentals and policies can play an important role in mitigating or amplifying the effects of

10 Mexico recorded a substantial decline in net energy exports, declining from 4½ percent of GDP to 1½ percent of GDP between 1980 and 2010. At the same time, it diversified away from those exports, which currently amount only to 13 percent of total exports (compared with about 50 percent in 1980).
11 Commodity-exporting advanced economies, in turn, have a less diversified export structure than 40 years ago. In fact, after declining slightly for three decades, the share of commodity exports in total exports increased sharply in the last decade for this group of countries, reaching 60 percent, on average, in 2010. Interestingly, these countries appear to be more reliant on commodities—based on our dimensions of dependence and export concentration—than the emerging market regions in our sample.
price shocks. Furthermore, the frequent concurrence of terms-of-trade and other external shocks (global growth or financial shocks) makes it intrinsically difficult to observe the direct impact of price shocks, unless a multivariate setting is used.

This section presents two complementary approaches for exploring the determinants of macroeconomic performance during episodes of sharp terms-of-trade drops—most of the time driven by commodity price shocks—in such a multivariate setting. The aim is to explain whether and to what extent country fundamentals and policies can shape the impact of these foreign shocks.

The first methodology entails a cross-sectional study of episodes of sharp negative terms-of-trade shocks that took place between 1970 and 2010 in a sample of 64 emerging and large commodity-exporting advanced economies. After documenting the behavior of key macroeconomic variables during these episodes, this methodology explores the role of fundamentals in determining the overall impact of the external price shock on domestic output.

This approach is complemented by a similar exercise in a panel setting, which allows for exploring the importance of certain variables for which reliable data are available only for a shorter and more recent time span (for example, degree of dollarization, fiscal stance).

Unlike other studies that have focused mostly on the traditional measure of terms of trade (export prices over import prices), we rely on an adjusted measure that captures the magnitude of the income effect of changes in trade prices, taking into account the initial export- and import-to-GDP ratios (that is, the direct impact of the changes in export and import deflators on the trade balance, given volumes). Specifically:

$$\text{TO}_t^A = \frac{\hat{P}_t^X}{\hat{P}_t^M} \left( \frac{X_{t-1}}{\text{GDP}_{t-1}} \right) - \frac{\hat{P}_t^M}{\hat{P}_t^X} \left( \frac{M_{t-1}}{\text{GDP}_{t-1}} \right),$$

where $\hat{P}_t^X$ and $\hat{P}_t^M$ denote the percentage change in export and import deflators, respectively, and $\frac{X_{t-1}}{\text{GDP}_{t-1}}$ and $\frac{M_{t-1}}{\text{GDP}_{t-1}}$ are the previous-year ratios of exports and imports to GDP.

**Cross-Sectional Approach**

The cross-sectional approach entails assessing whether country fundamentals at the outset of the shock can explain cross-country differences in macroeconomic performance during the full length (from peak to trough) of episodes of sharp and negative terms-of-trade shocks. Episodes are identified on the basis of whether a country experienced a cumulative drop in its (adjusted) terms of trade of at least

---

12 This measure can be (loosely) interpreted as a combination of standard terms of trade and trade openness. It does not attempt to capture, however, the country’s ability to adjust to an external price shock—as raised by Calvo, Izquierdo, and Talvi (2003)—but rather the net trade gains or losses (in terms of GDP) from shifts in export and import prices.
3 percentage points of GDP, from peak to trough (with negative changes in at least two consecutive years).\textsuperscript{13}

This criterion identifies 98 episodes. The sample of countries includes both commodity exporters and importers in order to disentangle the price effect from the effect of other external shocks that could be highly correlated with commodity prices (for example, global growth). Terms-of-trade shocks induced by export prices do not appear to have a different impact than those induced by import prices.

Interestingly, although there is a prevalence of episodes during the commodity shocks of the 1970s and 1980s, there are still a fair number of episodes dated in the last two decades, although they reflect primarily shocks to commodity-importing countries arising from higher import prices, rather than from lower export prices. In most cases, terms-of-trade shocks have been quite persistent, with an average peak-to-trough time span of 4½ years.

The magnitude of these shocks has been wide-ranging, and so has output performance during the episodes, suggesting that, despite being sizable, the price shocks cannot by themselves explain the differences in macroeconomic performance (Figure 4.5). In fact, only two-thirds of the episodes show negative cumulative

\textsuperscript{13}By requiring at least two consecutive years of terms-of-trade declines, our sample does not include any episode around the 2008–09 global crisis, given that the commodity price drop proved to be short-lived.

**Figure 4.5** Episodes of Large Terms-of-Trade Busts, 1970–2010 (Frequency and size of shock, in percent of GDP)

Source: Authors’ calculations.

\textsuperscript{1} Alternative terms of trade measure, in percent of GDP, as defined in the text.

\textsuperscript{2} GDP loss as defined in the text.
growth (relative to the preshock average), and the proportion falls to one-half for the subsample of episodes taking place during the 2000s. This reflects the importance of other external factors in driving economic growth, as the 2000s (up until the crisis) were characterized by favorable global growth and financial conditions.

A glance at the dynamics of key macro variables around the episodes comparing best and worst macro performers (in terms of GDP growth) offers some additional insights (Figure 4.6). There is a considerable difference between the groups of best and worst performers, with evidence suggesting that those growing faster before the shock (while external conditions were favorable) suffer the most with the reversal. Interestingly, these two groups do not appear to have faced significantly different trade prices, either during the boom or the subsequent bust. As most episodes of price busts were preceded by improving terms of trade, current account balances often strengthened before the negative shock. However, underlying current accounts (stripped of terms-of-trade changes) weakened markedly.

A number of the identified episodes of sharp negative terms-of-trade shocks were preceded by significant improvements in such terms. Although those

©International Monetary Fund. Not for Redistribution
preceding booms provided an opportunity for countries to improve their fundamentals and shield themselves against future shocks, the empirical evidence suggests that these countries by and large did not take advantage of this opportunity.

The analysis also explores the importance of having experienced a terms-of-trade boom in the years preceding a bust by splitting the sample between countries with the largest improvements in terms of trade (in the three years preceding the fall) and the rest (Figure 4.7). This simple exercise points to the importance of policy responses during the boom: despite displaying significantly better terms of trade—an average cumulative impact of about 10 percentage points of GDP against zero for the rest of the sample—countries with preceding booms did not perform better. On the contrary, although they grew at broadly the same pace as other countries before the bust, booming countries decelerated more markedly afterward in the face of the terms-of-trade drops of similar magnitudes. Policy responses appear to have played a role in explaining these missed opportunities: Countries with preceding booms showed strong improvements in their current accounts during the boom, but significantly larger deteriorations in their underlying (price-adjusted) positions. Booming countries appear not to have allowed their nominal exchange rates to appreciate more, although their real exchange rates still appreciated more on account of higher inflation. Booming countries also missed the opportunity to strengthen

Figure 4.7 Economic Performance in Countries with and without Preceding Terms-of-Trade Booms

Sources: IMF International Financial Statistics; and authors’ calculations.

Note: Based on splitting the sample of episodes of large and negative (openness-adjusted) terms-of-trade shocks into two halves, based on the cumulative terms-of-trade changes between \( t-3 \) and \( t \). Averages for each subsample are reported.

1 Prices held constant at \( t-3 \) levels.

©International Monetary Fund. Not for Redistribution
their fiscal positions (not shown), as their primary balances did not improve during the boom either in relative terms to other countries or in absolute terms.

**Econometric Approach**

We first estimate a simple regression model to identify the effects of fundamentals on output performance during the episodes, controlling for the size of the shock and other external factors. The specification is as follows:

\[ y_i = \alpha + \beta_0 T_0 T_i^4 + \beta_1 X_i + \beta_2 Z_i + \epsilon_i, \]

where: \( y_i \) is the output performance in episode \( i \), (measured as the cumulative difference between annual growth during the episode and the average growth rate in the preshock period). The average growth rate is computed over the five-year period up to the shock. We also use the three-year period preceding the shock, and the main results do not change significantly. \( T_0 T_i^4 \) is the (adjusted) terms-of-trade cumulative change during episode \( i \); \( X_i \) is a vector of variables reflecting fundamentals and policies in the run-up to the shock, and \( Z_i \) is a vector of controls (external factors). We focus on the following explanatory variables that to different degrees reflect economic policies:

- The external position, as reflected by the current account, external debt, or international reserves (either the level at the time of the shock or the change in the three years preceding the episode).
- A measure of de facto exchange rate flexibility, using the classification of Ilzetzki, Reinhart, and Rogoff (2008).
- The occurrence of a credit boom in the three years preceding the shock, as identified by either Gourinchas, Valdés, and Landerretche (2001) or Mendoza and Terrones (2008).

We also explore the role of financial openness—which could determine the country’s ability to obtain foreign funding to buffer the shock—using a measure of capital account openness based on the index constructed by Chinn and Ito (2008), as well as a measure of international financial integration, calculated as the sum of the countries’ total foreign assets and liabilities (in percent of GDP) from the updated and extended version of the Lane and Milesi-Ferretti (2007) data set.

While public debt is included in the set of explanatory variables, other fiscal and financial sector variables are not included in this approach. In particular, we do not include in the cross-section analysis any measure of the fiscal stance or the cyclical behavior of fiscal policy in the period preceding the episode. This reflects

---

14 All explanatory as well as control variables are explained in detail in Adler and Sosa (2011).
15 We also explore an alternative measure based on the standard deviation of the monthly percentage changes of the nominal exchange rate (over a 12-month window).
16 We consider public debt in percent of GDP, both the level at the time of the shock and the change in the three years preceding the episode.
poor data quality and/or coverage for a number of episodes that date to the 1970s and 1980s. In the case of financial variables (notably, financial dollarization), it is because insufficient variance across episodes in those decades also precludes proper econometric examination. These variables, however, are explored in the panel approach presented in the next section.

External factors used as controls are global demand (proxied by world real GDP growth) and global financial conditions (using the Chicago Board Options Exchange Market Volatility Index [VIX] and the 10-year U.S. Treasury bond yield).

Following a “specific-to-general” approach, we first regress output performance on each of the fundamentals, controlling for the size of the shock and for external conditions. Then, we include all the relevant fundamentals (and control variables) in a single regression. A negative value in our dependent variable indicates a loss of output, therefore a positive (negative) coefficient on an explanatory variable implies that this variable mitigates (exacerbates) the negative impact of the terms-of-trade shock on output. Regressions are estimated using ordinary least squares with robust standard errors. For the sake of brevity, Table 4.2 omits the coefficients of the controls.

The main results are as follows:

• The output loss is smaller in countries with a stronger current account position. The result holds when the change in the terms of trade in the three years preceding the shock is controlled for, suggesting that countries with a weaker (or deteriorating) underlying current account position tend to underperform in the aftermath of large terms-of-trade declines.

• Moreover, the larger the preceding terms-of-trade boom, the larger the negative impact of a weak external position (columns 10–11 in Table 4.2).

• There is robust evidence that the decline in output is smaller in countries with more flexible exchange rate regimes, supporting the notion that exchange rate flexibility significantly enhances the economy’s ability to adjust to real external disturbances.

• There is no evidence that countries’ external (or public) debt position explains differences in output performance during the bust, possibly reflecting that countries with stronger policies can sustain higher debt ratios without raising concerns about debt sustainability. Similarly, neither international reserves nor credit booms appear to have played a role.

• A higher degree of capital account openness appears to be associated with larger output costs, suggesting that capital inflows have, at least on average, been procyclical in the cases examined. However, the degree of capital procyclicality is likely to depend on the quality of country fundamentals. This caveat is particularly important with regard to our study, since many of the identified episodes from the 1970s and 1980s featured relatively weak policy frameworks. In fact, there is a vast literature pointing to the counterproductive effects of premature capital account liberalizations in developing economies.
### TABLE 4.2

Cross-Sectional Approach: Results

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong>: Cumulative Output Growth During the Bust, Relative to Trend Growth ($Y_i$)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ToT$^{AI}$</td>
<td>0.264</td>
<td>0.284*</td>
<td>0.205</td>
<td>−0.113</td>
<td>0.160</td>
<td>0.092</td>
<td>0.12</td>
<td>0.159</td>
<td>0.020</td>
<td>−0.125</td>
<td>0.135</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(0.17)</td>
<td>(0.20)</td>
<td>(0.19)</td>
<td>(0.15)</td>
<td>(0.26)</td>
<td>(0.27)</td>
<td>(0.23)</td>
<td>(0.22)</td>
<td>(0.165)</td>
<td>(0.199)</td>
</tr>
<tr>
<td>CA (percent of GDP, level in $t^2$)</td>
<td>0.568*</td>
<td>(0.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CA$_2$ (percent of GDP, change $t-3$, $t^2$)</td>
<td>0.503**</td>
<td>(0.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER Regime$^3$</td>
<td>−10.6**</td>
<td>(4.43)</td>
<td>−9.08**</td>
<td>(4.57)</td>
<td>−10.50**</td>
<td>(4.74)</td>
<td>−10.52**</td>
<td>(3.803)</td>
<td>−9.58**</td>
<td>−13.54***</td>
<td>(4.59)</td>
</tr>
<tr>
<td></td>
<td>(4.32)</td>
<td></td>
<td>(4.32)</td>
<td></td>
<td>(4.32)</td>
<td></td>
<td>(4.32)</td>
<td></td>
<td>(4.32)</td>
<td>(4.32)</td>
<td></td>
</tr>
<tr>
<td>FXVol$^4$</td>
<td>0.946***</td>
<td>(0.32)</td>
<td>0.707**</td>
<td>(0.34)</td>
<td>0.701**</td>
<td>(0.34)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td></td>
<td>(0.34)</td>
<td></td>
<td>(0.34)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KA openness$^5$</td>
<td>−2.030*</td>
<td>(1.21)</td>
<td>−1.755</td>
<td>(1.50)</td>
<td>−2.036</td>
<td>(1.50)</td>
<td>−1.567</td>
<td>(1.45)</td>
<td>−1.991</td>
<td>−1.544</td>
<td>−2.339+</td>
</tr>
<tr>
<td></td>
<td>(1.21)</td>
<td></td>
<td>(1.50)</td>
<td></td>
<td>(1.50)</td>
<td></td>
<td>(1.45)</td>
<td></td>
<td>(1.45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fin. Integ.$^6$</td>
<td>0.216***</td>
<td>(0.08)</td>
<td>0.222***</td>
<td>(0.08)</td>
<td>0.133**</td>
<td>(0.06)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0798)</td>
<td></td>
<td>(0.08)</td>
<td></td>
<td>(0.06)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER Regime x ToT$^A$ Prev$^7$</td>
<td>−0.334*</td>
<td>(0.182)</td>
<td>−0.277</td>
<td>(0.51)</td>
<td>−0.209</td>
<td>(0.48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.182)</td>
<td></td>
<td>(0.51)</td>
<td></td>
<td>(0.48)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ToT$^A$ Prev$^7$</td>
<td>0.129</td>
<td>(0.48)</td>
<td>0.191</td>
<td>(0.44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.48)</td>
<td></td>
<td>(0.44)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>−1.27</td>
<td>−3.43</td>
<td>0.62</td>
<td>−7.70**</td>
<td>−3.86</td>
<td>−0.29</td>
<td>−5.68**</td>
<td>−1.35</td>
<td>−7.57***</td>
<td>−1.105</td>
<td>−0.86</td>
</tr>
<tr>
<td></td>
<td>(2.75)</td>
<td>(2.34)</td>
<td>(2.70)</td>
<td>(2.97)</td>
<td>(2.40)</td>
<td>(3.19)</td>
<td>(2.83)</td>
<td>(2.67)</td>
<td>(2.78)</td>
<td>(2.452)</td>
<td>(3.25)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>91</td>
<td>93</td>
<td>79</td>
<td>68</td>
<td>92</td>
<td>70</td>
<td>64</td>
<td>73</td>
<td>66</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.103</td>
<td>0.114</td>
<td>0.131</td>
<td>0.119</td>
<td>0.102</td>
<td>0.207</td>
<td>0.213</td>
<td>0.211</td>
<td>0.206</td>
<td>0.424</td>
<td>0.305</td>
</tr>
</tbody>
</table>

Source: Authors’ estimations.

Note: Regressions estimated using ordinary least squares with robust standard errors (in parentheses). Regressions include controls for global factors (coefficients not shown).*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, + $p < 0.15$.

1 Cumulative change in the adjusted terms of trade measure, from peak to trough.
2 Current account balance, percent of GDP, in period $t$ or change from $t-3$ to $t$, as indicated.
3 Exchange rate flexibility, based on Ilzetzki, Reinhart, and Rogoff (2008) de facto index, at $t$. Dummy = 1 if index is between 1 and 4 (fixed), 0 if between 4 and 13 (flexible).
4 Standard deviation of the monthly percentage changes of the nominal exchange rate (over a 12-month window).
5 Chinn and Ito (2008) capital account openness index, average $t-2$ to $t$.
6 Measure of financial integration, defined as the sum of total external assets and total external liabilities (in percent of GDP).
7 Cumulative change in the adjusted terms of trade measure, in the three-year period before the shock.
When using the measure of international financial integration, the result reverts. This is because this measure better captures the interaction of financial openness and quality of fundamentals (as countries with good fundamentals tend to be more financially integrated). These results suggest that financial openness helps buffer the shock when country fundamentals are strong but could exacerbate it when fundamentals are weak.

• Finally, there is strong evidence that other external factors (notably, international interest rates and the degree of risk aversion, as reflected in the VIX) are also significant determinants of output performance during the bust.

Panel Approach

A large number of the episodes identified under the previous methodology date to the 1970s and 1980s. As mentioned previously, this poses a constraint on our ability to assess the importance of some fiscal and financial sector features, in the first case because of unavailable or unreliable data, and in the second case because of insufficient variance across countries and time for those decades. An example of the second case is financial dollarization, a phenomenon that grew during the 1980s, partly as a result of the move toward capital account liberalization. Hence, we complement the cross-sectional exercise with a panel approach that allows for exploiting the time series dimension of fiscal and financial variables, for which recent data are more reliable and show higher variation.

Our interest is in assessing the potential amplifying role of certain fundamentals with regard to the impact of large and negative terms-of-trade shocks. We estimate the following specification in a panel setting with fixed effects:

\[ y_{i,t} = \beta_0 + \beta_1 T_o T_{it}^A + \beta_2 X_{it} + \beta_3 F_{it} I_{it} + \epsilon_{i,t}, \]

where: \( y_{i,t} \) is country \( i \)'s real GDP growth at year \( t \); \( T_o T_{it}^A \) is the adjusted measure of terms of trade; \( X_{it} \) is a vector of exogenous control variables (including world real GDP growth, the U.S. 10-year Treasury bond yield, and the VIX); \( I_{it} \) is a variable that takes the value of the terms-of-trade shock at year \( t \) (\( T_o T_{it}^A \)) if the latter is lower than a certain threshold (set at −1.5 percentage points of GDP in our benchmark estimation); and \( F_{it} \) is a vector of country \( i \)'s economic fundamentals that (have the potential to) amplify the impact of terms-of-trade shocks.

Our interest is in the vector of coefficients \( \beta_3 \) as it provides insights about which and to what extent certain economic fundamentals can exacerbate the effect of such shocks, over and above their direct effect. Under this specification, the direct marginal effect of a large and negative terms-of-trade shock can be computed as \( \beta_1 T_o T_{it}^A \) where \( F_{EM} \) is the vector of fundamentals evaluated at the average value for the sample of countries. The amplification effect of country \( i \)'s policies (relative to an average country), on the other hand, can be calculated as \( \beta_3 (F_{i,t} - F_{EM}) \). Results are robust to an alternative specification that incorporates the level of policy variables, in addition to their interactions with \( I_{it} \).
The following set of macroeconomic fundamentals is explored:

- Public and external debt, current account, and net foreign assets (all in percent of GDP).
- A measure of de facto exchange rate flexibility, as discussed in the previous section.
- A measure of financial dollarization, defined as the share of foreign currency deposits in total deposits of the banking system. We rely on Levy Yeyati’s (2006) database, although we augment it (using information from multiple sources, including IMF staff reports, academic papers, and country documents) to extend the series back to the 1970s for a number of countries.
- The primary fiscal balance, in percent of GDP, as a measure of the fiscal position.
- A measure of capital account openness, based on Chinn and Ito’s (2008) index, normalized to a range from 0 to 1, with 1 being the most open.
- The measure of international financial integration described previously.

We estimate two alternative specifications of the model. The first examines the role of policies in amplifying or mitigating the impact of all large and negative shocks (of at least 1½ percent of GDP). The second examines the particular case of large negative shocks (also of at least 1½ percent of GDP) that were preceded by improving terms of trade in the three previous years. This second specification allows us to specifically explore to what extent policy responses during the boom phase of commodity price boom-bust cycles determine the impact of subsequent large price reversals.

Results unveil a number of insights (Table 4.3). While terms of trade appear to explain relatively little of the variance in growth, the estimation captures an unambiguous and statistically significant effect: a negative terms-of-trade shock of 1 percentage point of GDP would lead to 0.13 percent lower growth in the same year of the shock and 0.08 percent lower growth in the second year.

The analysis finds evidence that policies in the run-up to negative terms-of-trade shocks, particularly during booms, play a critical role in mitigating the impact of the negative shocks. Figure 4.8 reports the mitigation effect—of having better fundamentals than the average emerging market economy, one dimension at a time—in case of a negative terms-of-trade shock of 1 percent of GDP. A stronger fiscal position at the time of the shock can help mitigate its impact, arguably reflecting more space to undertake countercyclical policy. The mitigating effect is considerably stronger in the cases of shocks preceded by favorable conditions, stressing the importance of prudent fiscal management during booms (Table 4.3).

As in the cross-sectional study, exchange rate flexibility during booms also appears to operate as an important shock absorber. There is also strong evidence that financial dollarization is an important shock amplifier of boom-bust price

---

17 In the first case the variable \( I_{i,t} \) takes the value of the terms-of-trade shock if the latter is lower than \(-1.5\) percentage points of GDP. In the second case, \( I_{i,t} \) takes the value of the terms-of-trade shock if the previous condition holds as well as if the country experienced a positive terms-of-trade shock in the previous three years.
## TABLE 4.3
### Econometric Results of Panel Approach

<table>
<thead>
<tr>
<th>Dependent Variable: GDP Growth (Annual, in percent)</th>
<th>Amplification of Large and Negative Shocks</th>
<th>Amplification of Large and Negative Shocks Preceded by Booms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Period: 1970–2007</td>
<td>With External Controls</td>
<td></td>
</tr>
</tbody>
</table>
| Terms of trade
| (level)                                           | **(1)** (2)                              |                                                               |
| World GDP growth                                  | **(1)** (2)                              |                                                               |
| U.S. 10-year Treasury bond yield                  | **(1)** (2)                              |                                                               |
| VIX                                               | **(1)** (2)                              |                                                               |
| Interaction of fundamentals and negative and large ToT shocks² |                                                               |                                                               |
| ER Flexibility
| Dollarization
| ER Flexibility* dollarization

<table>
<thead>
<tr>
<th>Variable</th>
<th>Amplification of Large and Negative Shocks</th>
<th>Amplification of Large and Negative Shocks Preceded by Booms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terms of trade</td>
<td>0.131*** 0.100***</td>
<td>0.069* 0.074* 0.061 0.024 0.090** 0.090** 0.004 0.002 0.002</td>
</tr>
<tr>
<td>Lagged terms of trade</td>
<td>0.062** 0.074***</td>
<td>0.072 0.136*** 0.119** 0.092** 0.087** 0.091** 0.033 0.031 0.032</td>
</tr>
<tr>
<td>Lagged real GDP</td>
<td>-0.002</td>
<td>-0.009 0.000 0.000 0.025** 0.000 0.000 0.025** 0.025** 0.025**</td>
</tr>
<tr>
<td>World GDP growth</td>
<td>0.477***</td>
<td>0.458*** 0.393*** 0.403*** 0.513*** 0.422*** 0.486*** 0.405*** 0.401** 0.402**</td>
</tr>
<tr>
<td>U.S. 10-year Treasury bond yield</td>
<td>-0.296***</td>
<td>-0.231*** -0.268*** -0.266*** -0.071 -0.288*** -0.297*** -0.035</td>
</tr>
<tr>
<td>VIX</td>
<td>-0.107***</td>
<td>-0.111*** -0.101*** -0.119*** -0.096*** -0.113*** -0.108*** -0.107***</td>
</tr>
</tbody>
</table>

©International Monetary Fund. Not for Redistribution
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary fiscal balance (t – 1)&lt;sup&gt;6&lt;/sup&gt;</td>
<td>-0.038***</td>
<td>(0.013)</td>
<td>-0.023***</td>
<td>(0.008)</td>
<td>-0.096***</td>
<td>(0.021)</td>
<td>-0.428***</td>
<td>(0.020)</td>
<td>-0.428***</td>
<td>(0.035)</td>
<td>-0.429***</td>
<td>(0.014)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital account openness&lt;sup&gt;7&lt;/sup&gt;</td>
<td>0.103</td>
<td>(0.121)</td>
<td>0.251</td>
<td>(0.258)</td>
<td>0.802***</td>
<td>(0.270)</td>
<td>2.437***</td>
<td>(0.320)</td>
<td>2.202***</td>
<td>(0.255)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial integration&lt;sup&gt;4&lt;/sup&gt;</td>
<td>0.059</td>
<td>(0.099)</td>
<td>-0.456+</td>
<td>(0.281)</td>
<td>0.390*</td>
<td>(0.217)</td>
<td>-1.573**</td>
<td>(0.599)</td>
<td>-0.491</td>
<td>(0.342)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>4.256***</td>
<td>(0.009)</td>
<td>6.332***</td>
<td>(0.852)</td>
<td>6.698***</td>
<td>(0.865)</td>
<td>6.191***</td>
<td>(1.038)</td>
<td>7.319***</td>
<td>(1.062)</td>
<td>2.470***</td>
<td>(0.861)</td>
<td>6.293***</td>
<td>(1.022)</td>
<td>6.335***</td>
<td>(0.866)</td>
<td>2.768***</td>
<td>(1.194)</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2,025</td>
<td>2,025</td>
<td>1,567</td>
<td>1,571</td>
<td>1,227</td>
<td>1,130</td>
<td>1,970</td>
<td>1,879</td>
<td>760</td>
<td>760</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$-within</td>
<td>0.023</td>
<td>0.089</td>
<td>0.090</td>
<td>0.084</td>
<td>0.109</td>
<td>0.125</td>
<td>0.091</td>
<td>0.100</td>
<td>0.098</td>
<td>0.100</td>
<td>0.090</td>
<td>0.102</td>
<td>0.110</td>
<td>0.128</td>
<td>0.097</td>
<td>0.103</td>
<td>0.100</td>
<td>0.100</td>
</tr>
<tr>
<td>$R^2$-between</td>
<td>0.006</td>
<td>0.004</td>
<td>0.154</td>
<td>0.008</td>
<td>0.133</td>
<td>0.039</td>
<td>0.003</td>
<td>0.004</td>
<td>0.261</td>
<td>0.164</td>
<td>0.055</td>
<td>0.172</td>
<td>0.006</td>
<td>0.001</td>
<td>0.002</td>
<td>0.234</td>
<td>0.236</td>
<td>0.242</td>
</tr>
<tr>
<td>$R^2$-overall</td>
<td>0.015</td>
<td>0.077</td>
<td>0.088</td>
<td>0.070</td>
<td>0.105</td>
<td>0.069</td>
<td>0.075</td>
<td>0.085</td>
<td>0.029</td>
<td>0.089</td>
<td>0.089</td>
<td>0.109</td>
<td>0.081</td>
<td>0.080</td>
<td>0.088</td>
<td>0.035</td>
<td>0.035</td>
<td>0.035</td>
</tr>
<tr>
<td>Number of countries</td>
<td>64</td>
<td>64</td>
<td>59</td>
<td>61</td>
<td>55</td>
<td>57</td>
<td>63</td>
<td>63</td>
<td>49</td>
<td>49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors' calculations.

Note: Based on panel estimation, with fixed effects, that allows for asymmetric amplification effect, of negative and large terms-of-trade shocks, by country economic fundamentals. Robust standard errors reported in parenthesis.

*** p < 0.01, ** p < 0.05, * p < 0.1, + p < 0.15.

1 Adjusted terms-of-trade-measure.
2 Interaction of country economic fundamentals with the measure of adjusted terms of trade when the latter is lower than −1.5 percentage points of GDP (zero otherwise). Columns 10–19 add the constraint that these shocks must be preceded by improving terms of trade in the three previous years (to capture the importance of policies in preceding price booms for explaining subsequent performance during busts).
3 Measure of “de facto” exchange rate flexibility constructed by Ilzetzki, Reinhart, and Rogoff (2008), ranging from 1 to 13, with 13 being the most flexible regime.
4 Foreign currency deposits as a percentage of total deposits.
5 Interaction of exchange rate flexibility measure and dollarization.
6 Level, in percent of GDP.
7 Index of Chinn and Ito (2008) normalized to range between 0 and 1 (1 being the most open).
8 Total foreign assets plus total foreign liabilities, in percent of GDP. Countries with the U.S. level or higher are classified as fully integrated. For other countries, the measure is reported relative to the level of the United States.
cycles. As expected, exchange rate flexibility appears to lose power as a shock absorber in the presence of high financial dollarization (as indicated by the corresponding interaction term). The positive coefficient on the interaction term likely reflects the impact of balance sheet effects in dollarized economies.

In line with the results of the previous section, a more open capital account, on average, does not seem to smooth the external trade shock. The result reverts, however, if the measure of financial integration is used instead. With the exception of external debt and in line with previous results, we do not find evidence of other stock variables—public debt and net foreign assets—playing a significant role in amplifying or mitigating terms-of-trade shocks.

**CONCLUSIONS**

With many net commodity exporters, Latin America—and especially its southern region—is one of the most commodity-dependent regions within the emerging market world. In all but a few countries, this reliance on commodities appears to have remained broadly unchanged for the last 40 years. In this setting, increasing uncertainty regarding global economic prospects has raised questions about the potential impact of a sharp decline in commodity prices on the region, and about policies that could mitigate such an impact. The rich history of terms-of-trade shocks in emerging and commodity-exporting advanced economies over the last four decades provides valuable insights into these questions. Results of two complementary methodologies suggest that policies preceding sharp drops in terms of trade play an important role in determining the countries’ subsequent economic performance, particularly when such shocks are preceded by benign conditions (booms).
In particular, we find evidence that exchange rate flexibility can play a powerful role as a shock absorber, although with significantly less of an effect in the context of highly dollarized economies. There is also strong evidence that countries that behave more prudently during the boom phase perform better during the bust. Specifically, countries with weak current accounts tend to underperform, whereas a healthy initial fiscal position can play a major role in reducing the impact of the external shock.
ANNEX 4.1. COMMODITY DEPENDENCE AND CONCENTRATION

Figure A4.1  Net Commodity Exports—Selected Latin American Countries (Percent of GDP)
Sources: World Integrated Trade Solutions database; and authors’ calculations.
REFERENCES


Commodity Price Cycles: The Perils of Mismanaging the Boom

International Monetary Fund (IMF), 2006, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, September.
———, 2008a, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, April.
———, 2008b, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, October.
———, 2011, Regional Economic Outlook: Western Hemisphere—Watching Out for Overheating, Washington, DC, April.
CHAPTER 5

Terms-of-Trade Booms: Saving-Investment Patterns and a New Metric of Income Windfall

GUSTAVO ADLER AND NICOLAS E. MAGUD

Commodity-exporting countries across the world have benefited significantly from the commodity price boom of the past decade, which has enabled them to strengthen their economic fundamentals markedly along many dimensions. Being an important commodity-producing region, Latin America has witnessed a particularly stark transformation, in sharp contrast to its previous history of poor macroeconomic management. But does this transformation reflect a different and more prudent macroeconomic response to terms-of-trade shocks than in the past? Or is it simply that this time around the positive shock was much larger?

This chapter sheds some light on this issue by analyzing the recent episode from a historical perspective. In particular, it examines the income shock associated with the improving terms of trade (dubbed here as the “income windfall”) and the extent to which this income was saved. Although the focus is on Latin America, inter-regional comparisons are drawn when relevant.

Other recent studies (Izquierdo, Romero, and Talvi, 2008; Osterholm and Zettelmeyer, 2008; Céspedes and Velasco, 2011) have looked into the role of external factors—including terms-of-trade shocks—in driving economic growth in Latin America. However, their focus has been primarily on the effects of these shocks on real output. As such, they have overlooked an important dimension of terms-of-trade booms, as the impact of these shocks on domestic income tends to be larger than on output. This aspect is key to understanding the overall economic effect of terms-of-trade variations.

At the time of publication, an extended and more detailed version of this chapter was scheduled for inclusion in the *Journal of International Money and Finance.*

©International Monetary Fund. Not for Redistribution
This study offers several innovations vis-à-vis existing studies. First, it develops a simple but very informative metric (the income windfall) of the “extraordinary” income arising from the terms-of-trade shock. This metric allows for grasping the macroeconomic importance of the recent boom in absolute as well as relative (historical and inter-regional) terms. With this measure at hand, marginal savings rates are computed in order to shed light on the extent of the effort to save the extraordinary income now and in previous episodes. Finally, a simple econometric analysis is conducted to assess whether Latin America’s saving patterns over the recent boom have differed from previous booms, and from those observed in other economies, once we control for key external factors—such as the degree of persistence of the terms-of-trade shock, world interest rates, and income levels—that may have played a role.

The analysis finds that Latin America’s recent terms-of-trade shock has not been larger than the one experienced during the 1970s. However, the associated income windfall has been considerably larger than in the past, and quite large in absolute terms—reaching 100 percent of domestic income on a cumulative basis (or 15 percent per year on average) for the region as a whole. In some countries, the income windfall has been several times this magnitude. In terms of regional comparison, such income shocks are only comparable to those experienced by the Middle East and North Africa (MENA) oil-exporting countries. The analysis also finds that, while aggregate (average) savings increased more than in past episodes in response to the terms-of-trade shock, the proportion of the income windfall saved (that is, the marginal saving rate) has been smaller. And while part of this changing pattern can be explained by the persistence of the shock and lower global interest rates, there is still no evidence of a greater saving effort during the recent boom, even after controlling for these key factors. These findings challenge the growing perception that the macroeconomic response to the terms-of-trade boom was different this time. They suggest, in fact, that the marked improvements in economic fundamentals largely reflect the sheer size of the associated income shock, rather than a greater effort to save it.

This chapter first describes the metric of income windfall and compares Latin America’s current episode with those of other regions, as well as with its own past episodes. It then studies the extent to which windfalls were saved, and assesses these results econometrically before presenting conclusions.

**THE TERMS-OF-TRADE WINDFALL IN HISTORICAL PERSPECTIVE**

This section examines the history of large terms-of-trade shocks, focusing on a sample of 180 countries during 1970–2012. The data source is the IMF’s International Financial Statistics. The main exercise entails identifying episodes of terms-of-trade booms over the collected sample that satisfy (1) a terms-of-trade increase of at least 15 percent from start to peak; and (2) an annual average increase in the terms of trade of at least 3 percent.
These thresholds identify 270 episodes, encompassing low-income countries, emerging market economies, and advanced economies. As expected, when exploring the full sample of identified terms-of-trade booms, two clear waves are identified, one taking place in the 1970s and the other over the past decade (Figure 5.1). The magnitude of the terms-of-trade shocks during the recent boom (measured during the upswing) has not been larger than those seen in the 1970s, as shown in the upper left panel of Figure 5.1. The recent wave of terms-of-trade shocks, however, has been more widespread (upper right panel), with twice as many episodes as in any of the previous decades, including the 1970s. Another key difference with past episodes is that the recent wave of terms-of-trade shocks has proven to be more persistent, with an average upswing length of about seven years (so far), compared with three years in past episodes (lower left panel in Figure 5.1).

Looking beyond the upswing of the episodes, the end of the boom is measured as the point in time when at least one-third of the terms-of-trade increase during the upswing is reverted (or a new boom starts). The analysis finds that, even if the

\[\textit{End is reached when at least one-third of the increase in terms of trade is reverted (or a new boom takes place). For episodes that did not reach their end, by the end of the sample period, 2012 is taken as the episode end year.}\]

Figure 5.1 Key Features of Terms-of-Trade Boom Episodes

Source: Authors’ calculations.
Note: The figure shows statistics across all ongoing episodes (upswing) at each point in time.

\[\text{\textsuperscript{1} End is reached when at least one-third of the increase in terms of trade is reverted (or a new boom takes place). For episodes that did not reach their end, by the end of the sample period, 2012 is taken as the episode end year.}\]

\[\text{\textsuperscript{4} This reflects the widespread increase in commodity prices over the past 10 years.}\]
ongoing boom were to come to an abrupt end at the time of this publication, the full length of the episode (from start to end) would still be much longer than episodes in the past, reflecting both the relatively high persistence of the recent boom and the rapid reversal of booms in the 1970s and 1980s (on average, past episodes ended only one year after reaching their peaks) (lower right panel in Figure 5.1).

In the case of emerging Latin America—Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela—the data show that, within this group, only nine of the 11 countries satisfy the above thresholds during the 2000s. Uruguay and Mexico do not qualify as cases of recent terms-of-trade booms because, while they are producers of certain commodities, their net commodity exports are relatively small. At the same time, two independent episodes are identified for Paraguay since 2000, so the total number of episodes during the 2000s comes to 10.

Latin America’s current terms-of-trade boom—which started around 2002⁵—is comparable in magnitude and scope (that is, the number of countries) to those seen in the 1970s. Identified episodes have a median cumulative increase in terms of trade of about 80 percent during the upswing. Yet, there is significant variation across countries within the group. For example, Venezuela and Bolivia show cumulative terms-of-trade shocks of more than 120 percent, while Brazil is on the other extreme, with a shock of only about 35 percent. This compares to 11 episodes in the 1970s, with a median cumulative increase of about 70 percent.

Furthermore, a contemporaneous comparison across regions indicates that Latin America’s recent shock is only comparable to those of the MENA oil-exporting countries (Figure 5.2) and, to a lesser extent, those of commodity-exporting advanced economies (Australia, Canada, and Norway). Indeed, for other emerging market regions, a limited number of episodes (for example, emerging Asia) are identified, and they are of much lower magnitude (for example, emerging Asia and emerging Europe).⁶

This evidence, based on the traditional measure of terms of trade, would suggest that Latin America’s recent boom is not unprecedented. However, by not taking into account the degree of trade openness, which has changed markedly over time, these measures do not provide an informative view of the economic relevance of the shock.⁷ The next section discusses a metric that takes this dimension into account by focusing on the impact of terms-of-trade shocks on income levels.

**A Metric of Terms-of-Trade Income Windfall**

**Methodology**

The interest in this chapter lies in quantifying the extent to which real gross domestic income (GDI) in these countries was higher than what it would have

---

⁵The beginning of each episode varies across countries. See Adler and Magud (2013) for details.
⁶In Europe, only Russia, Ukraine, and Belarus show episodes of magnitudes comparable to those of Latin America. In emerging Asia, only Indonesia stands out.
⁷For further discussion on this, see Chapter 4 in this volume and Adler and Sosa (2011).
Figure 5.2  Emerging Latin America and Selected Regions: Terms-of-Trade Booms (Cumulative percentage change, during upswing)

Sources: IMF, International Financial Statistics; and authors’ estimates.
Note: Cumulative percentage change in terms of trade (of goods and services) from start to peak of each identified episode (that meet the criteria of at least 15 percent cumulative and 3 percent average increase). Episodes are grouped in five-year windows according to the date of their first year. Dotted lines indicate group averages. See further details in Adler and Magud (2013). EM = emerging market; AE = advanced economy; MENA = Middle East and North Africa.

©International Monetary Fund. Not for Redistribution
been had no terms-of-trade shock occurred (that is, in the counterfactual). To this end, we construct a simple metric that focuses on the difference between actual real GDI and real GDI measured at constant (pre-boom) terms of trade.

As in Kohli (2004), we define country \(i\)'s real GDI, at time \(t\), as follows:

\[
RI_{i,t} = \frac{GDI_{i,t}}{p^C_{i,t}} - \frac{GDP_{i,t}}{p^P_{i,t}},
\]

where \(GDI\) and \(GDP\) denote gross domestic income and gross domestic product, respectively, and \(p^C\) stands for the consumer price index (CPI). Key to this definition is the use of the CPI to deflate nominal income in order to capture the income's purchasing power in terms of the average consumption basket.

Equation (5.1) can also be written as \(RI_{i,t} = RGDP_{i,t} \times \left(\frac{p^X_{i,t}}{p^C_{i,t}}\right)\), where \(RGDP_{i,t}\) denotes real GDP, and \(p^P\) is the GDP deflator. This simple equation makes it clear that real income tends to diverge from real GDP when the GDP deflator diverges from the CPI, which usually occurs when the country faces large terms-of-trade shocks. Differentiating equation (5.1) and combining it with the demand components of the GDP deflator yields:

\[
RI_{i,t} \approx RGDP_{i,t} \left[ \hat{p}^X_{i,t} \times \hat{w}_i^X - \hat{p}^M_{i,t} \times \hat{w}_i^M \right] + \left[ \hat{E}_{i,t} + \hat{p}^C_{i,t} \right] \left[ \hat{w}_i^X - \hat{w}_i^M \right],
\]

where \(\hat{\cdot}\) denotes the annual percentage change of any variable \(\cdot\); \(\hat{p}^X_{i,t} = \hat{p}^x_{i,t}/p^x_t\) and \(\hat{p}^M_{i,t} = \hat{p}^m_{i,t}/p^m_t\) are country \(i\)'s export and import prices, expressed relative to the U.S. CPI; \(\hat{w}_i^X\) and \(\hat{w}_i^M\) denote the ratios of exports and imports (of goods and services) to GDP; and \(\hat{E}_{i,t}\) is country \(i\)'s exchange rate vis-à-vis the U.S. dollar (local currency units per U.S. dollar). Equation (5.2) shows that differences between real GDI and real GDP arise primarily from the income impact of terms-of-trade shocks, (as captured by the second term on the right-hand side), and from the effect of real exchange rate movements (as captured by the last term).

Stripping out the effect of changes in the real exchange rate (last term) to exclude endogenous variations in income, equation (5.2) forms the basis for our estimates of the income windfall. It provides us with the key components to build

\footnote{This increase in income (windfall) arising from terms-of-trade shocks can be thought of as mostly unexpected, and one can interpret contemporaneous changes in aggregate savings patterns as a response to these innovations. Ideally, one would derive the unexpected component of these terms-of-trade shocks, but data on expectations about trade prices are not available on a comprehensive basis.}

\footnote{The methodology relies on the fact that the GDP deflator and the consumer price index tend to diverge during terms-of-trade booms, as noted by Kohli (2004).}

\footnote{GDI is different from the concept of gross national disposable income (GNDY), as the latter includes the balance of income from abroad (that is \(GNDY = GDI + BI\). See IMF (2009) and European Commission and others (2009).}

\footnote{The CPI is used as a proxy for the private consumption deflator.}

\footnote{Expressing export and import deflators in relative terms to the U.S. CPI avoids imputing high global inflation (seen in the 1970s and 1980s) as terms-of-trade shocks.}
a counterfactual level of real income. We focus on a purely exogenous metric based on the difference between actual real income and income at constant (pre-boom) terms of trade, captured by the second term on the right-hand side of equation (5.2). This assumes that, in the absence of the terms-of-trade shock, the same level of output would have been achieved but with the relative prices prevailing before the boom.

The focus on this lower bound stresses the magnitude of the results, while it rules out endogeneity issues (by focusing only on the exogenous component of the terms-of-trade income shock).

Finally, using equation (5.2), we compute the annual income windfall as:

\[ w_{i,t} \equiv \left( \frac{RI_{i,t} - RI_{i,t}^*}{RI_{i,t}} \right) \]

(5.3)

where \( RI_{i,t} \) is an index of actual real income, and \( RI_{i,t}^* \) is the corresponding counterfactual, constructed by compounding equation (5.2). Thus, the annual income windfall at any point in time is given by the vertical distance between real income and real income at pre-boom terms of trade, and the cumulative windfall is measured by the area between the two. Both are expressed as shares of real income at pre-boom terms of trade. The cumulative income windfall for country \( i \) in episode \( j \) is, thus, computed as \( WI_{i,j} = \sum_{t \in j} w_{i,t} \).

Finally, in order to construct cross-sectional statistics, and given that the duration of each event varies over time and across countries, we normalize the length of each episode and report statistics that aggregate information at different fractions of the lifetime of each episode. In particular, each episode’s (start-to-peak) length is discretized into \( \frac{1}{4}, \frac{1}{2}, \) and \( \frac{3}{4} \) fractions.

**Results**

The economic importance of the income shock associated with terms-of-trade booms is evident from Figure 5.3, which presents the measures of real income for subsamples of the identified booms. As shown, the effect has been especially pronounced in the recent episode, particularly for emerging Latin American and the MENA oil-exporting countries. For Latin America, while output grew by about 50 percent during the recent boom, income grew by about 90 percent, with the 40 percentage points of difference between the two measures being the pure price impact of the improving terms of trade. For MENA oil-exporting countries, such an effect explains a difference of about 100 percentage points. While not shown here, it is worth highlighting that, for some countries, improvements in income levels (in terms of deviations from pre-boom trend) have come almost solely from this price effect. Within Latin America, Bolivia and Chile are striking cases of this.

Consistent with the size of the shaded areas reported in Figure 5.3, a historical comparison of the estimates of the cumulative income windfall points to a much larger effect during the recent wave than in past ones, including those of the 1970s (Figure 5.4). This reflects a higher degree of trade openness in most countries in the sample, as well as the longer duration of the recent event.
The overall patterns are also visible in the case of emerging Latin America (Figure 5.5), where income windfalls have been several times larger in the recent boom than in the terms-of-trade booms of the 1970s. Estimates of these recent income shocks are also quite large in absolute terms, with a median of about 87 percent of a year’s cumulative GDP, or about 15 percent per year. This means that, taking into account only the price effect of the terms-of-trade shock, real income has been, on average, at least 15 percent per year higher than what it would have been.
Figure 5.5  Emerging Latin America and Selected Regions: Income Windfall (Share of annual GDP)

Sources: IMF, International Financial Statistics; and authors’ estimates.
Note: Cumulative and annual average income windfall, as share of GDP, from start to peak of each identified episode (that meet the criteria of at least 15 percent cumulative and 3 percent average increase). Episodes are grouped in five-year windows according to the date of their first year. Bars indicate cumulative values, dots indicate annual averages, and dotted lines indicate group averages for cumulative values. See further details in Adler and Magud (2013). EM = emerging market; AE = advanced economy; MENA = Middle East and North Africa.
been otherwise. Within Latin America, Venezuela, Bolivia, and Chile stand out as having benefited the most, with cumulative (annual) income windfalls of as much as 300 (30) percent of income in the first case, and close to 200 (20) percent in the case of both Bolivia and Chile. Not surprisingly, Brazil is at the other end of the distribution, with significantly lower windfall estimates—reflecting its lower reliance on commodities and its lower degree of trade openness.

These effects are also large relative to the effects of other regions. For example, the median cumulative windfall for emerging Asia is estimated at about 50 percent of income, 30 percent in emerging Europe, and close to 65 percent in commodity-exporting advanced countries. Only oil-exporting countries in the MENA region show income windfalls of a larger magnitude than those of Latin America, reaching a median of about 180 percent of GDP. This highlights the order of magnitude of the terms-of-trade windfall experienced by Latin America over the past decade, which has been not only much larger that its own past windfalls, but also greater than those in most other regions. The share of countries that benefited from terms-of-trade booms has also been much higher in Latin America than in other regions.

**SAVING PATTERNS DURING BOOMS: AVERAGE VERSUS MARGINAL RATES**

This section documents aggregate saving patterns during these episodes of terms-of-trade booms by looking at both average as well as marginal rates. It is important to highlight that the analysis does not attempt to assess the optimality of the macroeconomic response to the terms-of-trade shock (that is, the determinants of saving and investment decisions). The latter entails, among other things, linking such response to the perceived persistence of the shock as well as other contemporaneous external perturbations. In addition, the analysis focuses on aggregate macroeconomic responses in terms of saving and investment patterns, without distinguishing between the possibly different behaviors of the public and private sectors. While the behavior of the public sector is a key aspect, there are two reasons for focusing only on the aggregate response: on the one hand, aggregate dynamics may be more informative of the overall policy response—that is, fiscal policy is only one aspect of the policy mix, and public saving-investment decisions can be largely offset by the private sector if other policies (monetary, macroprudential, and so on) are not consistent with the fiscal response. On the other hand, data limitations hamper a comprehensive comparison of episodes—especially with events that took place in the 1970s and 1980s—which is the primary focus of this chapter.

Marginal saving rates are of particular interest, as they give an indication of the country’s aggregate effort to save the additional (marginal) income arising from the terms-of-trade shock. We also decompose aggregate savings into domestic and foreign savings, relying on the current account identity ($S = I + C A$).13

13See Adler and Magud (2013) for a discussion on the role of the allocation of saving between domestic investment and foreign assets in terms of the subsequent impact on post-boom real income.
saving rates have remained high in MENA oil-exporting countries during the recent episode, the latter experienced an increase in saving rates of about 11 percentage points of GDP, starting from levels twice as high as those seen in Latin America. Furthermore, unlike in Latin America, saving rates have remained high in MENA oil-exporting countries during the life

Average Saving Rates

A comparison of Latin America’s average saving rates across episodes points to a visible difference between the recent boom and previous ones (Figure 5.6). In particular, during the recent event, the median saving rate increased by about 4 percentage points of GDP relative to pre-boom levels, as opposed to only 2 percentage points in past episodes. This has been accompanied by a remarkable increase in the investment rate (of about 5 percentage points of GDP), in clear contrast with the past. As a result, and despite higher saving rates, the recent episodes do not display higher current account balances than those of the past. It is worth highlighting in this regard that current accounts improved markedly during the first stages of the current episode but have deteriorated more recently (reflecting the pickup in investment along with the decline of saving rates). These dynamics could reflect, in part, changing perceptions regarding the persistence of the terms-of-trade shock, possibly being increasingly perceived as more permanent. They could also reflect changes in external financing conditions associated with the sharp drop in global interest rates (following the 2008–09 financial crisis).

Developments in Latin America are dwarfed by those seen in MENA oil-exporting countries. During the recent episode, the latter experienced an increase in saving rates of about 11 percentage points of GDP, starting from levels twice as high as those seen in Latin America. Furthermore, unlike in Latin America, saving rates have remained high in MENA oil-exporting countries during the life
of the recent boom despite low global interest rates over the last few years and the increasing perception that the shock was more persistent. A shared feature, however, is the continuous increase in investment, also leading to a marked weakening of current account balances toward the ½ life of the episode, although recovering later and still hovering about 10 percentage points of GDP in the MENA region as opposed to about zero in Latin America.

Marginal Saving Rates

Average saving and investment rates provide an indication of the macroeconomic response to the terms-of-trade shock. However, they do not allow us to compare the extent of the effort to save the income windfall across countries facing shocks of different magnitudes. Indeed, average savings are distorted by the size of the income shocks—for example, they can be higher in countries with lower marginal saving rates but facing larger income windfalls (see discussion below). Marginal rates, on the other hand, provide a more informative metric of the effort to save the income windfall, and are likely to be more relevant for explaining the dynamics of the economy during the boom as well as their post-boom impact.

We compute marginal saving rates in a way that captures the increase in saving as a proportion of the estimated income windfall. Specifically, the country’s average saving rate during the boom \( \bar{s} \) is decomposed into a norm saving rate \( \bar{s} \) and the marginal saving rate \( \sigma \), or share of the income windfall saved, as follows:

\[
\bar{s}_{it} = \bar{s} + \sigma \left( R_{i,t} - R_{i,t}^* \right) \frac{\left( R_{i,t} - R_{i,t}^* \right)}{R_{i,t}}.
\]  

(5.4)

The average saving rate can thus be seen as a weighted average of the norm saving rate and the saving rate on the extra income (windfall), and the marginal saving rate can be derived by re-arranging equation (5.4) as:\(^{14,15}\)

\[
\sigma_{it} = \frac{\bar{s}_{it} - \bar{s}}{R_{i,t} - R_{i,t}^*}.
\]  

(5.5)

\(^{14}\)Equation (5.5) shows that the marginal rate can be computed as the additional saving during the boom with respect to what saving would have been had no terms-of-trade boom occurred (measured as a share of the income windfall). Note that equation (5.4) implies \( \frac{\partial s}{\partial R_{ij}} = \sigma_{ij} \frac{1}{R_{ij}} \), which is empirically greater than zero in all cases. As mentioned before, this shows that, ceteris paribus, average saving rates \( \bar{s} \) can be higher in countries with lower marginal saving rates \( \sigma \) but facing larger income windfalls (higher \( R_{ij} \)).

\(^{15}\)Subsequently, the cumulative marginal saving rate for country \( i \) and episode \( j \) can be computed as:

\[
\sigma^c_{ij} = \sum_{t=1}^{T} \left( \bar{s}_{it} - R_{i,t}^* \right) \frac{\left( R_{i,t} - R_{i,t}^* \right)}{R_{i,t}}.
\]
We also compute the marginal rates for domestic and foreign savings, decomposing them in the same way that the average saving rate (S) can be separated into domestic investment (I) and foreign asset accumulation (CA) using the current account identity (CA = S - I). In our case, the measures are interpreted as the marginal saving (that is, the proportion of the windfall) channeled to increase the stock of domestic capital (investment) or to improve the country’s net foreign asset position (through a strengthening of the external current account), respectively. Specifically, the marginal domestic saving rate ($s_{WD}$) is computed as:

$$
s_{WD}^{t} = \frac{ir^{t} * RI_{I}^{t} - \overline{ir} * R_{I}^{t}}{RI_{I}^{t} - R_{I}^{t}}, \quad (5.6)
$$

where $ir$ stands for the investment rate and $\overline{ir}$ is the corresponding norm. And using the current account identity we derive the foreign saving component, as

$$
\overline{s}_{WF}^{t} = s_{WF}^{t} - s_{WD}^{t}.
$$

Computing these metrics reveals that Latin America’s marginal saving rates have actually been lower in the recent episode than in past episodes (Table 5.1). Indeed, the median saving rate in the last episode was about 45 percent (of the income windfall), compared with a median of 80 percent during past events, although marginal rates for previous episodes depict a relatively high dispersion. These figures suggest, therefore, that Latin America’s macroeconomic response to the recent boom in terms of its effort to save the windfall has not been greater than during past episodes. This contrasts with the sample median, which shows an increase in the marginal saving rate. There is, however, significant variance across countries within the region. Bolivia, Colombia, and Peru appear to have saved a larger proportion of their income shocks than the other countries, while Paraguay, Chile, and Brazil stand on the other extreme.

MENA oil-exporting countries appear to have saved a much larger share of the windfall than Latin America, with a median marginal saving rate of about 80 percent. Furthermore, the MENA region’s marginal rate estimates for the recent and previous episodes are of similar magnitudes, a pattern also observed for emerging market economies in most other regions. This suggests that differences in other common global factors (other than terms of trade) between the past and recent episodes are unlikely to fully explain the lower marginal saving rates in Latin America.\(^{16}\) Another important difference between these Latin American and MENA countries is in the split between domestic and foreign saving. MENA countries display a balanced allocation in the recent boom, as opposed

\(^{16}\)The next section formally examines the importance of these common global factors in a cross-sectional econometric exercise.
### TABLE 5.1
Average and Marginal Saving Rates during Terms-of-Trade Booms (medians)

<table>
<thead>
<tr>
<th>Country Group</th>
<th>Number of Episodes</th>
<th>Episode Length (years)</th>
<th>Pre-boom³</th>
<th>Boom (Upswing)</th>
<th>Marginal (percent of IW)³</th>
<th>Saving rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Average</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>Domestic</td>
<td>Foreign</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All episodes</td>
<td>270</td>
<td>3</td>
<td>18.4</td>
<td>22.7</td>
<td>−3.8</td>
<td>21.1</td>
</tr>
<tr>
<td>Current</td>
<td>62</td>
<td>6</td>
<td>19.3</td>
<td>21.1</td>
<td>−2.8</td>
<td>21.1</td>
</tr>
<tr>
<td>Past</td>
<td>208</td>
<td>3</td>
<td>18.3</td>
<td>23.2</td>
<td>−4.2</td>
<td>21.1</td>
</tr>
<tr>
<td>Selected subgroups</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America 11</td>
<td>35</td>
<td>3</td>
<td>17.2</td>
<td>18.9</td>
<td>−2.5</td>
<td>20.7</td>
</tr>
<tr>
<td>Current</td>
<td>10</td>
<td>9</td>
<td>17.2</td>
<td>17.0</td>
<td>−0.1</td>
<td>21.4</td>
</tr>
<tr>
<td>Past</td>
<td>25</td>
<td>2</td>
<td>17.2</td>
<td>20.2</td>
<td>−3.4</td>
<td>19.1</td>
</tr>
<tr>
<td>EM Asia</td>
<td>16</td>
<td>2</td>
<td>22.0</td>
<td>26.8</td>
<td>−4.4</td>
<td>23.1</td>
</tr>
<tr>
<td>Current</td>
<td>3</td>
<td>3</td>
<td>27.1</td>
<td>23.2</td>
<td>−3.9</td>
<td>29.5</td>
</tr>
<tr>
<td>Past</td>
<td>13</td>
<td>2</td>
<td>21.4</td>
<td>27.1</td>
<td>−5.2</td>
<td>21.2</td>
</tr>
<tr>
<td>EM Europe</td>
<td>15</td>
<td>4</td>
<td>19.4</td>
<td>20.9</td>
<td>−2.6</td>
<td>22.7</td>
</tr>
<tr>
<td>Current</td>
<td>6</td>
<td>5</td>
<td>17.6</td>
<td>20.6</td>
<td>−3.6</td>
<td>19.3</td>
</tr>
<tr>
<td>Past</td>
<td>9</td>
<td>3</td>
<td>20.5</td>
<td>25.3</td>
<td>−2.3</td>
<td>23.0</td>
</tr>
<tr>
<td>MENA Oil Exporters</td>
<td>39</td>
<td>3</td>
<td>24.4</td>
<td>23.0</td>
<td>−1.3</td>
<td>33.2</td>
</tr>
<tr>
<td>Current</td>
<td>7</td>
<td>8</td>
<td>34.3</td>
<td>19.6</td>
<td>8.2</td>
<td>45.1</td>
</tr>
<tr>
<td>Past</td>
<td>32</td>
<td>2</td>
<td>22.6</td>
<td>23.8</td>
<td>−2.4</td>
<td>31.2</td>
</tr>
<tr>
<td>Advanced Economies (excluding MENA)</td>
<td>21</td>
<td>4</td>
<td>22.4</td>
<td>25.0</td>
<td>−3.2</td>
<td>24.8</td>
</tr>
<tr>
<td>Current</td>
<td>3</td>
<td>9</td>
<td>22.3</td>
<td>20.2</td>
<td>2.1</td>
<td>24.0</td>
</tr>
<tr>
<td>Past</td>
<td>18</td>
<td>4</td>
<td>23.0</td>
<td>26.4</td>
<td>−3.9</td>
<td>26.0</td>
</tr>
</tbody>
</table>

Source: Authors’ estimates.

Note: Episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). EM = emerging market; MENA = Middle East and North Africa.

1From start to peak.

2Cycle is defined as start to end. End is identified when at least one-third of the shock is reverted.

3Average of three years previous to the terms-of-trade boom (in percent of GDP).

4Aggregate average rates (percent of GDP).

5Aggregate marginal rates, in percent of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).
to Latin America, where the allocation has been heavily biased toward domestic investment.17

Finally, a glance at the dynamics of Latin America’s marginal saving rates within the recent episode points to a gradual decline after a short-lived initial increase (Figure 5.7). Furthermore, the breakdown of the marginal saving rate into domestic and foreign savings shows, as average rates do, a growing share of the windfall being allocated to domestic capital formation rather than to improving countries’ net foreign asset position. As discussed above, these patterns could be thought of as reflecting changing perceptions of the persistence of the

17The breakdown between domestic and foreign saving shows that, other than Paraguay’s episode starting in 2002 and Bolivia’s episode in 2003, in all other events there is a larger share of marginal savings allocated to domestic investment, as opposed to countries’ improving their net foreign asset position (through the current account). In some cases, there is even a (marginal) deterioration in the country’s net international asset position. As mentioned before, the allocation of savings historically has had important implications for income levels after the terms-of-trade booms ended, as analyzed in Adler and Magud (2013).
terms-of-trade shock—that is, it being increasingly perceived as more protracted—as the boom evolved.\textsuperscript{18,19}

**COMMON EXTERNAL FACTORS AND SAVING PATTERNS**

The stylized facts presented in the previous sections indicate that Latin America has not saved more of the income windfall over the recent boom than in previous episodes, and it has saved less than other regions with windfall incomes of similar magnitudes. Such (unconditional) comparison, however, may hide the effects of time-varying global conditions as well as key country characteristics that could affect saving patterns. For example, differences in (per capita) income levels may play an important role in explaining cross-sectional differences in saving patterns. Similarly, differences across (and even within) episodes in terms of the prevailing world real interest rates and the persistence of the terms-of-trade shocks can also have an important bearing on saving patterns.\textsuperscript{20}

**Econometric Approach**

This section employs a multivariate econometric approach to study (1) whether Latin America’s saving patterns during booms have been fundamentally different from those of other countries; and (2) whether the region’s effort to save the income windfall during the recent boom has been stronger, as the improvement in fundamentals would suggest. Toward this end, we estimate panel specifications using feasible generalized least squares (FGLS) to control for autocorrelation and heteroskedasticity. The panel approach allows us to capture the role of cross-sectional heterogeneity in income levels, as well as the effects of time-varying external financial conditions and perceptions of the persistence of shocks on consumption-saving decisions. The first model is specified as follows:

\[
\begin{align*}
\frac{s_{jt}}{W_{jt}} = \alpha_j + \phi L^{LA}_{jt} + \beta_1 \rho_{jt} + \beta_2 r^* + \Omega_Z Z_j + \epsilon_{jt},
\end{align*}
\]  

\[\text{(5.7)}\]

\textsuperscript{18} The effects of the 2008–09 global financial crisis may have also played a role, leading to lower aggregate savings, at least temporarily.

\textsuperscript{19} These patterns could also be reconciled with the need to accumulate physical capital, especially since the sample of episodes is mostly composed of developing economies. However, whether domestic investment or foreign asset accumulation is preferable in terms of increasing post-boom income during periods of terms-of-trade booms remains an empirical issue. Adler and Magud (2013) present evidence suggesting that foreign saving historically has had higher rates of return, especially in Latin America.

\textsuperscript{20} These are the most relevant variables recognized in the literature as affecting countries saving and investment decisions. See, for example, Obstfeld and Rogoff (1995) and Végh (2013).
where \( jt \) denotes observation in each period \( t \) within episode \( j \), and the variables are defined as follows:

- \( D_{jt}^{LA} \) stands for a dummy variable that takes a value one for Latin American countries. This is the variable of main interest, as our aim is to explore whether, after controlling for key variables like income level, terms-of-trade persistence, and prevailing interest rates, Latin America still stands out as a poor saver during booms.
- \( s_{jt}^w \) denotes the windfall saving rate, as previously estimated.
- \( \rho_{jt} \) is a measure of the persistence of the terms-of-trade shock. We consider two alternatives definitions: (1) a measure of the cumulative duration of the boom as of each period \( t \), in terms of number of years since the beginning; and (2) a more elaborate measure aimed at capturing the underlying persistence of the shock as of each period \( t \). For this, we decompose the change in the terms of trade during the boom (start to each year) between its Hodrick-Prescott trend component \( \Delta TT_{jt}^{HPT} \) and its cyclical component \( \Delta TT_{jt}^{cyc} = \Delta IT_{jt} - \Delta IT_{jt}^{HPT} \), and compute a measure of persistence as

\[
\rho_{jt} = \frac{\Delta TT_{jt}^{HPT}}{\Delta TT_{jt}^{cyc}}.
\]

This ratio normally falls between 0 and 1, with transitory (persistent) shocks entailing low (high) values of \( \rho_{jt} \).\(^{21}\)
- \( r_{jt} \) is the 10-year U.S. Treasury bond interest rates (yields) prevailing at period \( t \) in real terms. Different specifications are estimated using, alternatively, the one- and five-year real rate, and the federal funds interest rate. This variable controls for the exogenous external financial conditions that might affect intertemporal consumption-saving decisions.
- \( Z_{jt}^\prime \) is a vector of other controls, including (1) a measure of the “norm” saving rate \( (\delta_j) \), as previously described; (2) the measure of income windfall \( (wij_t) \), as a way to explore possible nonlinearities in marginal saving rates; and (3) two alternative measures of real income (as these might affect the saving rates). In particular, we control for per capita income level in U.S. dollars as reported in the Penn World Tables or a similar measure reported by the World Bank’s World Development Indicators. In both cases, the variable is measured relative to the maximum value in the sample, thus its value ranges between 0 and 1.

Before conditioning the regressions on external factors and other controls, we run a regression to estimate the unconditional specification \( s_{jt}^w = \alpha + \phi D_{jt}^{LA} \) to statistically assess if Latin America has indeed had a lower marginal saving rate. Then we run the conditional regressions to check if the results hold after controlling for external and other factors.

\(^{21}\)This measure of persistence is in line with the ones proposed in the literature studying the impact of terms-of-trade shocks on current account dynamics. See Agenor and Aizenman (2004).
Results

Table 5.2 presents the main results. Column 1 shows the unconditional specification, indicating that Latin America has effectively displayed a lower marginal propensity to save during terms-of-trade booms. Column 2 presents the baseline conditional specification, and columns 3-10 present a number of robustness checks using alternative measures of foreign interest rates, income levels, and terms-of-trade persistence. Throughout the specifications we find that Latin American countries save less than other economies in the sample. The coefficient is in all cases statistically significant at conventional levels. It is also economically significant, pointing to a saving rate that is, on average, about 8–10 percentage points lower, against a sample average (conditional on controlled-for factors) of about 47–52 percent, depending on the specification.

The control variables are also statistically and economically significant in most cases, with the expected signs. For example, the duration of the episode—a measure of persistence—has a negative sign, indicating that the marginal saving rate falls with the persistence of the shock. On average, each additional year of boom results in about 1–2 percentage points lower marginal saving rates. The alternative metrics of real income levels display positive and statistically significant coefficients, as expected, indicating that higher-income countries tend to save more during booms.

Overall, these results suggest that Latin America tends to save less of the income windfall during terms-of-trade booms, even after controlling for key characteristics and external factors that normally drive saving decisions.

Next, we modify the specification to assess whether—beyond its historically lower saving rate—Latin America has displayed a different pattern (that is, a higher saving rate) during the latest boom. This entails adding to equation (5.7) the interaction of Latin America with a dummy of recent booms ($D_{REC}^{RE}$)—that is, those episodes taking place since 2000. For consistency, we also include $D_{LA}^{REC}$ separately, so that the interaction term would capture the marginal Latin America-specific effect only (for the recent episode). That is, we estimate the following specification:

$$s_{jt}^{w} = a + \delta D_{jt}^{LA} + \beta_{j} r_{jt} + \Omega' Z_{jt} + \mu D_{jt}^{REC} + \theta (D_{jt}^{LA} \ast D_{jt}^{REC}) + \epsilon_{jt}. \tag{5.8}$$

As in the previous specification, we first run the regression unconditioned (that is, against the dummies and the interaction only). Column 1 of Table 5.3 documents this. Again, we find a systematically lower saving rates for Latin America, with no different pattern for the most recent boom. If anything, it would appear that Latin America saved less of the income windfall in the recent boom, as indicated by the negative sign in the interaction term; however, it is not statistically significant. As in the Table 5.2, column 2 presents the baseline specification, while columns 3-10 show robustness checks. All the results of the benchmark specification hold.
### TABLE 5.2
Panel Regressions

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode length</td>
<td>-0.0157***</td>
<td>-0.0117***</td>
<td>-0.0109***</td>
<td>-0.0204***</td>
<td>-0.0119**</td>
<td>-0.0162***</td>
<td>-0.0170***</td>
<td>-0.0173***</td>
<td>-0.0173***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00452)</td>
<td>(0.00428)</td>
<td>(0.00427)</td>
<td>(0.00487)</td>
<td>(0.00462)</td>
<td>(0.00453)</td>
<td>(0.00450)</td>
<td>(0.00447)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal funds real interest rate</td>
<td>0.00452</td>
<td>0.00201</td>
<td>0.00303</td>
<td>0.00541</td>
<td>0.0150**</td>
<td>0.00667</td>
<td></td>
<td></td>
<td>0.0103^</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00556)</td>
<td>(0.00549)</td>
<td>(0.00547)</td>
<td>(0.00648)</td>
<td>(0.00607)</td>
<td></td>
<td></td>
<td></td>
<td>(0.00693)</td>
<td></td>
</tr>
<tr>
<td>Windfall income</td>
<td>0.0803^</td>
<td>0.113*</td>
<td>0.0711</td>
<td>0.0763^</td>
<td>0.0672</td>
<td>0.0609</td>
<td>0.0648</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0511)</td>
<td>(0.0648)</td>
<td>(0.0592)</td>
<td>(0.0514)</td>
<td>(0.0520)</td>
<td>(0.0521)</td>
<td>(0.0566)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America (dummy)</td>
<td>-0.0913***</td>
<td>-0.0938***</td>
<td>-0.0958***</td>
<td>-0.0933***</td>
<td>-0.0768**</td>
<td>-0.0844**</td>
<td>-0.0930***</td>
<td>-0.0921***</td>
<td>-0.0918***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0328)</td>
<td>(0.0341)</td>
<td>(0.0331)</td>
<td>(0.0330)</td>
<td>(0.0362)</td>
<td>(0.0350)</td>
<td>(0.0341)</td>
<td>(0.0340)</td>
<td>(0.0416)</td>
<td></td>
</tr>
<tr>
<td>Norm saving rate</td>
<td>0.351***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.108)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Income (Penn World Table)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.528***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.140)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Income (World Bank)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.192*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.102)</td>
<td></td>
</tr>
<tr>
<td>One-year U.S. Treasury real interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00196</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00610)</td>
<td></td>
</tr>
<tr>
<td>Five-year U.S. Treasury real interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.00280</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00661)</td>
<td></td>
</tr>
<tr>
<td>Ten-year U.S. Treasury real interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.00639</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00736)</td>
<td></td>
</tr>
<tr>
<td>Rho measure of persistence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.0413</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0454)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td><strong>0.467</strong>*</td>
<td><strong>0.499</strong>*</td>
<td><strong>0.507</strong>*</td>
<td><strong>0.436</strong>*</td>
<td><strong>0.455</strong>*</td>
<td><strong>0.453</strong>*</td>
<td><strong>0.503</strong>*</td>
<td><strong>0.512</strong>*</td>
<td><strong>0.522</strong>*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0163)</td>
<td>(0.0254)</td>
<td>(0.0231)</td>
<td>(0.0316)</td>
<td>(0.0298)</td>
<td>(0.0293)</td>
<td>(0.0281)</td>
<td>(0.0303)</td>
<td>(0.0336)</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>1,206</td>
<td>1,125</td>
<td>1,182</td>
<td>1,182</td>
<td>1,003</td>
<td>1,003</td>
<td>1,125</td>
<td>1,125</td>
<td>1,125</td>
<td></td>
</tr>
<tr>
<td>Number of episodes</td>
<td>229</td>
<td>225</td>
<td>229</td>
<td>229</td>
<td>219</td>
<td>219</td>
<td>225</td>
<td>225</td>
<td>225</td>
<td></td>
</tr>
</tbody>
</table>

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, ^ $p < 0.15$. 

©International Monetary Fund. Not for Redistribution
## TABLE 5.3

### Panel Regressions with Interaction

<table>
<thead>
<tr>
<th>Variables</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode length</td>
<td>-0.0160***</td>
<td>-0.0156***</td>
<td>-0.0123***</td>
<td>-0.0206***</td>
<td>-0.0120***</td>
<td>-0.0164***</td>
<td>-0.0172***</td>
<td>-0.0174***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.00452)</td>
<td>(0.00453)</td>
<td>(0.00429)</td>
<td>(0.00487)</td>
<td>(0.00462)</td>
<td>(0.00452)</td>
<td>(0.00450)</td>
<td>(0.00449)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal funds real interest rate</td>
<td>0.0127*</td>
<td>0.0128*</td>
<td>0.0109^</td>
<td>0.0113</td>
<td>0.0192**</td>
<td>0.0183**</td>
<td></td>
<td></td>
<td></td>
<td>0.0183**</td>
</tr>
<tr>
<td></td>
<td>(0.00747)</td>
<td>(0.00747)</td>
<td>(0.00733)</td>
<td>(0.00828)</td>
<td>(0.00797)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00903)</td>
</tr>
<tr>
<td>Windfall income</td>
<td>0.0703</td>
<td>0.0740</td>
<td>0.102^</td>
<td>0.0679</td>
<td>0.0704</td>
<td>0.0654</td>
<td>0.0599</td>
<td>0.0526</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0514)</td>
<td>(0.0515)</td>
<td>(0.0656)</td>
<td>(0.0598)</td>
<td>(0.0516)</td>
<td>(0.0520)</td>
<td>(0.0521)</td>
<td>(0.0572)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America (dummy)</td>
<td>-0.0750*</td>
<td>-0.0825*</td>
<td>-0.0808*</td>
<td>-0.0835^</td>
<td>-0.0735^</td>
<td>-0.107**</td>
<td>-0.0814*</td>
<td>-0.0805*</td>
<td>-0.0808*</td>
<td>-0.0880^</td>
</tr>
<tr>
<td></td>
<td>(0.0439)</td>
<td>(0.0462)</td>
<td>(0.0447)</td>
<td>(0.0471)</td>
<td>(0.0471)</td>
<td>(0.0462)</td>
<td>(0.0462)</td>
<td>(0.0574)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recent boom (dummy)</td>
<td>0.0114</td>
<td>0.0725*</td>
<td>0.0696^</td>
<td>0.0773*</td>
<td>0.0500</td>
<td>0.0185</td>
<td>0.0606</td>
<td>0.0312</td>
<td>0.0152</td>
<td>0.0800^</td>
</tr>
<tr>
<td></td>
<td>(0.0326)</td>
<td>(0.0435)</td>
<td>(0.0435)</td>
<td>(0.0422)</td>
<td>(0.0460)</td>
<td>(0.0463)</td>
<td>(0.0450)</td>
<td>(0.0446)</td>
<td>(0.0433)</td>
<td>(0.0549)</td>
</tr>
<tr>
<td>Interaction Latin America*Recent</td>
<td>-0.0367</td>
<td>-0.0175</td>
<td>-0.0187</td>
<td>-0.0194</td>
<td>-0.00366</td>
<td>0.0528</td>
<td>-0.0192</td>
<td>-0.0217</td>
<td>-0.0225</td>
<td>-0.0375</td>
</tr>
<tr>
<td></td>
<td>(0.0663)</td>
<td>(0.0678)</td>
<td>(0.0677)</td>
<td>(0.0665)</td>
<td>(0.0731)</td>
<td>(0.0690)</td>
<td>(0.0678)</td>
<td>(0.0678)</td>
<td>(0.0678)</td>
<td>(0.0824)</td>
</tr>
<tr>
<td>Norm saving rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.114)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Income (Penn World Table)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.506***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.142)</td>
<td></td>
</tr>
<tr>
<td>Real Income (World Bank)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.188*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.102)</td>
<td></td>
</tr>
<tr>
<td>One-year U.S. Treasury real interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00952</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00838)</td>
<td></td>
</tr>
<tr>
<td>Five-year U.S. Treasury real interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.000928</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00897)</td>
<td></td>
</tr>
<tr>
<td>Ten-year U.S. Treasury real interest rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.00492</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00963)</td>
<td>(0.0462)</td>
</tr>
<tr>
<td>Rho measure of persistence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.0521</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0462)</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.461***</td>
<td>0.461***</td>
<td>0.434***</td>
<td>0.465***</td>
<td>0.432***</td>
<td>0.443***</td>
<td>0.470***</td>
<td>0.492***</td>
<td>0.512***</td>
<td>0.444***</td>
</tr>
<tr>
<td></td>
<td>(0.0232)</td>
<td>(0.0340)</td>
<td>(0.0406)</td>
<td>(0.0322)</td>
<td>(0.0366)</td>
<td>(0.0374)</td>
<td>(0.0354)</td>
<td>(0.0403)</td>
<td>(0.0431)</td>
<td>(0.0426)</td>
</tr>
<tr>
<td>Observations</td>
<td>1,206</td>
<td>1,125</td>
<td>1,125</td>
<td>1,182</td>
<td>1,003</td>
<td>1,125</td>
<td>1,125</td>
<td>1,125</td>
<td>1,125</td>
<td>795</td>
</tr>
<tr>
<td>Number of episodes</td>
<td>229</td>
<td>225</td>
<td>225</td>
<td>229</td>
<td>219</td>
<td>219</td>
<td>225</td>
<td>225</td>
<td>225</td>
<td>224</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>8.066</td>
<td>27.63</td>
<td>29.12</td>
<td>21.59</td>
<td>40.76</td>
<td>26.23</td>
<td>26.00</td>
<td>24.69</td>
<td>24.95</td>
<td>15.08</td>
</tr>
</tbody>
</table>

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, ^ $p < 0.15$. 

©International Monetary Fund. Not for Redistribution
Consistent with the evidence presented in previous sections, we find no evidence of higher saving rates for Latin America during the recent boom, even after controlling for global interest rates, the persistence of the terms-of-trade shocks, and income levels. As such, it does not appear that the region made a stronger effort to save the income windfall than in past episodes.

CONCLUSIONS

This chapter presented a metric that quantifies the (exogenous component of the) income shock arising from terms-of-trade booms, and a metric of the associated savings. These measures allow for grasping the economic importance of these shocks and comparing them across regions and time in a consistent manner (for 180 economies during 1970–2012). Focusing on Latin America, the analysis finds that, while the region’s recent terms-of-trade boom has been of a similar magnitude to booms of the 1970s, the associated income windfall has been much larger. The analysis also finds that, in response to the shock, aggregate saving rates in Latin America have increased somewhat, but marginal saving rates have actually been lower. And while that decrease can be partially explained by the greater persistence of the recent shock and other prevailing common global factors, the analysis finds no evidence of a stronger effort (that is, of a higher marginal propensity) to save the income windfall this time, once those factors are controlled for. These findings suggest that the observed improvements in the region’s economic fundamentals have been largely driven by the sheer size of the terms-of-trade income windfall rather than by a more prudent macroeconomic response.

REFERENCES


External Conditions and Debt Sustainability in Latin America

GUSTAVO ADLER AND SEBASTIÁN SOSA

Over the past decade, and particularly during 2003–08, Latin America experienced an impressive strengthening of key macroeconomic fundamentals that ended with the global financial crisis triggered by the bankruptcy of Lehman Brothers (Figures 6.1 and 6.2). The region displayed remarkable improvements in terms of stocks (reducing public and external debt levels and accumulating public and foreign assets) and in terms of flows (improving primary fiscal and current account balances). It also made notable advances toward less-vulnerable debt structures, reducing the share of debt denominated in foreign currency and extending maturity.

While prudent policies undoubtedly played an important role, these gains reflected to a significant extent the highly favorable external environment from which the region benefited during this period—interrupted only temporarily during the 2008–09 international financial crisis and characterized by strong external demand, an unprecedented boom in commodity prices, and very benign global financing conditions. However, with prospects of less-favorable external conditions going forward, the regional policy debate has recently focused on whether the region has taken full advantage of the windfall. In particular, the question is: Has the region built enough buffers to guard itself from external shocks?1,2

This chapter sheds light on this question by studying the link between global variables (commodity prices, world growth, and financial market conditions) and a set of domestic variables (GDP growth, trade balance, real exchange rate, and sovereign spreads) that explain most of the dynamics of public and external sustainability indicators. To this end, it develops a simple framework that integrates econometric estimates of the effect of exogenous external variables on these key domestic variables with the IMF’s standard framework for debt sustainability.

1The chapter focuses on debt sustainability from the perspective of potential external shocks, leaving aside other objectives or possible shocks that could shape the desirability of larger buffers (for example, management of nonrenewable resources, buffers to deal with possible contingent liabilities arising from private sector excesses, and so on). The chapter also leaves aside issues related to the appropriateness of the fiscal stance on cyclical grounds.

2For a first look into this issue see IMF (2012a).
analysis. This integrated framework allows us to examine the evolution of public and external debt sustainability indicators (both in terms of stocks and flows) under alternative global scenarios, and consequently to assess the adequacy of current levels of buffers for 11 Latin American countries. 3

The analysis entails a methodological contribution to the existing IMF framework for public and external debt sustainability analysis, as this framework is currently not equipped to assess how changes in external conditions affect debt dynamics, given its lack of linkages between global and domestic variables. 4

3 The sample includes all South American countries (except Guyana and Suriname) and Mexico, representing about 95 percent of the region’s GDP.

Moreover, stress tests under the traditional debt sustainability analysis framework consider shocks to certain variables in isolation (output growth, interest rates, and so on), without taking into account the correlation among shocks and the joint dynamic response of some of these variables.

The chapter relates to a growing literature seeking to improve debt sustainability analysis. Most of these contributions (Celasun, Debrun, and Ostry, 2006; Cherif and Hasanov, 2012; Favero and Giavazzi, 2007, 2009; Kawakami and Romeu, 2011; and Tanner and Samake, 2008) have focused primarily on the joint stochastic properties of shocks, aiming at developing a probabilistic approach to debt sustainability analysis, including by incorporating explicit fiscal reaction functions to take into account the policy response to shocks and the feedback effects of fiscal policy on macroeconomic variables. Like this chapter, those studies rely on a methodology that combines vector autoregression (VAR) models with debt feedback to assess the impact of a set of macroeconomic shocks on public debt dynamics. However, those studies do not examine the impact of specific external shocks on debt dynamics—which are highly relevant for Latin America, especially for those economies that are highly financially integrated with international capital markets and/or rely heavily on commodity exports. In addition, most of the papers focus on a limited set of countries, and solely on public debt, without looking into external debt. This chapter contributes to the literature by filling these gaps.

The main results suggest that current fiscal positions in the region are, on average, adequate to deal with temporary and even moderate protracted external shocks, although fiscal space to face more severe protracted shocks could be limited. At the same time, there are important differences across countries, especially with respect to their ability to deal with protracted shocks. Countries fall broadly into three groups: (1) Argentina and Venezuela, which would face considerable fiscal sustainability issues under large shocks, and varying constraints even under moderate ones; (2) Brazil, Ecuador, Mexico, and Uruguay, which could manage moderate shocks but would benefit from building additional buffers to be in a position to deploy countercyclical policies under adverse scenarios, without reaching debt levels that could raise concerns about fiscal sustainability; and (3) Bolivia, Chile, Paraguay, Peru, and to a lesser extent Colombia, which have a relatively solid position to withstand sizable shocks—even responding with expansionary policies—without putting fiscal solvency at risk.

Overall, these results suggest that many countries in the region would benefit from building further fiscal space while favorable conditions last in order to be in a position to actively use fiscal policy should the external environment deteriorate markedly. In terms of the external position, the results indicate that, despite evidence of a recent widening in current account deficits, external sustainability does not appear to be a source of concern for Latin America in general.

5The role of external conditions in driving macroeconomic outcomes in Latin America has been studied extensively in the literature (Osterholm and Zettelmeyer, 2008; Izquierdo, Romero, and Talvi, 2007) but without exploring the implications for either fiscal or external sustainability.
The chapter first presents key stylized facts about the factors behind the declining debt ratios in the region over the past decade. It then describes the methodological approach used to examine how fiscal and external sustainability indicators would be affected under alternative (downside) scenarios. The chapter then describes the scenarios under consideration and presents the main results, deriving an assessment of the adequacy of current buffers, before concluding with key takeaways.

A DECADE OF FALLING PUBLIC AND EXTERNAL DEBT, 2003–12

Fiscal Sustainability

The analysis first takes a historical view of the drivers of public debt dynamics over the past decade, relying on the (accounting) decomposition offered by the IMF’s Public Debt Sustainability Framework. For consistency across countries, the focus is on general government gross debt, as reported by the IMF’s World Economic Outlook. In most cases, this level of consolidation appropriately reflects the level of public indebtedness. In addition, while the focus on gross rather than net debt implies overlooking the recent accumulation of assets by the public sector in certain countries, this is unlikely to distort the results, as the asset accumulation, when sizable, has tended to coincide with low levels of gross debt, thus not changing the general conclusions of the sustainability assessment.

Pre-Lehman Period: 2003–08

Between 2003 and 2008, Latin America witnessed a steep improvement of its fiscal sustainability indicators, most notably bringing public debt-to-GDP ratios down, on average, by about 30 percentage points of GDP (Figure 6.3). The decline was primarily driven by a combination of the direct effect of rapid economic growth and sizable primary surpluses. Negative real interest rates also appeared to have played a role in the downward debt dynamics in some countries. Interestingly, the marked real exchange rate appreciation observed during this period contributed only marginally to reduce debt levels.

6 It is important to highlight that the contributions of different factors to the changes in debt-to-GDP ratios, as presented in the IMF’s Debt Sustainability Framework, entail a simplification, as there are multiple interactions (nonlinearities) among the different factors, as described later in this chapter.

7 In the case of Argentina, intra-public sector claims (between the central government and public agencies like the Central Bank, ANSES, and so on) have grown in recent years.

8 The accumulation of (gross) foreign assets in different types of sovereign funds was a key (partially) offsetting factor.

9 This reflects several factors: (1) some countries with relatively high foreign-currency-denominated debt (Bolivia and Peru) allowed for limited exchange rate movements during this period; (2) in others (Brazil), most of the appreciation occurred only after public debt had shifted markedly toward local currency instruments; (3) in yet others (Chile and Mexico), foreign currency debt represents a very low share of total public debt; and (4) in Uruguay, the fact that the cumulative contributions are computed from 2002 onward implies including the sharp depreciation of 2002–03.
There are, however, visible differences across countries in the region, particularly regarding how they managed the rapidly increasing revenues during this period. Indeed, the contribution of primary surpluses is not necessarily a reflection of fiscal discipline in all countries, as this was a period of economic bonanza characterized by strong growth and markedly higher commodity prices, and therefore by a substantial increase in fiscal revenues.\footnote{See Izquierdo and others (2008) for an interesting discussion on this issue; Céspedes and Velasco (2011) for a comparison of fiscal behavior during the recent boom relative to previous commodity price booms; and Frankel, Végh, and Vuletin (2011) for a broader analysis of emerging markets’ “graduation” from fiscal procyclicality.}

In the LA7 group (encompassing Brazil, Chile, Colombia, Mexico, Paraguay, Peru, and Uruguay),\footnote{Countries are grouped based on similarities in terms of the role played by the different factors in driving the debt dynamics.} a drop of 20 percentage points of GDP in public debt ratios reflected mainly the contributions of primary surpluses and rapid real GDP growth—with the former being the result of real public expenditures growing at a slower pace than booming revenues—as well as generally slower than potential GDP growth (Figure 6.4). Chile, Colombia, Paraguay, and Peru displayed particularly restrained expenditure policies.\footnote{See country-by-country breakdown in Annex Figures A6.1–A6.4.}

A decomposition of commodity-related and noncommodity-related revenues suggests that the extraordinary increase in revenues arose primarily from the commodity sector, as noncommodity revenues in these countries increased in line with real GDP at rates that, while higher than those in the previous decade, were broadly in line with long-term potential.\footnote{For a discussion on the importance of commodity revenues in resource-rich economies, see IMF (2012b).}

The rest of the Latin American countries (Argentina, Bolivia, Ecuador, and Venezuela) also experienced a remarkable fall in indebtedness during this period (averaging about 45 percentage points of GDP), although starting from much
higher debt levels. In these cases, the decline was mostly driven by the direct effect of the economic boom on output (with GDP growth considerably above long-term potential, except in Bolivia) and by negative real interest rates.\(^{14}\) While primary balances also played an important role in reducing debt ratios, the extent of savings of the booming revenues (derived both from direct taxation on the commodity sector and from taxes on broad economic activity) was limited. Indeed, real public expenditure grew at a faster pace than potential GDP growth and even faster than observed output growth. As a result, and in contrast to the LA7 group, these countries spent a substantial fraction of the revenue boom (see Chapter 5).\(^{15}\)

**Post-Lehman Period: 2009–12**

Public debt trends changed markedly in 2009, reflecting the effects of the global crisis. Since then, Latin America’s debt ratios have remained broadly stable, on average, at about 35 percent of GDP, mostly on account of no further contributions from primary balances. Again, there is a stark difference between the LA7 and the rest of Latin America during this period.

After implementing significant fiscal stimulus during 2009–10, the LA7 countries have been making efforts to consolidate their fiscal positions and recompose primary surpluses (most noticeably Chile and Peru), although the recent improvements in primary balances partly reflect the rebound in commodity-related revenues in some cases. The result has been a (modest) resumption of the declining trend in debt ratios in most countries of this group.

\(^{14}\) Argentina’s debt restructuring in 2005 was a major factor driving debt ratios down. Bolivia also benefited from a debt relief program of roughly 25 percent of GDP in 2006.

\(^{15}\) The analysis of the composition of spending of the revenue windfall, or of whether different levels of spending were optimal from a social point of view, are beyond the scope of this chapter, as our interest lies primarily in the macro implications for debt sustainability.
The rest of Latin America, in contrast, has shown a sustained deterioration in primary balances since 2009, turning primary surpluses into deficits and thus contributing to push debt ratios upward. This deterioration has taken place despite the recovery of commodity-related revenues, as expenditure has continued to grow rapidly (significantly faster than potential GDP and even current GDP growth). In some of these countries, negative real interest rates on public debt have continued to play an important role in supporting debt reduction (Argentina and Bolivia) or containing its increase (Venezuela).

External Sustainability

Pre-Lehman Period: 2003–08

The dynamics of external debt during this period share some of the trends observed for public debt. The region as a whole made significant progress in bringing down external-debt-to-GDP ratios in this period, reducing them by more than 30 percentage points of GDP on average (Figure 6.5). Moreover, this sharp improvement was accompanied by a sizable accumulation of foreign assets (reaching nearly 70 percent of GDP on a cumulative basis). However, once again, there are visible differences between the two groups of countries mentioned above.

In the LA7 group, external debt declined by 25 percent of GDP, primarily on account of the significant real appreciation and external financing in the form of nondebt flows (especially foreign direct investment), combined with moderate current account surpluses.

Figure 6.5 Factors Driving External Debt Dynamics (Cumulative contributions since 2002, in percent of GDP, simple averages)

Sources: IMF, International Financial Statistics; and authors’ calculations.
Note: Main factors driving public debt dynamics are as identified in the IMF’s debt sustainability framework.
1 Includes Brazil, Chile, Colombia, Mexico, Paraguay, Peru, and Uruguay.
2 Includes Argentina, Bolivia, Ecuador, and Venezuela.

Bolivia, which maintained primary surpluses in this period, is an exception.
This reflected both public policies oriented to the accumulation of international reserves and assets under sovereign funds as well as private sector portfolio allocations (for example, pension funds accumulating assets abroad).
The countries in the rest of Latin America (all of which are heavy commodity exporters) witnessed an even more remarkable drop in external indebtedness (reaching about 50 percentage points of GDP), although starting from much higher levels. This reduction was mainly explained by large current account surpluses—reflecting highly favorable terms of trade—as well as sizable real exchange rate appreciation. Unlike for the LA7 group, the role of nondebt flows was quite limited. These countries accumulated large amounts of foreign assets—largely by the public sector in Bolivia and Ecuador, while mostly by the private sector in Argentina and Venezuela.

**Post-Lehman Period: 2009–12**

In 2009, the previous downward trend came to a halt—mainly reflecting a slowdown in real appreciation and a weakening of current account balances—leaving debt ratios at about 28–30 percent of GDP for both groups of countries.

In sum, despite the evident deterioration in debt trends after the Lehman event, the improvement in terms of both public and external debt sustainability in Latin America over the past decade has been remarkable. At the same time, current debt levels are still, in some cases, relatively high and close to thresholds that are typically considered risky. In this context, being that many of these countries are highly sensitive to external conditions, it is not clear the extent to which countries across Latin America are well placed to withstand a significant deterioration in the external environment.

**METHODOLOGICAL APPROACH**

**Public and External Debt Sustainability Analysis**

This section describes the framework to examine how external conditions affect the dynamics of public and external debt ratios through their impact on key domestic variables. The framework entails mapping, by means of econometric estimates, how shocks to key global variables (commodity prices, world growth, and financial market conditions) affect a set of domestic variables (GDP growth, trade balance, real exchange rate, and sovereign spreads) that enter into the laws of motion of public and external debt.

Once the econometric model is estimated and integrated with the Debt Sustainability Analysis Framework (Diagram 6.1), one can undertake scenario analysis to evaluate the adequacy of the current fiscal or external position by generating conditional forecasts of the endogenous domestic variables. To start, we show how the law of motion of debt ratios can be expressed as a function of the small set of domestic variables mentioned above.

18 As in the IMF’s standard Debt Sustainability Analysis Framework, we focus on general government gross debt.
Diagram 6.1  Illustration of Integrated Public and External Debt Sustainability Approach

Note: The diagram presents a simplified illustration of the integrated framework for public and external debt sustainability. Details and underlying assumptions are discussed in the main text of the chapter. DSA = debt sustainability analysis.
Public Debt Dynamics

Consider the following equation that governs the path of public debt (in nominal local currency terms):

\[ D_{jt} = E_{jt} D^{FC}_{j,t} (1 + r_{j,t-1}) + D^{LC}_{j,t-1} (1 + i_{j,t-1}) - PB_{j,t}, \]

(6.1)

where \( D_{jt} \) is country \( j \)'s nominal stock of public debt in period \( t \); \( D^{FC}_{j,t-1} \) is the stock of foreign (domestic)-currency-denominated debt; \( E_{jt} \) is the nominal exchange rate vis-a-vis the U.S. dollar; \( r_{j,t-1} \) and \( i_{j,t-1} \) are the average interest rates on foreign and local currency debt, respectively; and \( PB_{j,t} \) is the nominal primary fiscal balance.

It is evident from the nonlinearity of this equation that it is not possible to fully isolate the contribution of each of the main economic variables to the change in public debt. One can, however, write this equation in a way that approximates such contributions (as done in the IMF’s standard Debt Sustainability Analysis).

Denote \( \alpha_i = X_i / GDP \), as a nominal variable \( X_i \), expressed in percent of GDP; \( i_{j,t} = \alpha_{j,t} + (1 - \alpha_{j,t}) r_{j,t} \), as the effective average interest rate; \( \pi_{j,t} \) as domestic inflation (GDP deflator); \( g_{j,t} \) as real GDP growth; and \( \varepsilon_{j,t} \) as the nominal depreciation of the domestic currency vis-a-vis the U.S. dollar. Then, defining \( \alpha_{j,t} = D^{LC}_{j,t} / D_{jt} \), as the share of local-currency-denominated debt, one can reduce equation (6.1) to a small number of terms:

\[ \Delta d_{j,t} = \left[ i_{j,t-1} - \pi_{j,t} (1 + g_{j,t}) \right] \theta_{j,t} - (g_{j,t} - \pi_{j,t}) \theta_{j,t} \\
+ [(1 - \alpha_{j,t}) (1 + r_{j,t-1}) \varepsilon_{j,t}] \theta_{j,t} - PB_{j,t}, \]

(6.2)

where \( \theta_{j,t} = \frac{d_{j,t-1}}{(1 + g_{j,t}) (1 + \pi_{j,t})} \).

The first term of equation (6.2) broadly captures the (accounting) contribution of the real interest rate; the second term captures the effect arising from real GDP growth; the third term captures the impact of exchange rate movements (through valuation effects on foreign-currency-denominated debt); and the last term reflects the contribution of the primary balance.

Taking into account the share of debt falling due in the current period (\( \gamma_{j,t-1} \)) and subsequent periods (\( 1 - \gamma_{j,t-1} \)), we can model the dynamics of the average interest rate as a function of marginal interest rates (\( i^{*}_{j,t}, i_{j,t} \)):

\[ i_{j,t} = (1 - \gamma_{j,t-1}) i_{j,t-1} + \gamma_{j,t-1} \left\{ \alpha_{j,t} i^{*}_{j,t} + (1 - \alpha_{j,t}) i_{j,t-1} \right\}, \]

(6.3)

Assume the following pass-through structure from (global) risk-free interest rates (\( r^{*} \)) and sovereign spreads (\( i_{j,t} \)) into domestic interest rates (\( i_{j,t} \)). That is,
\[ \Delta t \Delta = \Delta r^* + \Delta s \Delta i. \] Assume also that real and nominal exchange rate shocks map one-to-one: \( \Delta \ln(\text{reer}_{j,t}) = -e r_{j,t}. \)

From equations (6.2) and (6.3), this set of (relatively innocuous) assumptions and from the fact that \( r^*_{j,t} = r^* + s \Delta i \), one can show that the dynamics of the public-debt-to-GDP ratio are governed by the behavior of only four (endogenous) domestic variables: \( \{s, g, \text{reer}, \text{pb}\}. \)

Furthermore, one can model the primary balance in a simple fashion by decomposing it into commodity revenues, noncommodity revenues, and expenditures (all in percent of GDP):

\[ \text{pb}_j = \text{rev}_{j}^C + \text{rev}_{j}^NC - \exp_j. \]

Subsequently, commodity revenues can be modeled as a function of the corresponding commodity prices:

\[ \text{rev}_{j}^C = \text{rev}_{j}^C \ast \left( \frac{P_{\text{rev}}^C}{P_{\text{rev}}^C} \right), \]

where \( \text{rev}_{j}^C \) (\( \text{rev}_{j}^C \)) are commodity-related revenues and \( P_{\text{rev}}^C \) (\( P_{\text{rev}}^C \)) are world commodity prices under a specific scenario (under the baseline).

Finally, a constant noncommodity-revenue-to-GDP ratio is assumed (that is, an elasticity equal to one), such that \( \text{rev}_{j}^NC = \eta \). Then, the dynamics of the public debt ratio are simply given by four endogenous domestic variables \( \{s, g, \text{reer}, \text{exp}\} \) and a set of exogenous global variables.

**External Debt Dynamics**

Similarly, to derive the set of variables that determine the path of the external-debt-to-GDP ratio, one can start from the law of motion of external debt:

\[ D_{j,t}^E = E_{j,t} \Delta L_{j,t}^F (1 + r_{j,t-1}) + L_{j,t-1}^E (1 + i_{j,t-1}) - \text{NICA}_{j,t} - \text{NDCF}_{j,t}, \]

where \( D_{j,t}^E \) is the nominal stock of total external debt (expressed in local currency); \( L_{j,t-1}^E \) (\( L_{j,t-1}^LC \)) is the stock of foreign- (local-) currency-denominated debt; \( r_{j,t-1} \) (\( r_{j,t-1} \)) is the average interest rate on foreign- (local-) currency-denominated debt; \( \text{NICA}_{j,t} \) is the current account balance excluding interest payments; and \( \text{NDCF}_{j,t} \) are the nondebt-creating flows (foreign direct investment and equity portfolio).

Then, defining \( \alpha_{j,t}^E = L_{j,t}^E / L_{j,t}^E \) and \( i_{j,t}^* = \alpha_{j,t}^E i_{j,t} + (1 - \alpha_{j,t}^E) r_{j,t} \), we can derive the path of external debt in terms of a small set of factors:

\[ \Delta d_{j,t}^E = i_{j,t-1}^* \sigma_{j,t} - g_{j,t} \sigma_{j,t} + \left( \left[ 1 - \alpha_{j,t}^E \right] \left( 1 + r_{j,t-1} \right) \text{E}_{j,t} \right] \sigma_{j,t} \text{ NICA}_{j,t} \text{ NDCF}_{j,t}, \]

This implies that both \( \text{A} \) and \( \text{A}^* \) (international inflation) are invariant across the scenarios under consideration, so that movements in the real effective exchange rate mirror those of the nominal exchange rate.
where \( \nu_{j,t} = \frac{d^{E}_{j,t}}{(1+g_{j,t})(1+\pi_{j,t})} \).

The first term reflects the contribution of interest payments; the second term captures the contribution of real GDP growth; the third term measures the valuation effect arising from movements in the real exchange rate; and the last two terms reflect the contributions of the current account balance (excluding interest payments) and nondebt financing flows, respectively.

Modeling the noninterest current account as \( NICA_{jt} = \theta_t + \eta_t \) (where \( \theta_t \) is the trade balance in period \( t \)) and using our previous assumption on the behavior of the real exchange rate (\( \Delta \ln(\text{reer}_{t,j}) = -\varepsilon_{t,j} \)), the external debt dynamics can be fully characterized by the path of a set of few domestic variables: \( \{s, g, \text{reer}, \text{tb}, \text{ndcf}\} \).20

Treating \( \text{ndcf}_j \) as exogenous (as we are primarily interested in externally triggered shocks), and putting together the systems of equations derived for public and external debt, one can show that both debt ratios are ultimately driven by five domestic variables, \( \{s, g, \text{reer}, \text{tb}, \text{exp}\} \), and a set of exogenous global variables. The next section discusses how to estimate the impact of external variables on the first four variables in this set, while the behavior of the last variable (\( \text{exp} \)) is evaluated under different policy rules.

Conditional Forecasting of Key Domestic Variables: A Vector Autoregression Approach

Country-specific vector autoregression (VAR) models are estimated in order to quantify the sensitivity of the variables (specified above) that characterize debt dynamics to external conditions. Specifically, the VARs are used to obtain forecasts of these domestic variables, conditional on a set of assumed global variables (global scenarios). A key feature of the framework is that primary balances and debt levels are included in the VAR in order to allow feedback effects from these variables to the other domestic variables that determine debt dynamics.

Each (reduced form) country-specific VAR model can be written as:

\[
y_t = B(L)y_{t-1} + H(L)\omega_t + u_t, \tag{6.8}\]

where \( y_t = (g_t, dTB_t, d\ln(\text{reer}_t))' \) is a vector of endogenous variables and \( \omega_t = (1, g_t, \text{vix}_t, \text{dTB}_t, \text{reer}_t, \text{exp}_t, \text{ndcf}_t)' \) is a vector of exogenous variables. The vector \( y_t \) includes real GDP growth (\( g_t \)), the change in the trade balance in percent of GDP (\( dTB_t \)), and the (log difference of) the real effective exchange rate

---

20 We focus on the trade balance, rather than the noninterest current account, as the former is if the main driver of the latter and is likely to have more stable relationships with the other key endogenous variables (real exchange rate, real GDP growth, and so on).
The vector \( \mathbf{z} \), in turn, includes global real GDP growth \( (g^W) \), the S&P 500 Chicago Board Options Exchange Market Volatility Index \( (vix) \) as a proxy for international financial conditions, \( \text{W} \) the (log differences of) agriculture, energy, and metals prices \( (P^A_t, P^E_t, \text{and } P^M_t) \), respectively, \( \text{pb} \) the primary balance in percent of GDP, and the debt-to-GDP ratio \( (dp) \). \( B(L) \) and \( H(L) \) are lag polynomial matrices, which include up to four lags. The VAR models are estimated using quarterly data from 1990:Q1 through 2012:Q1. The data sources are primarily the IMF’s International Financial Statistics (IFS) and World Economic Outlook (WEO) database, and Haver Analytics.

It is worth noting that since our main interest resides in obtaining conditional forecasts and not standard VAR tools such as impulse response functions and variance decompositions, there is no need for identification restrictions to recover the structural parameters of the model. Similarly, as our interest is in the conditional forecasting performance of the model during bad external scenarios, specifications are selected based on their out-of-sample forecast power during the Lehman event.

Unlike that of other papers in the literature, our approach does not entail estimating a fiscal reaction function, (that is, there is no equation for the primary balance). This is deliberate, as our objective is not to obtain alternative debt paths under the assumption that fiscal responses to the negative shocks mirror those of the past—which may have been constrained (or suboptimal) in many cases—but rather under broadly unconstrained fiscal policy responses (either neutral or countercyclical). This does not mean that the VAR does not control for the fiscal stance, but rather that the primary balance is treated as exogenous for the purpose of estimation only. For projections, the primary balance under alternative scenarios is constructed as follows: revenues are projected based on the forecast.

\[ \text{(dlh(rerc r),)} \]21 The VIX index has recently been used as a measure of global uncertainty or financial stress. Bloom (2009), for instance, shows that this volatility index is highly correlated with measures of micro- and macro-level uncertainty, including from financial variables. More recently, IMF (2012a), Adler and Tovar (2012), and Carrière-Swallow and Céspedes (2011) also used the VIX to measure global uncertainty shocks.

International commodity prices are measured in real terms and stripped of exchange rate effects, as in Adler and Sosa (2011).

As the global variables included in vector \( \mathbf{z} \) are exogenous to the model, this approach does not allow for capturing correlations among shocks to these variables. However, the assumptions about the path of the global variables under each scenario, discussed in the next section, are based on broad patterns observed in previous episodes of external shocks.

Whether or not past fiscal policies were socially optimal is still a matter of debate. While there is a vast literature trying to explain the suboptimality of procyclical policies with political economy and capital market frictions (Talvi and Végh, 2005; Tornell and Lane, 1999), some authors have recently argued that procyclical responses were optimal in the context of countercyclical sovereign spreads (Cuadra, Sanchez, and Sapriza, 2010; Hatchondo, Martinez, and Roch, 2012).
for output (conditional on the exogenous path of the foreign variables) and on standard assumptions about the output elasticity of noncommodity revenues. Commodity-related revenues, in turn, are projected based on the exogenously determined path of the relevant commodity prices. On the expenditure side, we consider alternative responses—both neutral and countercyclical (explained in detail later)—to the negative shock. This approach allows us to better assess the impact of different components of the primary balance (commodity revenues, revenues linked to economic activity, and expenditure). Finally, as stated earlier, the primary balance enters the growth equation, so our approach incorporates the feedback effects of different fiscal responses on output.

**Sovereign Spreads Module**

A sovereign spread equation—one of the variables that determine debt dynamics—is estimated separately since the availability of data is significantly more limited (starting only after 1998, and varying by country) than in the case of other variables included in the model. The spread equation includes key macroeconomic fundamentals and exogenous global variables:

\[
\Delta s_{it} = \beta_{t,0} + \sum \beta_i \Delta s_{i,t-1} + \sum \gamma_i \Delta x_{i,t} + \varepsilon_{i,t},
\]

(6.9)

where \( \varepsilon_{i,t} = (p d_{i,t}, p b_{i,t}, p d_{i,t}^j, e d_{i,t}, c a_{i,t}, f x r_{i,t}, \ln r_{i,t}) \) is a vector of potential predetermined and exogenous variables, which are expected to have a similar impact across countries, and \( x_{i,t} = (v i x_{i,t}, \ln p_{i,t}^w) \) is a vector of predetermined and exogenous variables with different effects across countries. We consider three different estimation methods: ordinary least squares (without constant), panel with fixed effects, and panel with random effects.

Of the country fundamentals considered, only the level of public debt, international reserves, and the real exchange rate appear to have a statistically significant role. Of the exogenous variables considered, only the VIX produces statistically significant and robust results, with important differences across idiosyncratic coefficients. Surprisingly, commodity prices do not appear to be important, perhaps because of their close correlation with the VIX and the fact that the real exchange rate captures much of the impact of changes in trade prices.

As before, our interest resides primarily in the forecast properties of the model, especially during bad external scenarios. Thus, we choose a specification that displays good forecasting performance both for crisis periods and for subsequent normal times. We do this by evaluating the out-of-sample forecasting accuracy of the different specifications and estimation methods for the period from June 2008 to December 2012.

---

26Sufficiently long series of Emerging Market Bond Index spreads are not available for Bolivia and Paraguay. In these cases, sovereign spreads are modeled using the average coefficients of the other countries of the region.
GLOBAL SCENARIOS

This section first focuses on debt dynamics under baseline global assumptions (that is, the latest WEO projections). Then, we study how debt sustainability in the region would change under four alternative (adverse) global scenarios, each defined by exogenously determined paths for the exogenous variables. We explore two scenarios of temporary shocks and two others where shocks have more permanent effects. A brief characterization of each scenario is outlined below.

Scenario 1: Temporary Financial Shock

This scenario entails a temporary “pure” financial shock, reflected in a spike of the VIX in 2013 of similar magnitude to the one observed after the Lehman event, with the VIX returning to baseline levels in 2014. Real variables, such as global growth and commodity prices, are assumed to remain unchanged at baseline levels. While the latter is a strong assumption, it is meant to allow the scenario to capture the effect of a shock that is mostly financial.

Scenario 2: Temporary Real Shock

This scenario assumes a temporary global recession, with lower growth and commodity prices during 2013–14, returning to the baseline path afterward. This scenario can be characterized as a backdrop against which global uncertainties remain somewhat elevated for some time—leading to a global economic slowdown, but no crisis—but are eventually resolved.

Scenario 3: A Protracted Global Slowdown

This scenario entails a relatively high level of uncertainty (as reflected by current levels of the VIX), lower commodity prices, and lower global growth (all relative to the baseline). The scenario does not assume abrupt changes, but rather protracted weakness in real global variables.

---

27 The analysis leaves aside any issue related to possible changes in the (currency or maturity) composition of public and external debt following a shock, as these would require a much stronger set of behavioral assumptions.

28 A detailed description and the path of external variables, both under the baseline and alternative scenarios, are presented in Table 6.1 and Figure 6.6. It is worth noting that the analysis does not consider adverse scenarios that are country-specific in nature. For example, shocks stemming from large neighbors (for example, Brazil) could be an additional relevant shock (not studied here) for several Southern Cone Common Market (Mercosur) members (Argentina, Uruguay, and Paraguay). See Adler and Sosa (2014).
Scenario 4: A Tail Event

In contrast to scenario 3, this is an extreme event meant to study the implications of a crisis with an impact on global variables (VIX, global GDP growth, and commodity prices) of magnitudes similar to those observed after the Lehman event. Unlike that episode—which displayed a quick rebound of commodity prices, and, to a lesser extent, global growth—this scenario assumes that a new Lehman-like event would have more protracted effects on the global economy, as fiscal and monetary space in advanced economies is today much more limited than in 2008.

Main Assumptions

For each of these scenarios, a path of global exogenous variables is assumed (Table 6.1 and Figure 6.6). These variables include global growth, the VIX index, the 10-year U.S. Treasury bond interest rate, and commodity prices (food, energy and metals). Some general assumptions on the extent of non-debt-creating capital inflows and on reserve accumulation are also made in order to fully specify the set of exogenous variables.

The VAR model (together with the spread equation) and the debt motion equations capture the key linkages between domestic and external variables. To fully determine the dynamics of debt ratios, however, a few assumptions on domestic policy are also necessary. These include (1) the output elasticity of non-commodity fiscal revenue; (2) real public expenditure policy; and (3) the extent of reserve accumulation.29 Table 6.2 details these key assumptions under each of the four alternative scenarios.

The assumptions on real expenditure growth deserve special attention as they determine the degree of cyclicality of the fiscal stance, given the endogeneity of the other components of the primary balance.30 For each scenario we study three different expenditure rules:

1. **Baseline fiscal policies.** In this case, real expenditure growth behaves as in the baseline projection, regardless of the scenario under consideration. The idea is to focus on the “pure” impact of changing external conditions, maintaining policies unchanged.

2. **Neutral fiscal policy.** Fiscal policy is likely to react to negative external shocks, so we consider an expenditure rule that implies a broadly neutral stance—that is, expenditure growing at potential GDP growth rates under

---

29 The assumption about the accumulation of reserves is needed to determine the path of sovereign spreads.

30 Commodity revenues are assumed to vary primarily with commodity prices, while noncommodity revenues vary with nominal GDP as the elasticity of noncommodity revenues to output is assumed to equal one. While this elasticity may deviate from one at times—including because of possible revenue measures—the evidence suggests that, over the past decade, it has indeed been close to one on average (Annex Figure A6.2).
## TABLE 6.1

### Key Global Assumptions under Alternative Scenarios

<table>
<thead>
<tr>
<th>Global Assumptions</th>
<th>Baseline (BL) (2013–17 average)</th>
<th>Scenarios</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>G8+China GDP Growth</strong> (percent)</td>
<td>3.6</td>
<td>BL</td>
<td>2013: BL – 1.5%</td>
<td>BL + 4 pts</td>
<td>2013: Lehman-like</td>
<td>2014–17: BL – 1%</td>
</tr>
<tr>
<td><strong>VIX (points)</strong></td>
<td>17</td>
<td>2013: Lehman-like</td>
<td>BL</td>
<td>2013: Lehman-like</td>
<td>2014–17: BL + 2pts</td>
<td></td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td>–10</td>
<td>BL</td>
<td>2013: BL – 10%</td>
<td>BL – 7%</td>
<td>2013: BL – 15%</td>
<td>2014–17: BL – 5%</td>
</tr>
<tr>
<td><strong>Commodity Prices</strong></td>
<td>–8</td>
<td>√</td>
<td>2013: BL – 20%</td>
<td>BL – 15%</td>
<td>2013: BL – 35%</td>
<td>2014–17: BL – 10%</td>
</tr>
<tr>
<td><strong>Nondebt Flows</strong></td>
<td>By country</td>
<td>√</td>
<td>BL</td>
<td>BL × 0.7</td>
<td>2013: BL + 2008–09 change</td>
<td>2014–17: BL × 0.8</td>
</tr>
</tbody>
</table>

Source: Authors’ assumptions.

1 Temporary financial shock affecting 2013 only. Financial variables return to projected path under the baseline in 2014.

2 Temporary real shock (commodity prices and world growth) in 2013–14. Variables return to projected path under the baseline in 2015.

3 Global slowdown over the whole forecast horizon.

4 Lehman-like event in 2013–14, with protracted impact on global growth, commodity prices, and the VIX.

5 Relative to 2012 level.

6 As projected by IMF country desks for each country.

7 Reported gap vis-à-vis baseline is reached by end-2013. Prices recover gradually afterward to reach baseline by end-2014.

8 Reported gap vis-à-vis baseline is reached by 2013-Q2. Prices recover gradually afterward to reach new path by end-2014.
Figure 6.6  Global Variables under Alternative Scenarios

Sources: IMF, International Financial Statistics; and authors’ estimations.
TABLE 6.2

Key Domestic Policy Assumptions under Alternative Scenarios

<table>
<thead>
<tr>
<th>Policy Assumptions</th>
<th>Scenarios</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline (BL) (2013–17 average)</td>
<td>Financial Shock¹</td>
<td>Global Recession²</td>
<td>Protracted Global Slowdown³</td>
<td>Tail Event⁴</td>
</tr>
<tr>
<td>Noncommodity Revenue Elasticity to Output</td>
<td>BL³</td>
<td>BL</td>
<td>BL</td>
<td>BL</td>
<td>BL</td>
</tr>
<tr>
<td>Reserve Accumulation (percent of GDP)</td>
<td>BL⁵</td>
<td>BL</td>
<td>BL</td>
<td>0</td>
<td>2013–14: –2.0</td>
</tr>
<tr>
<td></td>
<td>2014–17: 0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ assumptions.

¹Temporary financial shock affecting 2013 only. Financial variables return to projected path under the baseline in 2014.
²Temporary real shock (commodity prices and world growth) in 2013–14. Variables return to projected path under the baseline in 2015.
³Global slowdown over the whole forecast horizon.
⁴Lehman-like event in 2013–14, with protracted impact on global growth, commodity prices and VIX.
⁵As projected by IMF country desks for each country.

Each of the four scenarios, thus only allowing for automatic stabilizers to operate.³¹

(3) Countercyclical fiscal policy. This considers the possibility of countercyclical policies beyond the effect of automatic stabilizers. To make policies comparable across countries, we specify a simple rule such that, in each scenario, expenditure growth above the potential GDP growth rate by a margin that is proportional (one-to-one) to the gap between actual and potential GDP growth.

Exploring these alternative rules allows us to assess the extent to which, under each of the negative external scenarios, fiscal buffers are large enough to respond by deploying countercyclical fiscal policy, fiscal buffers are just large enough to allow automatic stabilizers to work, or there is no fiscal space for stimulus and a fiscal tightening is necessary to ensure debt sustainability. The assessment focuses on sustainability, leaving aside risks related to possible financing (that is, liquidity) shocks. It is important to stress that for countries with well-established fiscal rules (for example, Brazil, Chile, Mexico), the reported dynamics under the different

³¹An exception to this rule is introduced in cases where IMF baseline projections for 2013–14 assume expenditure growth above potential GDP growth. In these cases, we assume expenditure growth equals the baseline projections in order to avoid a situation in which fiscal policy is more expansionary in the baseline than in the negative scenario. This exception also recognizes the fact that IMF country desks (and their projections) may have specific information about expenditure plans already in the pipeline.
scenarios should be interpreted as an illustration of how fiscal variables would behave in the event of a temporary deviation from the existing rules and, as such, of the magnitude of the fiscal adjustments that would be required to return to the target under the corresponding rule after the shock.

**LATIN AMERICA’S AGGREGATE RESULTS**

**Baseline Projections**

We first examine the projected trajectories of public and external debt under the baseline, with the path of global variables as in the September 2012 *World Economic Outlook* (IMF, 2012c). The dynamics under the baseline shed light on the region’s debt sustainability in the absence of unexpected foreign shocks. They also play a role in assessing debt sustainability under the alternative scenarios, as projected debt ratios are computed by adding to the WEO baseline the estimated impact of changes in external conditions. The latter is computed as the difference between the debt projection under each VAR scenario forecast and the projection under the VAR baseline forecast. By focusing on the “marginal” impact of changes in global conditions on the WEO’s baseline projection, this approach ensures that country-specific information embedded in that projection—such as revenue measures or investment plans already in the pipeline—is incorporated in the scenario projections, as shown in equation (6.10):

\[
\frac{d_t|\text{Scenario}_i}{d_t|\text{WEO Baseline}} + (d_t|\text{VAR Forecast Scenario}_i - d_t|\text{VAR Forecast Baseline}).
\]

Under the baseline, both public and external debt ratios are, on average, expected to decline only slightly (less than 2 percentage points of GDP) through 2017, continuing with the trend observed since 2009 (Figure 6.7). In the case of public debt, commodity-related revenues will continue to be a major factor pushing debt down, although they will be mostly offset by the continuation of non-commodity primary deficits. With (noninterest) current accounts broadly balanced on average, Latin America’s external debt dynamics will be largely determined by the offsetting forces of still large nondebt-creating capital inflows (foreign direct investment and equity portfolio flows) and further foreign asset accumulation.

**Alternative Downside Scenarios**

This section analyzes the results across different scenarios, considering both baseline policies—to identify the “pure” impact of changes in external conditions, maintaining expenditure policy unchanged—as well as policies that entail a neutral stance or a countercyclical fiscal stance.

---

32 VAR-estimated baseline projections are those resulting from the use of the VAR model under WEO baseline global assumptions. These may differ from the IMF country desks’ WEO baseline projections.
Figure 6.7  Latin America, Factors Driving Public and External Debt Dynamics under Alternative Global Scenarios (Contributions to change in debt-to-GDP ratio, in percent of GDP)

Sources: IMF, International Financial Statistics; and authors’ estimations.
Note: Simple average for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay, and Venezuela.
1 IMF country desk projections (based on WEO baseline assumptions).
2 Based on differential between VAR forecast and VAR baseline. Bars denote the contribution of each factor to the deviation of the debt ratios from baseline.
3 Deviation in percent of baseline.

Baseline Policies

The results suggest a generally limited impact of temporary negative external shocks (either financial or real, as depicted by scenarios 1 and 2) both on public and external debt (Figure 6.7). A temporary financial shock (scenario 1) would lead to an increase of public debt of about 7 percentage points of GDP by 2017 (relative to the baseline), with most of the impact arising from the deterioration in economic activity and the associated weakening of primary balances, reinforced by the effect of the real depreciation in countries with foreign-currency-denominated debt. A temporary real shock (scenario 2) would have a much more muted impact on public debt. Transitory shocks would not have visible effects on external debt.
dynamics. In the case of a financial shock (scenario 1) the effects of the associated real depreciation and rise in external interest rates (due to an increase in spreads) would be non-negligible, but they would be fully offset by the projected current account adjustment that would accompany this shock. Interestingly, the sharp increase in sovereign spreads under scenario 1 (Figure 6.7, lower panel) would induce only a mild effect on average interest rates—and thus on debt dynamics—as a result of the relatively low levels of short-term debt.

However, the impact of more persistent shocks to foreign variables (scenarios 3 and 4) on public debt trajectories would be significantly higher. Under scenario 4, public debt would increase on average by 20 percentage points of GDP (to about 55 percent) by 2017 due to the combination of a sharp decline in output and the associated weakening of noncommodity primary balances, considerably lower commodity revenues, and a non-negligible effect stemming from the real depreciation. External debt, on the other hand, would remain at manageable levels under these scenarios, with increases of only 5–6 percentage points of GDP by 2017—mainly reflecting lower growth, the effects of real depreciations, and a likely drop in non-debt capital inflows, offset partially by projected current account improvements.

**Active (Neutral and Countercyclical) Policies**

If authorities were to respond to the negative shocks of scenarios 1 and 2 by implementing either neutral or countercyclical policies (as defined earlier), the impact on public debt levels would be more pronounced. Public debt would reach 47 percent of GDP (52 percent) by 2017 in case of a neutral (countercyclical) policy response under scenario 1, and 42 percent of GDP (45 percent) in case of a neutral (countercyclical) policy response under scenario 2 (Figure 6.8, upper panel).
While representing a sizable impact, these levels do not appear to be particularly worrisome, especially given that primary balances would deteriorate only marginally and would not need to be adjusted significantly to keep public debt on a sustainable path. These scenarios would not entail a significant impact on external debt paths even under active policies.

Interestingly, under scenario 3, the debt trajectory associated with a countercyclical fiscal policy response would be very similar to the one resulting from a policy reaction that is essentially neutral. This reflects the fact that this scenario would imply not only a decline in actual GDP growth but also in potential growth. Thus, the output gap—measured relative to the new potential—would be rather small (Figure 6.7, lower panel), and so would be the scope for expansionary fiscal policy. It is also worth highlighting that, if authorities were to fail to recognize that under this scenario the new potential growth rate is lower than previously estimated, what may be intended as a neutral stance would, in fact, be stimulative and would lead to a worsening of the primary balance and thus public debt dynamics.

Under scenario 4, there would be more scope for expansionary countercyclical policies, as output would fall significantly below (the new lower) potential levels. Both a neutral policy response—allowing automatic stabilizers to operate—and a countercyclical response would lead to substantial increases in public debt (of more than 20 and 30 percentage points of GDP by 2017, relative to the baseline, respectively). These increases would bring public debt ratios to levels (66 percent of GDP in the case of a countercyclical policy response) that might raise concerns about fiscal sustainability, especially in countries where the required adjustment in the primary balance to stabilize debt ratios would be large.

Finally, external debt would increase to about 35 percent of GDP in the face of more persistent negative external shocks (scenarios 3 and 4), irrespective of policies. As discussed earlier, this partly reflects the fact that current accounts in Latin America tend to improve after negative external (financial) shocks.

COUNTRY-SPECIFIC RESULTS

The regional averages discussed in the previous section, however, mask some important differences across countries (Figures 6.9 and 6.10).

Baseline Projections

Under baseline external conditions, public debt ratios will continue to decline moderately in most countries (Brazil and Uruguay, starting from higher initial levels, would experience the largest decreases), with primary balance gaps generally improving. A notable exception is Venezuela, where debt is projected to increase by 30 percentage points of GDP, reaching 80 percent of GDP, by 2017.33

33In a few countries (mainly Argentina, Chile, Ecuador, Mexico, and Venezuela), this baseline already projects fiscal consolidation to varying degrees. If such projections were to not materialize, debt dynamics would worsen both under this baseline and the alternative scenarios (by construction).
External debt, in turn, is projected to remain broadly stable in most countries under the baseline external scenario.

**Alternative Downside Scenarios**

Most countries in the region should be in a position to undertake an expansionary countercyclical policy response in the event of temporary shocks (scenarios 1 and 2) without raising debt sustainability concerns (that is, high debt and primary gap levels). An exception would be Venezuela, which would likely have limited or no scope for countercyclical policy, reflecting the combination of relatively weak initial positions and high sensitivity to these shocks (that could rapidly lead to large deficits).

In case of external shocks with more protracted effects (scenarios 3 and 4), countries can be classified into three different groups based on the extent of fiscal...
buffers to implement either neutral or countercyclical fiscal policy responses (Figure 6.9).

The first group of countries (Argentina and Venezuela) would likely need to undertake sizable fiscal consolidation in the face of adverse shocks, including (although to a lesser extent) moderate shocks, to keep public debt on a sustainable path.\footnote{In these two cases, results should be interpreted with caution, as important structural changes in the past decade may have affected the econometric results regarding the impact of external shocks on domestic variables. On the one hand, these countries have moved toward less international financial integration, possible making them less vulnerable to global financial shocks. On the other hand, their dependence on commodity exports has increased, thus making them more vulnerable to commodity price shocks. While it is difficult to point to a specific direction of the possible estimation bias, evidence of the impact of the 2008–09 crisis on domestic output suggests that these countries are still highly sensitive to external shocks.}

\section*{Figure 6.10 Key External Indicators under Different Scenarios (Percent of GDP)}

Source: Authors’ estimates.

Note: Series indicate the path of external debt and noninterest current account balance gap from 2012 to 2017 for each country. Solid lines denote path under neutral policies. Dotted lines correspond to countercyclical policies. ARG = Argentina; BOL = Bolivia; BRA = Brazil; CHL = Chile; COL = Colombia; ECU = Ecuador; MEX = Mexico; PAR = Paraguay; PER = Peru; URY = Uruguay; VEN = Venezuela.

\footnote{Noninterest current account (NICA) balance at year t minus debt-stabilizing NICA balance at 2017, as defined in the IMF Debt Sustainability Analysis framework.}
The second group (Brazil, Mexico, Uruguay, and to a lesser extent Ecuador) has public debt dynamics that would be less vulnerable to moderate shocks, although still significantly sensitive to tail events. In particular, this group should be in a position to deal with a moderate deterioration of the external environment (scenario 3), although debt ratios could reach levels (ranging from 55 percent of GDP to 65 percent of GDP) that, while manageable, would be relatively high for emerging market standards, and could make these countries vulnerable to possible subsequent adverse shocks.35

Under a more severe event (scenario 4), the scope for implementing a countercyclical policy response (and to some extent even for neutral policies) without raising concerns about debt sustainability would be limited for this second group of countries, as indicated by the sharp deterioration in debt levels and/or primary balance gaps.36 In countries with well-established fiscal rules (Brazil, Mexico), adherence to the rule following a temporary deviation at the time of the adverse shock would, of course, ensure that public debt remains on a sustainable path. In some cases, however, returning to the fiscal targets under the rule could entail significant fiscal consolidation.37

Finally, a third group of countries (Bolivia, Chile, Colombia, Paraguay, and Peru), to varying degrees, appears to be in a position to weather a marked worsening of external conditions—even undertaking countercyclical policies—without jeopardizing fiscal solvency. Peru appears to exhibit the strongest position, even under the described extreme circumstances. In Chile and Paraguay, under scenario 4 and assuming countercyclical policies, both the primary balance gap and debt ratios could increase significantly, but debt would still remain at relatively moderate levels.38 Colombia, with debt levels reaching over 50 percent of GDP and the primary balance gap at −4 percent of GDP, appears to exhibit a somewhat less solid fiscal position, though those figures should not raise concerns about fiscal solvency.

On the external front, even under the more extreme scenarios (3 and 4) countries in the region would be in a position to keep external sustainability under check (Figure 6.10).39 In fact, under both scenarios (and even assuming active policy responses) debt levels would remain moderate, and current account balance gaps would be either closed or positive. A key factor driving this result—as noted earlier—is the fact that current accounts tend to improve in the face of large negative external shocks (especially financial ones).

35 Furthermore, in the cases of Ecuador and Mexico, the baseline already assumes a path of fiscal consolidation (with public expenditure growing below potential GDP growth). If such consolidation were not to take place, debt dynamics would worsen both under the baseline and the alternative scenarios.
36 For instance, countercyclical responses would lead to a sizable jump in debt ratios to substantially high levels in Brazil, a sharp deterioration of the primary balance gap in Ecuador, or a combination of both in Mexico and Uruguay.
37 As indicated earlier, the focus of this chapter is on the sustainability impact of external shocks, leaving aside the desirability of larger buffers to guard against possible idiosyncratic shocks. The latter could be of particular importance in resource-rich economies (for example, Bolivia and Ecuador). For a further discussion of these issues, see IMF (2012b).
38 The fiscal position in Chile is further strengthened by the substantial stock of foreign assets in sovereign funds (about 11 percent of GDP in 2012).
39 An exception is Venezuela, where external sustainability concerns could be raised in case of a tail event.
CONCLUSIONS

Latin America experienced a sharp improvement in key macroeconomic fundamentals over the past decade, although these gains were to some extent the result of a highly favorable external environment. With prospects of less-favorable conditions going forward, the region’s fundamentals may change drastically. This chapter proposed a simple framework to undertake debt sustainability analysis focusing on the impact of changes in external variables. Using this framework, the chapter examined what public and external debt sustainability indicators (both in terms of stocks and flows) would look like under alternative negative external scenarios. The results are used to assess whether current levels of policy buffers (especially fiscal) in the region are adequate to withstand a deterioration of the global environment.

The main results indicate that while external sustainability does not appear to be a source of concern for Latin America in general, fiscal space to deal with a protracted deterioration of the external environment may still be limited in several countries. These results suggest that the region would benefit from strengthening buffers further, while favorable conditions last, to be in a position to actively use fiscal policy should the external environment deteriorate markedly.

There are, however, some important differences across countries. Three groups can be identified according to their degrees of fiscal space to deal with negative external shocks:

(1) Argentina and Venezuela, which would have to deal with tight fiscal constraints even in the face of relatively moderate shocks, likely precluding the deployment of countercyclical policy;

(2) Brazil, Mexico, Uruguay, and to a lesser extent Ecuador, which would have some space to run countercyclical fiscal policy but would benefit from building in further space in order to be able to respond actively without raising concerns about fiscal sustainability or requiring large subsequent fiscal consolidations, especially under severe scenarios; and

(3) Bolivia, Chile, Paraguay, Peru, and to a lesser extent Colombia, which appear at present to be in a position to weather sizable shocks with countercyclical policies without compromising debt sustainability.
ANNEX 6.1. FACTORS DRIVING PUBLIC AND EXTERNAL DEBT DYNAMICS BY COUNTRY, 2003–12

Figure A6.1 Factors Driving Public Debt Dynamics (Cumulative contributions, percent of GDP)

Sources: IMF; International Financial Statistics; IMF country desks; and authors’ calculations.

Note: Main factors driving public debt dynamics are as identified in the IMF’s debt sustainability analysis framework.
Figure A6.2 Components of Primary Balance Dynamics *(Index, 2003 = 100 unless otherwise stated, in real terms)*

Sources: IMF, International Financial Statistics; and authors’ calculations.

Note: Calculated using GDP deflator for all series. Data on commodity-related revenues for Ecuador, Mexico, and Venezuela (Chile) are available from 2000 (2005).

1 Expenditure base year equals percent of revenues in that year.
2 Based on projected growth for 2015–17.
Figure A6.3 Factors Driving Primary Balance Dynamics (Cumulative contributions, percent of GDP)

Sources: IMF, International Financial Statistics; IMF country desks; and authors’ calculations.
**Figure A6.4** Factors Driving External Debt Dynamics (Cumulative contributions, percent of GDP)

Sources: IMF, International Financial Statistics; IMF country desks; and authors’ calculations.

Note: Main factors driving public debt dynamics are as identified in the IMF’s debt sustainability analysis framework.

**REFERENCES**


Cherif, R., and F. Hasenow, 2012, “Public Debt Dynamics: The Effects of Austerity, Inflation,
DC.
_____, 2009, “How Large are the Effects of Tax Changes?” NBER Working Paper No. 15303
Research.
International Monetary Fund (IMF), 2002, “Assessing Sustainability,” Policy Development and
____ _, 2005, “Information Note on Modifications to the Fund’s Debt Sustainability
Assessment Framework for Market Access Countries,” Policy Development and Review
Analysis,” Fiscal Affairs Department and the Strategy, Policy, and Review Department,
____ _, 2012a, Regional Economic Outlook: Western Hemisphere—Rebuilding Strength and
Flexibility, World Economic and Financial Surveys, Washington, DC, April.
____ _, 2012b, “Macroeconomic Policy Frameworks for Resource-Rich Developing Countries,”
____ _, 2012c, World Economic Outlook, World Economic and Financial Surveys, Washington,
DC, September.
DC: Inter-American Development Bank.
Izquierdo, A., E. Talvi, L. Catão, E. A. Cavallo, and A. Powell, 2008, All that Glitters May Not
Be Gold. Assessing Latin America’s Recent Macroeconomic Performance. Washington,
DC: Inter-American Development Bank.
Osterholm, P., and J. Zettelmeyer, 2008, “The Effect of External Conditions on Growth in
Autoregression Approach for Brazil, Mexico, and Turkey,” IMF Staff Papers 55(1): 149–82.
CHAPTER 7

Has Fiscal Policy Become Less Procyclical in Latin America?

ALEXANDER KLEMM

Fiscal policy in Latin America has been procyclical for many decades. The easy availability of funds during periods of economic expansion, against a backdrop of major social and infrastructure needs, has repeatedly prompted rapid increases in government expenditure. But spending often has had to be cut sharply later when economies have fallen into recession or faced a sudden stop of capital inflows. This procyclicality has been empirically documented in a growing literature that started in the late 1990s with Gavin and Perotti (1997). With very few exceptions, studies have found evidence of procyclical fiscal policy in developing and emerging market economies, and especially in Latin America.

However, given the improvements in macroeconomic performance and policy frameworks of many Latin American countries over the past decade, this chapter studies whether fiscal policy has become less procyclical in recent years. In assessing cyclicity, the analysis uses a broader measure of fiscal policy that gives credit for automatic stabilizers and controls for commodity prices. The measure is applied to a large sample of both emerging market and advanced economies. The panel data estimates also take account of the endogeneity of the output gap or growth using instrumental variable approaches, as these are affected by fiscal policy through the multiplier.

Consistent with previous studies, the analysis finds evidence suggesting countercyclical fiscal policy in advanced economies and, generally, procyclical policy in Latin America. For a broader sample of emerging market economies, the evidence is less clear. However, the results are very sensitive to specifications, making it hard to draw firm conclusions. A more detailed analysis of Latin American countries shows that, while many countries appear to have procyclical policy, country-specific empirical estimates typically lack statistical significance. However, the analysis finds that key countries in the region—Brazil, Chile, Colombia, El Salvador, and Mexico—have moved toward less procyclical policy since 2005.

While the focus of this chapter is on the cyclicity of fiscal policy, it should not be forgotten that this is just one aspect of fiscal policy. Other aspects—such as having to deal with a sudden financing constraint or having to reduce debt toward a sustainable level—may trump cyclicity concerns. This would happen even in the absence of uncertainty about the true output gap, which poses
additional policy challenges. Hence finding that a country implemented procyclical policy does not mean that it did not take the best possible course of action, given its particular circumstances.

This chapter first covers methodological issues, including the definition of cyclical fiscal policy and the treatment of commodity and asset price shocks and changes in the composition of GDP. It then provides a brief review of existing studies, categorizing them by their explicit or implicit definition of procyclical fiscal policy. The chapter then describes the data used, including a new commodity price index, and presents the empirical results, including panel data regressions for advanced and emerging market economies and a more detailed analysis of Latin America based on country-by-country regressions. This is followed by a brief discussion of issues related to the quality of fiscal policy and then conclusions.

METHODOLOGY

The idea behind countercyclical fiscal policy is simple: fiscal policy should be tighter during booms and looser during recessions. To test for this empirically, previous studies have either looked at correlations between fiscal and macroeconomic variables or used a regression approach, which allows further controls. The typical regression relates the change in (a measure of) the fiscal balance to the output gap and a few additional variables:

\[
\frac{\Delta B}{Y} = \beta_0 + \beta_1 \left( \frac{Y - Y'}{Y'} \right) + \beta_2 \frac{B}{Y_{t-1}} + \gamma' x + \epsilon_t \]

where \( B \) is the fiscal balance, \( Y \) is nominal GDP, \( Y' \) is potential GDP, \( x \) is a vector of other control variables, \( \epsilon_t \) is a country-fixed effect (which may be added in case of estimation on panel data), and \( \epsilon \) is an error term. Variants in the literature include using real GDP growth instead of the output gap as a regressor, and focusing on government revenues or expenditures instead of a fiscal balance.

Table 7.1 presents a summary of key studies and their approaches. In these studies, the estimated coefficient on the output gap (\( \beta_1 \)) is the main indicator of the cyclical stance of policy. A negative coefficient is evidence of procyclical policy, as it suggests that the fiscal stance is relaxed in a boom. Conversely, a positive coefficient implies countercyclical policy. With an insignificant coefficient, acyclical fiscal policy cannot be rejected against the alternative hypotheses of procyclical or countercyclical fiscal policies.

When estimating this type of regression, three main issues have to be addressed:

- The estimation and endogeneity of the output gap
- The definition of the cyclical stance
- Other major influences on the fiscal balance, such as commodity-related revenues.

©International Monetary Fund. Not for Redistribution
<table>
<thead>
<tr>
<th>Study</th>
<th>Method</th>
<th>Finding 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catao and Sutton (2002)</td>
<td>Regression of change in fiscal balance on output gap</td>
<td>Most emerging markets procyclical</td>
</tr>
<tr>
<td>Céspedes and Velasco (2011)</td>
<td>Regression of change in fiscal balance on output gap and cyclical component of commodity prices</td>
<td>Diversity across countries; some developing economies have become more countercyclical</td>
</tr>
<tr>
<td>Daude, Melguizo, and Neut (2011)</td>
<td>Correlation between change in cyclically-adjusted primary balance and output gap</td>
<td>Most of Latin America procyclical</td>
</tr>
<tr>
<td>Di Bella (2009)</td>
<td>Regression of change in cyclically-adjusted primary balance on cyclically adjusted primary balance and debt rating during 2009 downturn</td>
<td>Economies with stronger fiscal positions and credit ratings more countercyclical</td>
</tr>
<tr>
<td>Egert (2012)</td>
<td>Regression of overall balance/cyclically adjusted primary balance (CAPB) on output gap/growth</td>
<td>European countries countercyclical (overall balance) or acyclical (CAPB)</td>
</tr>
<tr>
<td>Frankel, Végh, and Vuletin (2013)</td>
<td>Correlation between cyclical components of real government spending and GDP</td>
<td>Developing economies more procyclical than advanced, but less than in the past</td>
</tr>
<tr>
<td>Gali and Perotti (2003)</td>
<td>Regression of CAPB on output gap and debt</td>
<td>Some European countries countercyclical, not less than before European Monetary Union</td>
</tr>
<tr>
<td>Gavin and Perotti (1997)</td>
<td>Regression of change in fiscal balance/revenue/spending growth on GDP growth</td>
<td>Advanced economies countercyclical; Latin America procyclical</td>
</tr>
<tr>
<td>Ilzetzki and Végh (2008)</td>
<td>Regression of real spending on real GDP</td>
<td>Developing economies often procyclical</td>
</tr>
<tr>
<td>Jaimovich and Panizza (2007)</td>
<td>Regression of fiscal balance or spending on growth</td>
<td>Advanced economies countercyclical; developing ones indeterminate</td>
</tr>
<tr>
<td>Kaminsky, Reinhart, and Végh (2005)</td>
<td>Difference between spending growth in good and bad times; correlation between spending and growth</td>
<td>Most non-OECD and half of OECD countries procyclical</td>
</tr>
<tr>
<td>Lane (2003)</td>
<td>Regression of government spending on GDP</td>
<td>Procyclical policies more likely in economies with volatile output and dispersed political power</td>
</tr>
<tr>
<td>Lledo and others (2011)</td>
<td>Regression of government spending on GDP growth</td>
<td>Developing economies, especially in sub-Saharan Africa, procyclical</td>
</tr>
<tr>
<td>Talvi and Végh (2005)</td>
<td>Correlation between real output and government consumption/revenues</td>
<td>Developing economies procyclical</td>
</tr>
<tr>
<td>Végh and Vuletin (2012)</td>
<td>Regression of tax rates on cyclical component of real GDP</td>
<td>Tax policy acyclical in advanced economies; procyclical in developing economies</td>
</tr>
</tbody>
</table>

Source: Compiled by IMF staff.

1 Many papers have a different focus; the finding reported here is related to the cyclicality of fiscal policy.
Output Gap

Potential GDP and the output gap are estimated using traditional Hodrick-Prescott filters to ensure systematic treatment of all countries, and to avoid arbitrary adjustments based on varying information sets. This approach, however, raises several issues that are relevant for the analysis of the fiscal stance. First, output gap estimates change whenever new data become available, even if past data are not revised. Hence, when assessing fiscal policy at some point in the past, it is necessary to distinguish carefully between the intended and the resulting cyclical stance.\(^1\) Although the main interest here is to analyze the actual fiscal outturn, the analysis is complemented by looking at real-time data to compare outturns and intentions (Box 7.1). Second, the volatility of trend growth in emerging market economies makes it hard to distinguish between the trend and cyclical components of growth (Aguiar and Gopinath, 2007), and as result to assess the cyclical stance of fiscal policy. To deal with this issue, we complement our analysis by using commonly used alternative specifications for the output gap, such as actual real GDP growth. Finally, since the output gap is partly the result of fiscal policy, and since estimating the equation (7.1) using ordinary least squares would produce biased results, we also estimate our regressions applying an instrumental variable approach.

Cyclical Stance

Previous studies have used two approaches to measure the cyclical stance. Some have considered only discretionary policy actions—such as tax cuts or budget revisions—to delimit the cyclical stance. In practice this means using changes in the cyclically adjusted primary balance (or a structural balance) as the dependent variable of the regression. Other studies have taken all actual changes in the fiscal balance, whether owing to discretionary action or occurring automatically (for instance, because of rising revenues) when the economy performs better than expected.

This study proposes an innovative third approach. Specifically, it includes as part of the cyclical response of fiscal policy the automatic stabilizers that are an inherent part of the economy’s tax and welfare system, such as the additional revenues gained during a boom owing to a rising average tax rate under a progressive tax system, or the reduction in welfare spending as the unemployment rate drops.\(^2\) However, the analysis does not consider as a policy response (1) the additional revenues from taxing deviations of GDP from potential at an unchanged average tax rate, and (2) declines in spending ratios that are only the result of GDP exceeding potential.

The reason for adopting this approach is that ignoring the contribution of systematic automatic stabilizers could be misleading in the analysis of policy. For

---

1. See Beetsma and Giuliodori (2010), Bernoth and others (2008), Cimadomo (2012), and Forni and Momigliano (2004), who tend to find that intended policies have been less procyclical than actual ones.
2. Alternative definitions of automatic stabilizers are possible. These would include any increase in revenue, even at constant or falling tax rates as a stabilizer, for example if the starting assumption is an economy of lump-sum taxes. We use the more demanding definition of an automatic stabilizer that requires an increase in the revenue-to-GDP share, as would happen under a progressive tax schedule.
BOX 7.1 Comparing Actual and Intended Fiscal Policy

The intention of fiscal policy, based on output gap forecasts available at the time, could be different from the actual impact of fiscal policy. To check for this, regressions for this study were run on a historical output gap series using output gap estimates for a given year based on data available for the fall of the previous year. Past vintages of the IMF’s World Economic Outlook database were used to estimate the ex ante assumed output gap and intended fiscal stance. Key findings are summarized in Box Table 7.1.1.

### TABLE 7.1.1

<table>
<thead>
<tr>
<th>Country-Specific Regressions: Coefficients on the Output Gap “Forecasts” Under Alternative Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Argentina</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Belize</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Brazil</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Chile</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Colombia</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Guyana</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Honduras</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mexico</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Nicaragua</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Paraguay</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Peru</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Suriname</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Venezuela</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Note: Robust standard errors in parentheses. IV-1 uses the lagged output gap as an instrument, IV-2 the U.S. 1-year Treasury bill and the export-weighted growth rate of trading partners. The coefficient on the output gap is shown. All regressions also include a constant, the lagged adjusted primary balance, and the commodity price index. OLS = ordinary least squares.
example, when comparing the policy responses of two countries, noting a more active discretionary response in one of them but not reporting on the larger automatic stabilizers in the other would bias the assessment. Lesser reliance on discretionary measures could, in fact, be motivated by the presence of stronger automatic stabilizers, which reduces the need for policy action.

The definition strikes a balance between ignoring automatic stabilizers and counting all temporary revenue gains as a policy response. Empirically, it is implemented by using changes in an adjusted primary balance as the dependent variable. Specifically, the adjusted balance is defined as:

$$\left( \frac{B}{Y} \right) = \frac{B}{Y} + G \left( \frac{1}{Y} - \frac{1}{Y'} \right),$$  \hspace{1cm} (7.2)

where $G$ is government spending. The year-to-year difference in this adjusted balance will rise if the average tax rate goes up and/or spending grows less than potential GDP.\(^3\)

**The Role of GDP Composition and Commodity and Asset Prices**

Apart from the business cycle, tax revenues can also be strongly affected by the composition of GDP as well as commodity and asset prices.

\(^3\)Klemm (2014) also looks at primary expenditures (excluding transfer payments) as an alternative specification of the cyclical stance: $\Delta \left( \frac{G}{Y'} \right) = \beta_0 + \beta_1 \left( \frac{Y - Y'}{Y'} \right) + \beta_2 \left( \frac{G}{Y'} \right) + \gamma x + f + \epsilon$. While this measure has the advantage of avoiding the question of cyclical adjustments, it is only a valid measure to the extent that there is no policy change in the revenue side. The results were similar to, though somewhat weaker than, those obtained for the fiscal balance.
The composition of GDP can play a role, as not all components are equally taxed. Exports tend to be lightly taxed, while consumption is relatively heavily taxed. It is therefore conceivable that an export-driven economic boom leads to a fall in the revenue ratio, even in the absence of a tax cut. Reflecting this, Kaminsky, Reinhart, and Végh (2004) note that a discretionary countercyclical policy can be accompanied by a rising, steady, or falling fiscal balance as a share of GDP. On the other hand, one could argue that a falling effective average tax rate, even if due to changes in the composition of GDP, is in effect procyclical, even if not a result of discretionary policy. A government trying to maintain a countercyclical or even acyclical policy would have to take measures to undo such a fall in effective average tax rates. This would also be consistent with treating a rise in average tax rates that results from progressive tax systems as part of automatic stabilizers, as we have done above.

Asset and commodity prices may also boost revenues beyond what can be explained by real GDP growth. In the case of asset prices this occurs through wealth and transaction taxes. A rise in commodity prices will increase profits of exporters, which can boost revenues. Even greater is the effect in countries exporting natural resources, particularly where profits are highly taxed or where the government owns and operates these enterprises. In economies where commodities play an important role, it is therefore important to consider the cyclical part of commodity revenues, although this can be difficult to ascertain in practice. For example, in the event of a commodity price boom, it may not be clear which part of the revenue increase is structural (say, due to China's permanent rise in the world economy, or new oil extraction technology) and which part is temporary. A straightforward approach to separating cyclical and trend components would be to use filtering techniques, yet this has the strong drawback of assuming away any structural breaks in the series, and is therefore not used in our analysis.

In addition, even spending only the permanent revenue gains from structurally higher commodity prices is not necessarily acyclical. While there may not be an impediment from a fiscal sustainability perspective, spending the permanent revenue gains will still add to domestic demand, and would be procyclical if output is above potential. More generally, adjustment to permanent changes to commodity revenues may be countercyclical or procyclical, depending on the direction of the price change and the output gap.

Therefore, from the perspective of assessing the cyclicality of fiscal policy, the relevant question is not whether commodity-related changes in revenues are permanent or temporary, but whether their use increases or reduces economic cycles. To control for the effect of commodity prices on the fiscal balance, we propose including a country-specific commodity price index as a regressor, following

---

4Natural resources can also be seen as a national asset, the sales of which should be counted as a capital transaction, in which case only the real return on that asset should be thought of as revenue (Barnett and Ossowski, 2003).
Céspedes and Velasco (2011). The index is constructed as the change in commodity prices, weighted by the share of each exported commodity in GDP. Since the index is specific to each country it reflects the relevant dependence on commodities.

**Estimation**

The analysis also estimates country-specific and panel regressions. Given the ample evidence that fiscal policy affects economic growth and the output gap, we ensure that the estimation of equation (7.1) reflects the endogeneity of the output gap or growth rate. In the case of country-specific regressions, we use instrumental-variable regressions, with either the lagged output gap or the export-weighted growth rate of trading partners and the U.S. real interest rate as instruments. For panel regressions, we also report results using a system generalized method of moments (GMM) estimator proposed by Blundell and Bond (1998).

**DATA**

The main data source is the IMF’s World Economic Outlook (WEO) database. In addition, we use U.S. Treasury bill rates from the Federal Reserve Board, and trade and commodity price data from the UN Comtrade database. For resource-related fiscal revenues in Chile and Mexico, we use the IDB Fiscal Resources data set. The data set covers the period from 1980 to 2012, although actual data availability varies by country and variable. For the regressions based on real-time data, WEO vintages from 1990 through 2012 are used.

For the primary balance, we use our own calculations adding back interest expenditure to overall government net lending. The WEO also reports a primary balance, using the more accurate approach of also deducting interest receipts. This, however, reduces the sample size, as not all countries report such receipts. As interest receipts are typically small, we chose this approximation to have a larger sample size.7

For commodity prices, we use a newly-calculated price index, based on time-varying weights, lagged by $d$ periods:

$$P_{xit} = \sum_{j=1}^{f} \frac{x_{it-j+d}}{Y_{it-d}} \cdot P_{jt}$$

(7.3)

---

5 One approach would be to use a fiscal balance excluding commodity-related revenues. Unfortunately, this is available only for a few countries. Another simple alternative is to analyze spending rather than balances, which will be valid unless there are simultaneous structural revenue reforms.

6 An alternative approach is to use a vector autoregression (as do Ilzetzki and Végh, 2008), but this is more applicable for quarterly (or longer) data sets. Quarterly data are difficult to obtain and interpret, however, given that budgets are usually annual, and given the different choices by countries in terms of the extent to which fiscal accounts are prepared on an accrual versus a cash basis.

7 In the case of Brazil, where interest receipts are particularly high, we instead use net interest expenditure. Indeed, in the case of Brazil, the WEO reports net rather than gross interest spending.
where $i$ denotes countries, $j$ denotes commodities, $t$ denotes time, $P_{jt}$ is the logarithm of the price in U.S. dollars, and $x_{ij,td}$ are export values. This index allows us to take into account that the commodity export and import basket might change substantially over a long period, while ensuring that changes in the price index reflect changes in commodity prices rather than endogenous changes in export and import volumes in response to price fluctuations.

**FINDINGS**

**Panel Data Results**

Panel data estimates were conducted for a group comprised of 19 Latin American economies, a broader group covering 134 developing and emerging market economies, and a group of 32 advanced economies, allowing for different intercepts for each country, but imposing the same slope within a region. The regressions address the endogeneity issue, control for the effect of commodity prices, and allow alternative specifications (output gap versus growth rates).

The results (Table 7.2) suggest that fiscal policy in Latin America has been procyclical, as the coefficient on the output gap is negative and statistically significant, both in a standard within-group regression and in a GMM regression that allows for endogeneity. In contrast, the results for advanced economies show a positive and statistically significant coefficient, implying countercyclical fiscal policy. For a broad set of emerging market and developing economies, the evidence is unclear, with mostly insignificant findings. Results, however, are sensitive to the specification used. For example, if growth rates are used rather than output gap, all regressions turn insignificant (see bottom part of Table 7.2).

The coefficient on the commodity price is often significant and positive across all regions. This is in line with expectations, as the adjusted primary fiscal balance generally strengthens when commodity price growth is strong (unless countries spend more than their additional resource revenues). Despite the significance of the commodity price index, its introduction does not change the other coefficients very much, suggesting that any omitted variable bias from not including it could be limited.

---

8GMM estimates are presented with the standard specification tests: the Arrellano-Bond AR(1) test, which is expected to be rejected, and the AR(2) test and the test of over-identifying restrictions (Sergeant/Hansen test), which should both not be rejected. The specification tests of system GMM regressions are passed in all cases, except regression (3'), where the test of over-identifying restrictions rejects the validity of instruments with a p-value of 4 percent. However, as the result is in line with all other results on advanced economies, the rejection of this specification does not affect the overall interpretation.

9Alternative specifications of commodity price indicators—commodity prices weighted by total commodity exports instead of GDP, and commodity prices applied to net rather than gross commodity exports—yielded similar results (Klemm, 2014).
### TABLE 7.2
The Adjusted Fiscal Balance in Various Panel Data Estimates

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Advanced Economies</th>
<th>Emerging Market/Developing Economies</th>
<th>Latin America</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WG (1)</td>
<td>WG (2)</td>
<td>GMM (3)</td>
</tr>
<tr>
<td>Output gap</td>
<td>0.13** (0.06)</td>
<td>0.14** (0.06)</td>
<td>0.30*** (0.11)</td>
</tr>
<tr>
<td>Commodity price growth</td>
<td>0.56*** (0.07)</td>
<td>1.40*** (0.64)</td>
<td>0.55*** (0.17)</td>
</tr>
<tr>
<td>Adjusted deficit, t-1</td>
<td>-0.23*** (0.03)</td>
<td>-0.23*** (0.10)</td>
<td>0.04 (0.11)</td>
</tr>
<tr>
<td>Observations</td>
<td>791</td>
<td>760</td>
<td>760</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.22</td>
<td>0.27</td>
<td>0.27</td>
</tr>
<tr>
<td>Number of countries</td>
<td>33</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Estimation Method</th>
<th>WG (1')</th>
<th>WG (2')</th>
<th>GMM (3')</th>
<th>WG (4')</th>
<th>WG (5')</th>
<th>GMM (6')</th>
<th>WG (7')</th>
<th>WG (8')</th>
<th>GMM (9')</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth</td>
<td>0.27*** (0.04)</td>
<td>0.26*** (0.05)</td>
<td>0.34*** (0.09)</td>
<td>0.03* (0.02)</td>
<td>0.01 (0.03)</td>
<td>0.01 (0.04)</td>
<td>-0.07 (0.10)</td>
<td>-0.12 (0.12)</td>
<td>-0.17 (0.23)</td>
</tr>
<tr>
<td>Commodity price growth</td>
<td>0.49*** (0.12)</td>
<td>-0.49 (1.09)</td>
<td>0.55*** (0.07)</td>
<td>0.08 (1.17)</td>
<td>0.44*** (0.13)</td>
<td>0.87 (0.87)</td>
<td>-0.49*** (0.09)</td>
<td>-0.42*** (0.10)</td>
<td>-0.34* (0.19)</td>
</tr>
<tr>
<td>Adjusted deficit, t-1</td>
<td>-0.28*** (0.03)</td>
<td>-0.27*** (0.04)</td>
<td>-0.11 (0.10)</td>
<td>-0.58*** (0.11)</td>
<td>-0.58*** (0.14)</td>
<td>-0.72*** (0.15)</td>
<td>-0.49*** (0.09)</td>
<td>-0.42*** (0.10)</td>
<td>-0.34* (0.19)</td>
</tr>
<tr>
<td>Observations</td>
<td>791</td>
<td>760</td>
<td>760</td>
<td>2,568</td>
<td>2,036</td>
<td>2,036</td>
<td>355</td>
<td>333</td>
<td>333</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.22</td>
<td>0.27</td>
<td>0.27</td>
<td>0.30</td>
<td>0.40</td>
<td>0.26</td>
<td>0.26</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>Number of countries</td>
<td>33</td>
<td>32</td>
<td>32</td>
<td>146</td>
<td>134</td>
<td>134</td>
<td>20</td>
<td>19</td>
<td>19</td>
</tr>
</tbody>
</table>

Note: WG = within-group regression. Robust errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. System generalized methods of moments (GMM) regressions estimated with xtabond2. The output gap/growth and the lagged adjusted primary fiscal balance are treated as endogenous, using the first and second lag as instruments and the collapse option.
Country-Specific Results

Fiscal policy is likely to be run differently across countries, even within a region. Panel estimates, though common in the literature, can only give a first impression because they force the same cyclicity coefficient on all countries. Country-specific regressions were also estimated (using the same explanatory variables) for the 19 Latin American economies, applying an instrumental-variable approach with the lagged output gap as an instrument.

Table 7.3 presents results from country-by-country regressions of the adjusted fiscal balance for the period from 1990–2012. As before, these regressions include the lagged adjusted fiscal balance and the commodity price index, but to maintain readability only the coefficient on the output gap is reported. In addition to presenting ordinary least squares (OLS) results, we report two instrumental-variable specifications, as the system GMM approach cannot be used in pure time-series regressions. In the first of these instrumental-variable regressions the lagged output gap is used as an instrument. In the second approach the export-weighted GDP growth of trading partners and the U.S. one-year Treasury rate serve as instruments, as done in other papers in the literature. Finally, the table reports on regressions allowing a varying degree of cyclical over time, showing coefficients for the period before 2005 and the change to the coefficient afterward. In these regressions the output gap and the commodity price index were interacted with the time indicator. The year 2005 was chosen because panel regressions suggest this to be the year with the most significant change in coefficient, while for comparability a single year for all countries seemed useful.

What stands out from the first three columns of Table 7.3 is the very small number of statistically significant coefficients. This is a common though rarely mentioned feature of studies on fiscal policy cyclicality, many of which do not report tests of significance. Still, the coefficients for some countries show evidence of procyclical policy under both the OLS and instrumental-variable regressions. In other countries, such as Ecuador and Venezuela, the evidence for procyclical fiscal policy does not hold up in the instrumental-variable estimates. The coefficient is neither positive nor consistently statistically significant in any of the 19 countries. In other words, there is no significant evidence for countercyclical policy in any Latin American country. In summary, for most countries, acyclical policy cannot be rejected, although a mildly cyclical (with a coefficient close to zero) or erratic (with large standard errors) fiscal policy is also consistent with the evidence.10

The time-varying regressions offer further insights. Fiscal policy in Brazil,11 Chile, Colombia, El Salvador, and Mexico appears to have become less procyclical

---

10 Similar country-by-country analysis using the adjusted spending ratio shows even fewer statistically significant results (see Klemm, 2014).

11 In the case of Brazil, policy lending, which is not part of the fiscal balance but may affect the fiscal stance, has grown in importance. If net policy lending is added to the adjusted fiscal balance, the coefficient on the output gap interacted with the post-2005 dummy becomes larger, but as the standard error rises even more, turns insignificant.
Has Fiscal Policy Become Less Procyclical in Latin America?

TABLE 7.3

Country-Specific Regression: Coefficients on the Output Gap under Alternative Specifications

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>OLS</th>
<th>IV-1</th>
<th>IV-2</th>
<th>Pre-2005</th>
<th>Δ Since 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>–0.32***</td>
<td>–0.38**</td>
<td>–0.24</td>
<td>–0.26**</td>
<td>–0.36</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.15)</td>
<td>(0.19)</td>
<td>(0.11)</td>
<td>(0.67)</td>
</tr>
<tr>
<td>Belize</td>
<td>0.22</td>
<td>2.40</td>
<td>0.20</td>
<td>0.54</td>
<td>–0.53</td>
</tr>
<tr>
<td></td>
<td>(0.30)</td>
<td>(1.76)</td>
<td>(1.30)</td>
<td>(0.35)</td>
<td>(0.48)</td>
</tr>
<tr>
<td>Bolivia</td>
<td>–0.45</td>
<td>–0.21</td>
<td>–0.14</td>
<td>–0.41</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.38)</td>
<td>(1.00)</td>
<td>(1.02)</td>
<td>(0.43)</td>
<td>(1.12)</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.32</td>
<td>5.55</td>
<td>0.01</td>
<td>–0.16</td>
<td>0.74*</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(21.96)</td>
<td>(1.66)</td>
<td>(0.21)</td>
<td>(0.33)</td>
</tr>
<tr>
<td>Chile</td>
<td>0.27</td>
<td>–1.09</td>
<td>1.37*</td>
<td>0.00</td>
<td>0.90**</td>
</tr>
<tr>
<td></td>
<td>(0.26)</td>
<td>(1.21)</td>
<td>(0.69)</td>
<td>(0.17)</td>
<td>(0.34)</td>
</tr>
<tr>
<td>Colombia</td>
<td>–0.14</td>
<td>–0.50</td>
<td>0.14</td>
<td>–0.31</td>
<td>0.68*</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.45)</td>
<td>(0.33)</td>
<td>(0.24)</td>
<td>(0.38)</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>0.24</td>
<td>–0.77</td>
<td>0.97*</td>
<td>–0.35</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>(0.20)</td>
<td>(1.45)</td>
<td>(0.44)</td>
<td>(0.33)</td>
<td>(0.51)</td>
</tr>
<tr>
<td>Ecuador</td>
<td>–0.48**</td>
<td>0.60</td>
<td>0.97</td>
<td>–0.28</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(2.45)</td>
<td>(1.18)</td>
<td>(0.23)</td>
<td>(0.50)</td>
</tr>
<tr>
<td>El Salvador</td>
<td>0.30</td>
<td>–1.03</td>
<td>0.69***</td>
<td>–0.08</td>
<td>0.61*</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(2.90)</td>
<td>(0.22)</td>
<td>(0.24)</td>
<td>(0.32)</td>
</tr>
<tr>
<td>Guatemala</td>
<td>0.14</td>
<td>–0.75</td>
<td>0.58</td>
<td>–0.42</td>
<td>0.62</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(1.69)</td>
<td>(0.43)</td>
<td>(1.24)</td>
<td>(1.28)</td>
</tr>
<tr>
<td>Guyana</td>
<td>1.12***</td>
<td>–0.89</td>
<td>2.23</td>
<td>1.12</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>(0.23)</td>
<td>(6.46)</td>
<td>(4.86)</td>
<td>(0.83)</td>
<td>(0.83)</td>
</tr>
<tr>
<td>Honduras</td>
<td>0.21</td>
<td>0.18</td>
<td>0.54</td>
<td>1.51*</td>
<td>–1.42*</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.37)</td>
<td>(0.57)</td>
<td>(0.65)</td>
<td>(0.69)</td>
</tr>
<tr>
<td>Mexico</td>
<td>–0.21</td>
<td>0.43</td>
<td>0.53</td>
<td>–0.32**</td>
<td>0.46**</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.66)</td>
<td>(1.07)</td>
<td>(0.15)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>–0.33</td>
<td>–0.71</td>
<td>–0.24</td>
<td>–0.81**</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.61)</td>
<td>(0.32)</td>
<td>(0.29)</td>
<td>(0.45)</td>
</tr>
<tr>
<td>Paraguay</td>
<td>–0.07</td>
<td>4.98</td>
<td>0.10</td>
<td>–0.13</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>(0.13)</td>
<td>(35.75)</td>
<td>(0.24)</td>
<td>(0.25)</td>
<td>(0.29)</td>
</tr>
<tr>
<td>Peru</td>
<td>0.36</td>
<td>0.58*</td>
<td>1.32</td>
<td>0.20</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.29)</td>
<td>(0.28)</td>
<td>(0.99)</td>
<td>(0.57)</td>
<td>(0.53)</td>
</tr>
<tr>
<td>Suriname</td>
<td>–1.10</td>
<td>–9.85</td>
<td>–2.81</td>
<td>–1.26</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>(0.68)</td>
<td>(10.88)</td>
<td>(1.78)</td>
<td>(0.77)</td>
<td>(2.16)</td>
</tr>
<tr>
<td>Uruguay</td>
<td>–0.45***</td>
<td>–0.71***</td>
<td>–0.27</td>
<td>–0.46***</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.18)</td>
<td>(0.23)</td>
<td>(0.08)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>Venezuela</td>
<td>–0.60***</td>
<td>0.28</td>
<td>0.36</td>
<td>–0.54***</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.83)</td>
<td>(0.77)</td>
<td>(0.15)</td>
<td>(0.37)</td>
</tr>
</tbody>
</table>

Note: OLS = ordinary least squares. Robust standard errors in parentheses. IV-1 uses the lagged output gap as an instrument, IV-2 the U.S. 1-year Treasury bill and the export-weighted growth rate of trading partners. The coefficient on the output gap is shown. All regressions also include a constant, the lagged adjusted primary balance, and the commodity price index.

since 2005. Only Honduras appears to have become more procyclical. As the post-2004 period includes the global financial crisis and related fiscal stimulus, the next boom period will provide a test of whether more countercyclical policies will prevail. In most countries, the intended and actual impact of fiscal policy broadly coincided (for a fuller discussion see Box 7.1).
THE QUALITY OF FISCAL POLICY

As noted earlier, the cyclical stance of fiscal policy is only one dimension of its quality. A given fiscal stance could be achieved with many different underlying tax and expenditure policies. Hence, a move toward more countercyclical policy could be problematic if certain risks are not addressed.

Fiscal Sustainability

A countercyclical policy response—and in particular deficit-increasing policy during recessions—must not go so far as to put medium-term finances at risk. In Latin America, public debt remains very high, on average, having stopped declining in 2007 (Figure 7.1). Going forward, the evolution and relatively high levels

Figure 7.1 Public Debt in Latin America (Percent of GDP)
Source: IMF, World Economic Outlook database.
¹For details on Argentina’s GDP see Appendix 2.1 of the IMF’s April 2014 Regional Economic Outlook: Western Hemisphere (IMF, 2014).
of debt since the global financial crisis may constrain countercyclical policy action during downturns. However, the situation differs greatly across countries, as some (for example, Chile, Paraguay, and Peru) have very low debt stocks.

Fiscal expansions in downturns are meant to address a demand shortfall and thus should be reversible or limited in time. If the higher expenditures are structural in nature, it will be harder to readjust the stance when the economy improves. Chile has tried to reduce this risk by linking increases in structural spending to permanent revenues (for example, a recent tax reform to finance education spending). Most other countries in Latin America, however, do not make this distinction.

**Fiscal Institutions**

Many countries in Latin America have adopted reforms to strengthen fiscal institutions, including fiscal rules. Provided that such rules are well designed, they can support sustainable fiscal policy while avoiding procyclicality. Indeed, countries such as Chile, Colombia, and Mexico have managed to move toward more countercyclical policy while following a fiscal rule. Fiscal transparency is also important, for both policymakers and the public. Some recent examples of nontransparent policies include the use of one-off transactions to reduce reported deficits or the increased use of deficit-neutral operations such as policy lending, which may still increase fiscal liabilities.

**CONCLUSIONS**

This chapter has considered the cyclicality of fiscal policy in Latin America using a new methodology that gives full credit to automatic stabilizers, while controlling for commodity prices and allowing for endogeneity. The evidence suggests that fiscal policy in Latin America has been procyclical, on average, rather than acyclical or countercyclical as in most advanced economies. Country-specific estimations, however, yield mostly insignificant results, as is common—but often unacknowledged—in comparable studies. In more recent years, Brazil, Chile, Colombia, El Salvador, and Mexico appear to have moved toward less procyclical or more countercyclical fiscal policy. It remains to be seen whether this development will prevail during times of closed or positive output gaps, when previous fiscal stimulus measures should be unwound. More generally, countries need to rebuild their buffers, not least to be prepared for any future negative economic shock.

Apart from cyclical considerations, fiscal policy should be sustainable and transparent. Fiscal institutional measures such as well-designed fiscal rules can support sustainability without leading to procyclical fiscal policy. Fiscal transparency has improved in many countries over the past decade, but recent examples indicate the reappearance of problematic behavior such as the use of one-off transactions and operations that are chosen to avoid increasing reported deficits.
REFERENCES


Is Latin America Vulnerable to Rising Capital Flow Volatility?
Several years have passed since the bankruptcy of Lehman Brothers marked the beginning of a global storm that put many advanced economies on the verge of a financial meltdown. Financial risks have receded somewhat since then, but they continue to loom over the world economy, raising questions about the potential impact of global financial shocks on emerging market economies (EMEs).

It is unclear whether these economies are more or less vulnerable to external financial shocks than in the past. Over the past two decades, most EMEs witnessed significant changes in two critical dimensions that are likely to determine the impact of these global shocks on their domestic economies. On the one hand, most went through a marked process of financial integration with the rest of the world, arguably making them more sensitive to global financial conditions.1 On the other, they made marked improvements in key macroeconomic fundamentals, thus becoming more resilient to such shocks.

This chapter studies the impact of global financial shocks on the domestic output of EMEs, with a focus on the role that financial integration and macroeconomic fundamentals play in mitigating or amplifying such an effect. Specifically, the chapter: (1) focuses on the pure effect of external financial shocks by isolating the impact of these events from any contemporaneous trade shocks; and (2) examines how the degree of financial integration and the strength of macroeconomic fundamentals interact with these external disturbances, either to amplify or mitigate their impact on the economy. For this purpose, the chapter assesses the impact of large external financial shocks using a cross-sectional econometric approach based on a quarterly database for 40 emerging market and nine small advanced economies over the period from 1990–2010.

A previous version of this work was published under the title “Global Financial Shocks and their Economic Impact on Emerging Market Economies” in the Journal of International Commerce, Economics and Policy, Vol. 4, No. 2.

1 Of course, increased financial integration may also have brought other benefits (for example, risk-sharing, better international allocation of savings, transfer of financial expertise). These, however, are beyond the scope of this chapter.
This work is related to several branches of literature. First, it relates to the recent literature on decoupling, which has argued that EMEs have become less dependent on (that is, have “decoupled” from) the economic performance of advanced economies (IMF, 2007). While prompted by the remarkable growth performance of EMEs over the past decade despite slow growth in advanced economies, this view seems to have been vindicated during the 2008–09 global crisis, as many EMEs navigated relatively unscathed through what was clearly the most severe global shock in decades. This study adds to this literature by disentangling and quantifying the specific mechanisms that may amplify and mitigate the output cost to global shocks.

The chapter is also related to a growing literature examining the role of sudden changes in uncertainty—as proxied, for example, by spikes in the S&P 500 Chicago Board Options Exchange Market Volatility Index (VIX)—in driving the business cycle (Bloom, 2009). Uncertainty spikes can have sizable effects on real activity by encouraging a “wait and see” attitude that amplifies economic cycles. Indeed, such spikes have been shown to induce a collapse in investment and private consumption. In addition, such effects are more severe in EMEs than in the United States, possibly due to the role that financial frictions (for example, collateral constraints, liquidity shortages, or currency mismatches) tend to play in EMEs (Carrière-Swallow and Céspedes, 2011). This study relates to this literature to the extent that the identified effects of global financial shocks on domestic output in EMEs—that is, spikes in the VIX—may partly arise from heightened uncertainty. Unlike these other papers, however, the aim here is to disentangle the role of macroeconomic fundamentals and financial integration in amplifying or mitigating the impact of these shocks, rather than to assess the specific role that heightened uncertainty may have.

Finally, this chapter relates broadly to several strands of recent literature examining the role of macroeconomic fundamentals in absorbing external shocks, and the real effects of sudden stops and contagion (Calvo, Izquierdo, and Mejía, 2004; Calvo and Télvi, 2008; Ocampo, 2012). Unlike these studies, however, this study pays special attention to the role of financial integration and its evolution over time in determining EMEs’ vulnerability to exogenous global financial shocks.

The analysis provides several key insights. First, large global financial shocks tend to have a sizable impact on EME output, even after controlling for any associated trade shock (for example, the terms of trade or a drop in external demand).

Second, these shocks have nonlinear effects on EMEs’ domestic output, which varies with the degree of financial integration with the rest of the world and the strength of macroeconomic fundamentals. In particular, exchange rate flexibility has a prominent role buffering the impact of these shocks, especially for highly financially integrated economies. The strength of the external position (current account balance and external debt) is also found to play a similar role.

Third, greater financial integration does not always increase an economy’s vulnerability to external financial shocks. As a matter of fact, the exchange rate...
regime is critical in determining this relationship: financial integration amplifies global financial shocks in economies with fixed exchange rate regimes, but mitigates them in economies with more flexible regimes. The corollary of these results is that financially integrated economies with strong fundamentals (especially exchange rate flexibility) are better equipped to cope with global financial shocks than economies with weak fundamentals and limited financial linkages.

The analysis also allows us to assess how the vulnerability of different economies in the sample to an adverse global financial shock varies across regions and time. In particular, simulations of the estimated model—which combine the joint effect of higher financial integration and changing fundamentals to an adverse global financial shock—show that, while still significantly vulnerable, both Latin America and emerging Asia are less sensitive today to these shocks than in the past. By contrast, emerging Europe is found to be more vulnerable on account of both a steep process of financial integration, and the worsening of fundamentals in some key dimensions over the past 10–15 years.

This chapter first discusses the identification of global financial shocks and the behavior of key global variables during these episodes. It documents the evolution of financial integration and key macroeconomic fundamentals across EMEs since 1990. The chapter then discusses the econometric methodology, presents its main findings, and reports simulation results to illustrate the changing vulnerability of EMEs to global financial shocks. The chapter concludes with a discussion of the key takeaways and avenues for further research.

RECURRENT EPISODES OF GLOBAL FINANCIAL STRESS

The VIX has gained acceptance as a summary indicator of global uncertainty or financial stress. According to the VIX—and based on a simple statistical analysis that identifies large deviations of the index from its own trend, as in Bloom (2009)—the world has experienced periods of global financial stress every 2½ years on average over the past two decades (Figure 8.1 and Table 8.1). Whether these shocks originated in advanced economies (for example, 9/11 or Lehman) or emerging market economies (for example, the Asian or Russian crises), their repercussions were global, and their effects where arguably transmitted to EMEs and small advanced economies through two main channels, as described below.

The exact interpretation of spikes in the VIX is still a matter of debate in the academic literature. Bloom (2009), however, shows that the VIX is strongly correlated with measures of uncertainty, including financial variables. This lends support to its use as a measure of global financial stress. See also Carrière-Swallow and Céspedes (2011).

Kaminsky and Reinhart (2003) study under what conditions financial turbulence that originated in certain EMEs spread globally to other emerging and advanced economies. They argue that these episodes only spread when the local shock affects asset markets in one or more of the world’s financial centers; otherwise spillovers are confined to economies in the same region. Or to put it differently, for a shock to become systemic it has to reach the financial center. This conclusion supports the choice of the VIX as a global shock measure.
Trade Channel

Excluding those episodes linked to geopolitical tensions in the Middle East—leading to spikes in oil prices—all episodes of global financial shocks were accompanied by sharp falls in commodity prices, possibly reflecting expectations of a slowdown of the world economy and thus of demand for these basic products. Indeed, most episodes also led to softer external demand, as suggested by economic activity indicators of large advanced economies (Figure 8.2, top panels).
Financial Channel

At the same time, these episodes were accompanied by sizable re-pricing of sovereign risk—as reflected in the widening of EMBI spreads—and a reversal of capital flows, in some cases very pronounced (Figure 8.2, bottom panels).

Thus, to varying degrees, EMEs are likely to have been affected both through trade and financial channels during these episodes. This chapter focuses on the financial dimension, which may also encompass the effect of spikes on uncertainty as discussed before and its economic impact on EMEs.4

4 Trade shocks (particularly those arising from commodity price fluctuations) are the subject of analysis in Chapter 4.
It is conjectured here that the impact of global financial shocks on EMEs depends primarily on two main factors (Figure 8.3). On the one hand, an economy’s degree of financial integration with the rest of the world is likely to influence its vulnerability to external financial shocks. While financial integration is a somewhat elusive concept—and has been studied from different angles—one would expect that, all else being equal, a higher degree of integration would increase domestic sensitivity to these shocks. To capture this, we focus on the stock of foreign assets and liabilities, relative to GDP, as a measure of financial integration, as this indicator is likely to capture both the degree of arbitrage (spillover) between external and domestic financial markets, as well as the potential magnitude of the economic impact of external shocks on the domestic economy.

On the other hand, an economy’s strength of economic fundamentals is also likely to buffer or amplify the impact of external shocks. Strong fundamentals can prevent capital outflows in the first place (as investors would be less concerned about creditworthiness) but can also play a role in allowing the economy to adjust more easily to a given shock (for example, by providing more room to undertake countercyclical policies by lowering interest rates, letting the exchange rate depreciate, or using fiscal policy to stabilize domestic demand).

Financial integration may have other potential positive side effects—for example, risk-sharing or higher long-term growth—that are not considered in our analysis.

We also explore a similar measure that excludes international reserves and official external debt, as these components are unlikely to be channels of transmission of external shocks. On the contrary, these components of the international investment position tend to be countercyclical. Stylized facts and econometric results, however, do not change significantly with this alternative measure.
have moved in the opposite direction, particularly over the past decade. Countries have led the pace of integration within the region, while other countries in South America by the Chinn and Ito index of capital account openness (Figures 8.3 and 8.4).

From a gradual process of financial liberalization and the withdrawal of restrictions over the past two decades on these two fronts, potentially changing Europe, and to an even greater extent in small advanced economies.

Adler and Tovar

**Financial Integration, 1, 2 2010**

*(Percent of GDP)*

Source: Lane and Milesi-Ferretti (2007).

Note: Hong Kong SAR and Singapore values exceed those of the reported scale. Their corresponding values are 2261 and 1241.

1 Foreign assets plus foreign liabilities, as percent of GDP.

2 Simple averages.

**Figure 8.4 Financial Openness in Emerging Market and Small Advanced Economies**

To varying degrees, EMEs across the board have experienced a marked transformation over the past two decades on these two fronts, potentially changing their vulnerability to global shocks. The most prominent transformation has been the increase in financial integration with the rest of the world, mostly resulting from a gradual process of financial liberalization and the withdrawal of restrictions on international capital movements, particularly during the 1990s, as shown by the Chinn and Ito index of capital account openness (Figures 8.3 and 8.4). This is visible in Latin America and emerging Asia, even more so in emerging Europe, and to an even greater extent in small advanced economies.

1. Within Latin America, this trend has not been homogeneous across different countries. Countries in the LA6 group (Brazil, Chile, Colombia, Mexico, Peru, and Uruguay) and the Central American countries have led the pace of integration within the region, while other countries in South America have moved in the opposite direction, particularly over the past decade.
Figure 8.5  Key Macroeconomic Fundamentals in Emerging Market Economies and Small Advanced Economies, 2010 versus 2000
Source: IMF, International Financial Statistics; and authors’ calculations.
Note: LA6 = Brazil, Chile, Colombia, Mexico, Peru, and Uruguay; Other LA = Argentina, Bolivia, Ecuador, Jamaica, Paraguay, and Venezuela.
At the same time, many emerging market economies have witnessed a gradual strengthening of their economic fundamentals along a number of dimensions, particularly on the external and fiscal fronts, during the past two decades (Figure 8.5). This has been evident in Latin America and emerging Asia, but less so in emerging Europe.

Since progress along these respective dimensions has opposing and nontrivial implications for the transmission of global financial shocks to EMEs, assessing an economy’s vulnerability to them—and whether that vulnerability has increased or declined over time—requires a multivariate econometric approach that appropriately captures and quantifies the importance of these two opposing forces.

THE IMPACT OF GLOBAL FINANCIAL SHOCKS

Sample, Data, and Econometric Approach

To quantify the impact of large external financial shocks on domestic output we undertake a cross-sectional econometric approach based on quarterly observations for a sample of 40 EMEs and nine small advanced economies during seven episodes of global financial shocks (measured by sizable spikes in the VIX index, as defined in Figure 8.1). Of the nine episodes identified earlier, those of Enron and the Iraq War are treated as one, given their close proximity. Similarly, the 2011 event associated with the European crisis is dropped due to insufficient observations (only GDP data up to 2011:Q4 were available on a comprehensive basis).

The econometric analysis has three key features. First, the dependent variable measuring output performance captures both the depth and duration of each individual episode \( j \) (Figures 8.6 and 8.7). Specifically, we compute the cumulative change in the cyclical component of output \( Y_{it} \) estimated using a standard Hodrick-Prescott filter—over the duration of the episode and the following two quarters (as long as there is no overlap with a subsequent event), in order to capture possible lagged effects of the shock:

\[
Y_{it} = \sum_{t_{i} \leq j} \left( \frac{y_{i,t} - y_{i,t}^{c}}{\bar{y}_{i,t}^{c}} \right) \times 100. \tag{8.1}
\]

A glance at the distribution of our output loss measure suggests that performance varied significantly across both episodes and economies, with some economies displaying sizable output losses and others showing positive growth during these events. The 2008–09 event that followed the bankruptcy of Lehman Brothers deserves special attention not only because of the severity of the shock, but also because, despite the wide dispersion of outcomes, all economies experienced notorious output losses.

It is important to highlight that, in contrast to most studies that rely on annual data, our analysis is based on quarterly data, allowing us to measure more precisely the output costs of global financial shocks. For most countries, the constructed dependent variable uses quarterly GDP data. In some instances, however, quarterly GDP series are extended by chaining them with variance-adjusted indicators of economic activity or industrial production.
The second feature of the economic analysis is that we choose a specification that disentangles the link between domestic output performance and global financial shocks (measured by the VIX) after controlling for any associated effect arising through trade channels. In the absence of comprehensive (country-specific) data on terms of trade and external demand, which would allow for measuring such trade shocks more precisely, we rely on a proxy variable that measures the cumulative loss of exports (in percent of trend) during the episode. Resembling the measure of output performance, this variable captures both the depth and duration of the trade shock during each event. A weakness of this measure is that it is not entirely exogenous, and may lead to over-controlling. For this reason, and to check the robustness of the results, regressions are also run using available series of terms of trade and world GDP instead of exports (which proxy for exogenous trade prices and external demand). Results remain qualitatively and quantitatively unchanged.

The third feature of the analysis is that the specification allows for the financial shock to interact with the economy’s degree of financial integration (defined as total foreign assets plus total foreign liabilities in percent of GDP)\(^9\) as well as with

\(^9\)The measure is constructed with data from the updated and extended version of the Lane and Milesi-Ferretti (2007) database. Econometric results also hold for a measure of financial integration that strips holdings of international reserves, as well as official loans. Such adjustment is meant to better capture those assets and liabilities that would be sensitive to global shocks.
measures of economic fundamentals. In this manner we are able to study the amplification or mitigation effect of these country features in the face of a global financial shock. Moreover, we allow for interaction effects between country fundamentals and financial integration.

Thus, the benchmark model is:

\[ Y_{i,j} = \beta_0 + \beta_1 \text{Exp}_{i,j} + \beta_2 \text{GFS}_j + \beta_3 \text{FI}_{i,j} \ast \text{GFS}_j + \beta'_4 X_{i,j} \ast \text{GFS}_j + \beta'_5 \left( X_{i,j} \ast \text{FI}_{i,j} \right) \ast \text{GFS}_j + \varepsilon_{i,j}, \]  

(8.2)

where \( i \) and \( j \) denote country and episode respectively; \( \text{Exp}_{i,j} \) is the cumulative change in de-trended exports (in percent of trend); \( \text{GFS}_j \) is the global financial shock, computed as the average monthly VIX times the length of the episode, in months; \( X_{i,j} \) is the vector of country fundamentals, evaluated at the beginning of each episode; and \( \text{FI}_{i,j} \) denotes financial integration.

Figure 8.7  Output Performance during Global Financial Shocks, by Country (Cumulative, in percent of annual GDP)

Source: Authors’ calculations.

Figure shows cumulative change in the cyclical component of GDP, in percent of (potential) GDP. Dotted lines reflect regional medians.

1 Average of different episodes, excluding cases of identified idiosyncratic events: Asian countries (1997), Russia (1998), Brazil (2002), and Uruguay (2001–02).

2 Greece event of May 2010. The European episode of mid-2011 is not included, because comprehensive GDP data were not available at the time of writing.
Broadly speaking, $\beta_2$ captures the direct effect of the global financial shock, while $\beta_3$ and $\beta_4$ capture the interaction effect of the global shock with financial integration and fundamentals, respectively (that is, the amplification or mitigation effect). Finally, the last term (with coefficient $\beta_5$) is introduced to capture the fact that the role of fundamentals in the face of a global shock may not be independent of the degree of financial integration. However, it is important to keep in mind that, in quantifying the role of fundamentals and financial integration, one must take the total effect of the shock into account. More precisely, under this specification, the marginal effect of a global financial shock (equivalent to a one-point increase in the VIX) is given by:

$$\frac{\partial Y_{i,j}}{\partial GFS} = \beta_i + \beta_3 F_{i,j} + \beta_4 X_{i,j} + \beta_5 (X_{i,j} F_{i,j}).$$ (8.3)

And the amplification effect of a fundamental ($x$), included in $X$, is given by:

$$\frac{\partial^2 Y_{i,j}}{\partial GFS \partial x} = \beta_{i,x} + \beta_{5,x} F_{i,j}. \quad (8.4)$$

The following country fundamentals are explored:

- **Exchange rate flexibility**, as captured by the de facto exchange rate regime classification of Ilzetzki, Reinhart, and Rogoff (2008). The variable, based on the coarse classification, excludes those regimes classified as freely falling or dual markets with missing parallel market data. It is also normalized to range from 0 to 1, with 1 being a freely floating regime and 0 a peg or similar regime.

- **External sustainability measures**, as reflected in the current account balance, external debt, net foreign assets, and international reserves, all in percent of GDP.

- **Fiscal position measures** (public debt and primary balance, in percent of GDP).

- **Deposit dollarization**, from Levy Yeyati (2006) database, augmented to extend country and time coverage, based on IMF country staff reports and country desk information.

A possible shortcoming of the specification (and its selection of fundamentals) is that it does not explore the role of policy responses, which may have varied over time and between economies. However, it is important to keep in mind that policy space at the time of a shock is normally determined by the initial conditions (counter cyclical fiscal or monetary policy would normally be possible only if fiscal solvency is not an

---

10 Other economy characteristics that may also be relevant—such as exchange rate misalignment, measures of strength of the financial system, financial regulation, macroprudential policies, and so on—are not included in the econometric exercise due to data limitations.
issue and the monetary/exchange rate framework is sufficiently flexible at the time of the shock). Hence, it is likely that policy response measures would be correlated with some of the measures of country fundamentals already considered in our specification.

A simple bivariate analysis of the data highlights the importance of some of these country features, particularly when the financial shock is of large magnitude. Specifically we find that:

• A low degree of exchange rate flexibility appears to be associated with sharp economic contractions.
• This is also the case for a low current account balance, low net foreign assets, and highly dollarized economies.
• Interestingly, in this simple bivariate analysis, financial integration or the level of international reserves appear to have a muted role.

Although these simple patterns may provide some insights as to the relevance of some variables vis-à-vis others, they should be interpreted with caution, as they may reflect simple correlations with other variables.

**Cross-Sectional Results**

This section explores a number of specifications of the cross-sectional multivariate setting described above to get a sense of the role that individual variables have in amplifying or mitigating the impact of financial shocks. For simplicity we start with a basic specification that reports the effect of the VIX on our measure of output. From there on, all specifications control for trade effects and include different combinations of macroeconomic fundamentals and their interaction with financial integration, depending on their statistical significance. Table 8.2 presents a summary with the most relevant results.

Results suggest that exchange rate flexibility is fundamental in buffering large global shocks, while higher financial integration, current account deficits, and external debt tend to amplify them. Interestingly, and despite our priors, a number of variables were found to have a muted effect. International reserve buffers were found to have no statistically significant role in buffering global shocks. In the case of fiscal variables, we failed to find any significant role for debt levels. Although the primary fiscal balance was found to play a mitigating role—a stronger position mitigates the impact of the shock—its statistical significance disappeared when other fundamentals were included, no doubt suggesting a strong cross-correlation. Finally, the degree of dollarization did not appear to be significant either.

---

11 See Adler and Tovar (2012) for more details.
12 It is certainly possible that the limited information content that can be extracted from a simple debt-to-GDP ratio in assessing creditworthiness may be behind the lack of significance of debt levels in our regressions.
13 Arguably the measure fails to properly capture the extent of currency mismatches in the financial system. Unfortunately, comprehensive data on currency mismatches at a quarterly frequency are not available.
Recall that the amplification effect of a fundamental \((x)\) is given by equation (8.4). To illustrate such an effect, we use the estimated coefficients to obtain the predicted impact of a global financial shock (measured as a 10-point increase in the VIX) for different degrees of financial integration and fundamentals (Figure 8.8). The analysis shows that:

- For the median EME—with a de facto crawling peg—higher financial integration tends to increase vulnerability to global financial shocks.
- The role of financial integration in mitigating or amplifying financial shocks, however, greatly depends on the economy’s exchange rate regime.

### TABLE 8.2

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Output Performance(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic Model</td>
</tr>
<tr>
<td>VIX</td>
<td>-0.176***</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
</tr>
<tr>
<td>Trade channel</td>
<td>0.117***</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
</tr>
<tr>
<td>Terms of trade</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>World GDP</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Interaction of VIX with</strong></td>
<td></td>
</tr>
<tr>
<td>Financial integration</td>
<td>-0.077+</td>
</tr>
<tr>
<td></td>
<td>(0.049)</td>
</tr>
<tr>
<td>Current account balance</td>
<td>0.001+</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
</tr>
<tr>
<td>Exchange rate flexibility</td>
<td>-0.096**</td>
</tr>
<tr>
<td></td>
<td>(0.046)</td>
</tr>
<tr>
<td>External debt</td>
<td>-0.000+</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
</tr>
<tr>
<td><strong>Interaction of VIX with financial integration and</strong></td>
<td></td>
</tr>
<tr>
<td>Exchange rate flexibility</td>
<td>0.190***</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
</tr>
<tr>
<td>Constant</td>
<td>15.757***</td>
</tr>
<tr>
<td></td>
<td>(1.756)</td>
</tr>
<tr>
<td>Observations</td>
<td>337</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.418</td>
</tr>
<tr>
<td>F</td>
<td>98.24</td>
</tr>
</tbody>
</table>

Source: Authors’ estimates.
Note: See equation (8.2) and main text for an explanation on how to derive the amplification effect of a given fundamental from these estimated coefficients. VIX = Chicago Board Options Exchange Market Volatility Index. Robust standard errors in parentheses. *** \(p < 0.01\), ** \(p < 0.05\), * \(p < 0.10\), + \(p < 0.15\).

\(^1\)Cumulative change of cyclical component of GDP, in percent of trend.
That is, greater financial integration amplifies the shock under fixed rate regimes but mitigates it under floating regimes.\footnote{A possible interpretation is that closer financial ties with the rest of the world can help mitigate financial shocks by keeping lines of credit open during these events, provided that the more procyclical (for example, speculative) flows can be mitigated with an appropriate degree of exchange rate floating.}

- At the same time, for most levels of integration, greater exchange rate flexibility reduces the output cost of the global shock. Such a mitigation effect is particularly pronounced for high levels of financial integration.
- As expected, larger current account deficits make an economy more vulnerable, although the effect is of small magnitude.
- Similarly, high levels of external debt make an economy more vulnerable to financial shocks, irrespective of the level of financial integration.

Overall, these results support the notion that financially integrated EMEs with strong fundamentals (especially exchange rate flexibility) are better equipped to cope with global financial shocks than economies where fundamentals are weak or that have fewer financial linkages. Although not analyzed in detail here—mainly due to data limitations—the buffering effect provided by strong fundamentals probably operates in two ways: first, by mitigating capital outflows if an adverse global shock occurs, and second, by lowering the economic impact of any resulting capital outflows. Some preliminary evidence of the importance of the first effect is discussed in IMF (2012).

**Figure 8.8** Macroeconomic Fundamentals and the Impact of Global Shocks

Source: IMF staff calculations.

Note: Impact of 10-point Chicago Board Options Exchange Market Volatility Index (VIX) shock for different levels of financial integration and fundamentals (other variables unchanged, at median emerging market value).

1 Cumulative deviations from trend output in percent of trend.

2 Total foreign assets plus total foreign liabilities, as percent of GDP. Reported levels correspond to deciles 20–80.

3 Percent of GDP. Levels correspond to deciles 20–80.
Finally, we make use of the benchmark model to determine the estimated impact of different financial shocks witnessed in the past two decades across different regions (Figure 8.9). Specifically, the simulations take as input the values of economic fundamentals and financial integration corresponding to 1997 (right before the Asian crisis), 2008 (right before Lehman), and 2010 (right before Greece’s event). This exercise unveils how the degree of vulnerability of different regions has diverged over time. While Latin America and emerging Asia have seen a gradual improvement (becoming less sensitive to these shocks), particularly since 1997, emerging Europe has systematically moved in the opposite direction. As a result, while the estimated impact of a 10-point VIX shock on Latin America and Asia is today about 0.34 percentage points of GDP, the impact on emerging Europe reaches about 0.57 percentage points of GDP. To give a sense of magnitudes, these estimates imply that a Lehman-type event

©International Monetary Fund. Not for Redistribution
(with an average 40-point increase in the VIX over a year) would have an impact equivalent to about 1¼ percent of GDP loss in Asia and Latin America, and 2¼ percent of GDP in emerging Europe, even after controlling for the associated external trade shock.

These results suggest that improvements in fundamentals over the past 20 years in Latin America and Asia have more than offset the potentially greater vulnerability arising from increased financial integration. In emerging Europe, on the other hand, both fundamentals (identified as relevant by the econometric exercise) and financial integration have moved in the direction of making the region more vulnerable to global financial shocks.

**CONCLUSIONS**

Emerging market economies continue to be vulnerable to large global financial shocks, as made evident by the behavior of capital flows in and out of these economies during periods of global financial stress. However, despite the increasing degree of financial integration of EMEs, such vulnerability appears to have declined over time for some regions (Latin America and Asia), reflecting to a large extent marked improvements in fundamentals. A key factor determining these effects in many of these economies, particularly in Latin America, has been progress toward greater exchange rate flexibility which is found here to mitigate the impact of adverse financial shocks, particularly in highly financially integrated economies. Economies in both regions have also made improvements in external sustainability (current account and external debt), a key dimension determining the impact of financial shocks. Overall, these results support the notion that financially integrated EMEs with strong fundamentals (especially exchange rate flexibility) are better equipped to cope with global financial shocks than economies where fundamentals are weak or that have fewer financial linkages. Of course, this does not make them immune to adverse shocks, but at least it may help them sail more safely over global financial waves.

**REFERENCES**


Global financial markets have been a source of sizable shocks over the past decade, with broad repercussions across emerging markets. Stark examples are the crisis triggered by the bankruptcy of Lehman Brothers in 2008, and the quantitative easing (QE) program in advanced economies in the aftermath of that crisis. Looking forward, new shocks are likely, as the reduction in the scale of bond purchases by the Federal Reserve—known as “QE tapering”—marks only the start of the normalization of U.S. monetary conditions. Against this backdrop, understanding the implications of global financial shocks in terms of their effect on capital flows to and from emerging market economies (EMEs) remains a key issue.

EMEs have become increasingly financially integrated with the rest of the world over the past two decades, raising their exposure to global financial shocks. However, a key feature of greater financial integration has been that both sides of EMEs’ balance sheets—that is, foreign liabilities as well as foreign asset holdings—have increased. As a result, EMEs have had increased resources at their disposal to offset balance of payments pressures arising during episodes of retrenchment by foreign investors that often occur at times of financial distress in global markets. Larger stocks of public sector foreign assets (primarily international reserves) are undoubtedly a source of resilience for these economies. But whether private foreign asset holdings are also a source of international liquidity, and the extent to which local investors play a stabilizing role following negative external shocks, remain open questions. Understanding the behavior of gross capital flows is thus critical, especially at the current juncture characterized by looming financial risks—including those stemming from uncertainty about the pace of U.S. monetary tightening.

A number of global financial shocks have occurred over the past two decades—some of them of sizable magnitude—that are useful for assessing the dynamics of gross capital flows to EMEs. These include global uncertainty shocks, as captured by the Chicago Board Options Exchange Market Volatility Index (VIX), sharp movements in the U.S. monetary policy (real) interest rates (the federal funds rate), and movements in the U.S. long-term (real) interest rates (for example, the 10-year Treasury bond rate). Figure 9.1 illustrates the frequency and magnitude of some of these shocks.
Global shocks have often had important effects on net capital flows to EMEs and, more broadly, on economic activity in these countries. These aspects have been addressed extensively in previous studies. However, attention to the dynamics of gross capital flows—and especially to the potential stabilizing role played by local investors—has remained limited, despite some recent evidence of domestic investors playing such an offsetting role by repatriating foreign assets (Figure 9.2).

Global shocks have often had important effects on net capital flows to EMEs and, more broadly, on economic activity in these countries. These aspects have been addressed extensively in previous studies. However, attention to the dynamics of gross capital flows—and especially to the potential stabilizing role played by local investors—has remained limited, despite some recent evidence of domestic investors playing such an offsetting role by repatriating foreign assets (Figure 9.2).

The vast literature on sudden stops comes to mind (Calvo, 1998; Dornbusch and Werner, 1994; Dornbusch, Goldfajn, and Valdés, 1995; Calvo, Izquierdo, and Mejía, 2004; Calvo and Reinhart, 2000; Edwards, 2004), although this strand of work has focused primarily on abrupt reversals in net capital inflows. More recently, Bluemen and others (2013), and IMF (2013) have also studied the impact of global financial shocks on net flows to EMEs. Finally, Adler and Tovar (2013) have studied the impact of global financial shocks on economic activity, and the role of financial integration in amplifying or mitigating such impact.
For example, this phenomenon has been observed in the aftermath of large
global uncertainty shocks—like the one experienced during the 2008–09 global
financial crisis—as well as after the QE tapering shock in May 2013. Whether
this is a generalized phenomenon across EMEs and types of financial shocks,
however, remains unclear.

Some recent studies have focused on gross flows, examining whether episodes
of net capital flow reversals were driven by declines in gross inflows (foreign inves-
tors retrenching from EMEs), surges in gross outflows (local investors accumulat-
ing external assets), or a combination of both (Powell, Ratha, and Mohapatra,
2002; Cowan and others, 2008; Rothenberg and Warnock, 2011; Forbes and
Warnock, 2012; Bruno and Shin, 2012; Calderón and Kubota, 2013; and
Bluedorn and others, 2013). A few papers (Cavallo and others, 2013) have also
pointed to episodes of reversals of gross inflows that did not entail a reversal of
net inflows (that is, residents fully offsetting the behavior of nonresident inves-
tors). A common thread among these studies is the notion that the behavior of
foreign and local investors may be driven by different factors and may respond
differently to certain shocks. As a result, domestic investors could potentially play
a stabilizing role, for example by repatriating foreign assets when foreign investors
are liquidating positions in EMEs (that is, during episodes of gross inflow rever-
sals). For instance, a recent study by Broner and others (2013) finds a positive
correlation between gross inflows and gross outflows, and that the behavior of
domestic investors tends to offset that of foreigners during financial crises. None
of these studies, however, has explored the link between specific global shocks and
gross flows, despite the fact that this is critical to assess EMEs’ vulnerabilities to
(likely) changes in global financial conditions.

This chapter contributes to this literature by examining the dynamic response
of net and gross capital flows to key global financial shocks, including short- and
long-term U.S. interest rates. Specifically, the chapter uses a panel vector auto-
regression (PVAR) setting that encompasses a group of 38 EMEs over the period
from 1990:Q1–2012:Q4 to study (1) the extent of the offsetting role played by
domestic investors in response to adverse foreign shocks, and (2) whether this
depends on the specific nature of the shock (in particular, uncertainty or short-
and long-term interest rate shocks). The chapter also examines differences across
EME regions, across countries with different characteristics (for example, finan-
cial integration and capital account openness), and across types of capital flows.

---

2 On May 22, 2013, the Federal Reserve Board chairman announced for the first time the Federal
Reserve’s intentions to start a process of gradually reducing the scale of bond purchases (“QE taper-
ing”). The mere announcement was followed by a sharp rise in long-term U.S. interest rates, and
important repercussions on capital flows to EMEs.

3 Financial crises, however, are defined in an ad hoc manner that makes it difficult to associate these
events with specific external shocks.

4 Forbes and Warnock (2012) and Calderón and Kubota (2013) study the impact of global financial
shocks, but in probit settings that are not well-suited to grasp the impact on capital flows and their
dynamic responses outside sudden-stop events.
Finally, the estimated model is used to discuss the impact of shocks to U.S. economic activity on capital flows to EMEs.5

This chapter follows the terminology used in recent papers, referring to gross inflows as the net movement in international liabilities of a country, and gross outflows as the net movement in international assets.6 While balance of payments accounting is based on doubly-entry, movements in the asset and liability sides of the financial account may differ because some operations involve an offsetting entry in the current account or a change in international reserves. As is standard in the literature, the analysis of gross flows is based on the notion that gross inflows (outflows) primarily reflect foreign (domestic) investors’ behavior. That is, shocks to gross flows are primarily supply-driven.7

After controlling for U.S. interest rates, U.S. GDP growth, and commodity prices, the analysis finds that global uncertainty shocks lead to net capital outflows from EMEs, but the impact is generally short-lived and relatively moderate. The response of net flows, however, hides sizable dynamics in gross flows. In fact, the analysis finds evidence that while foreigners retrench from EMEs during adverse shock events, residents repatriate foreign assets, playing a meaningful offsetting role. In the case of (pure) U.S. interest rate shocks, the analysis finds important differences between the impact of short- and long-term interest rate shocks. Domestic investors do not appear to play a mitigating role in the case of short-term interest rate shocks. In fact, a positive shock to the federal funds rate is associated with statistically significant outflows by both foreign and local investors, although the magnitudes are relatively moderate. In the case of shocks to long-term U.S. interest rates, in contrast, the analysis finds evidence of asset repatriation, but this offsetting force falls short of balancing the retrenchment of nonresidents (thus implying nontrivial net capital outflows).8 Table 9.1 summarizes the main results.

These results suggest that, while increased financial integration has raised EMEs’ exposure to global financial shocks, increased foreign asset holdings are likely to play an important—although not complete—stabilizing role. The results also shed light on how EMEs are likely to react to the Federal Reserve’s exit from QE, as the latter is likely to entail higher longer-term U.S. interest rates.

This chapter first discusses the empirical approach used and then presents the main results and their robustness and extensions, before concluding with a summary of key takeaways.

---

5The net effect of this type of shock is of particular interest at the current juncture and, a priori, ambiguous. Positive economic shocks to activity in the United States would normally lead to a tightening of monetary conditions there, pushing flows away from EMEs. At the same time, better economic prospects could attract flows to these economies, especially to U.S. trading partners.

6Specifically, a positive gross capital inflow is an accumulation of net foreign liabilities, while a positive gross capital outflow entails an accumulation of net foreign assets.

7While this could be controversial in the analysis of idiosyncratic shocks, it is less likely to be so in the context of global financial shocks studied in this chapter. Results confirm that movements in gross inflows and outflows are not symmetric.

8Although not the main focus of the analysis, we also find that positive growth disturbances in the United States lead to net capital inflows to EMEs, despite the associated rise in U.S. interest rates.
EMPIRICAL APPROACH

The objective of this chapter is to examine the dynamic effect of global financial shocks on net and gross capital flows into EMEs. Since financial shocks are often accompanied by other shocks (for example, to U.S. output growth and commodity prices) and those shocks may by themselves have important implications for capital flows to and from EMEs, a multivariate approach is critical to disentangle the pure effect of each of the shocks.9

Panel Vector Autoregression Model

A PVAR model is employed to quantify the dynamic impact of global financial shocks on both net and gross capital flows to EMEs. Specifically, we estimate a first-order PVAR model that treats all the variables in the system as endogenous and allows for unobserved country heterogeneity. Two versions of the model are estimated, focusing on net capital flows and gross capital flows separately.10 In both cases the specification takes the following reduced form:

\[ y_{t,i} = \alpha + \gamma_i + \beta' y_{t-1,i} + \epsilon_{t,i}, \tag{9.1} \]

with time index \( t = 1, \ldots, T \); country index \( i = 1, \ldots, N \), where \( y_i \) is a vector of six variables for country \( i \) \( \{G, VIX, INT, INT_{10Y}, COMMP, NKFi\} \) in the specification using net capital flows (NFK) or a vector of seven variables\( \{G, VIX, INT, \)

---

9In fact, a simple event analysis confirms that even in episodes of sizable global financial shocks, their impact on flows to EMEs is often not visible in a bivariate setting (see Annex 9.1).

10We follow the recent literature in studying overall flows, excluding international reserve flows. A known shortcoming of this approach is that both private and public flows are included, because of data limitations, despite the fact that they may not behave in the same way in the face of global financial shocks. Bluedorn and others (2013) show that official flows can play an important offsetting role in some cases—although this is a relevant feature for only a small number of countries in our sample that experienced crises (that is, countries that were impaired from borrowing in external financial markets).

©International Monetary Fund. Not for Redistribution
INT_10Y, COMMP, GKI, GKO) in the specification using gross capital flows (GKI and GKO); \( \gamma_i \) is a vector of country specific fixed effects; and \( \varepsilon_{i,t} \) denotes a vector of reduced form errors. As mentioned previously, we follow the terminology used in the recent literature, calling gross capital inflows (outflows) the (net) change in international liabilities (assets). Both net and gross flows are expressed in annualized terms and in percent of trend GDP (expressed in U.S. dollars) to properly normalize the flows while preventing the measure from being contaminated by contemporaneous movements in GDP. Our measures of international financial conditions include global uncertainty (proxied by the VIX), changes in the short-term U.S. real interest rate (the federal funds rate, INT), and changes in the long-term U.S. real interest rate (the 10-year Treasury bond rate, INT_10Y).\(^{11}\) Real interest rates are computed using forward-looking inflation expectations at 1- and 10-year horizons, and first differences are used to ensure series stationarity.\(^{12}\) U.S. real output growth (\( G \)) and (the log difference of) a broad index of commodity prices (COMMP) are also included, mainly as control variables. Table A9.2.1 in Annex 9.2 describes the variables used in the empirical exercise in detail.

The main objective is to identify the dynamic response of capital flows to EMEs to global uncertainty and U.S. interest rate shocks. Two features of the selected specification are critical to estimate such effects. First, controlling for (as well as allowing feedback through) movements in U.S. real output and commodity prices is key to ensuring that the estimated effects reflect those of pure global financial developments and not the response of financial variables to real shocks. Second, as there is significant cross-section heterogeneity in terms of the level of capital flows (especially with regard to gross flows), the model includes country fixed effects (\( \gamma_i \)) that capture the countries’ unobserved time-invariant idiosyncratic characteristics. However, to avoid the bias associated with the fact that fixed effects would be correlated with the regressors due to the lags of the dependent variables, we use forward mean-differencing, also referred to as the “Helmert procedure,” following Love and Zicchino (2006) and Arellano and Bover (1995).\(^{13}\)

Once the PVAR is estimated, we compute impulse response functions to examine the effect of global financial shocks on capital flows. Since only the reduced form version of the model is estimated, imposing additional structure on

\(^{11}\)The VIX has recently been used as a measure of global uncertainty or financial stress. Bloom (2009) shows that this volatility index is highly correlated with measures of micro- and macro-level uncertainty, including from financial variables. More recently, Carrière-Swallow and Céspedes (2011), Adler and Tovar (2013), and Adler and Sosa (2013) also used the VIX to measure global uncertainty shocks.

\(^{12}\)Although we rely on real interest rates, shocks to them are primarily driven by nominal innovations, as inflation expectations tend to be highly stable for the sample period and the countries under study.

\(^{13}\)This transformation is an orthogonal deviation, where each observation is expressed as a deviation from the mean of all the future observations. Each observation is weighted so the variance is standardized. The procedure preserves homoscedasticity and does not induce serial correlation (Arellano and Bover, 1995). Moreover, by preserving the orthogonality between transformed variables and lagged dependent variables, this technique allows the use of the lagged values of regressors as instruments, and for estimation of the coefficients by the generalized method of moments (GMM).
the error variance-covariance matrix is required in order to identify structural shocks. We use a standard Choleski decomposition to orthogonalize the reduced form errors. Our selected ordering (where the more exogenous variables of the model precede the endogenous ones) is as follows: \{G, VIX, INT, INT_10Y, COMMP, NKF\} and \{G, VIX, INT, INT_10Y, COMMP, GKI, GKO\} for the specifications using net flows and gross flows, respectively. Within the global variables, this order assumes primarily that financial conditions and commodity prices respond contemporaneously to U.S. output shocks, but that U.S. output only responds to changes in financial conditions and commodity prices with a lag. This assumption is consistent with the notion that interest rates and prices are forward-looking variables.\(^{14}\)

Confidence intervals around the impulse responses are generated with Monte Carlo simulations by randomly generating a draw of the coefficients of the model and recalculating the impulse-responses. This procedure is repeated 700 times to compute the 5th and 95th percentiles of the impulse responses.

### Data

The sample encompasses quarterly data for a group of 38 EMEs over the period from 1990:Q1 to 2012:Q4. Table A9.2.2 in Annex 9.2 presents the list of countries and the time coverage for each of them. The data sources are primarily the IMF’s Balance of Payments Statistics (version BP6TS) and World Economic Outlook, Haver Analytics, and the Federal Reserve Bank of Cleveland database. Table 9.2 reports key summary statistics for the variables of the model.

---

**TABLE 9.2**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>NKF</td>
<td>3.77</td>
<td>7.65</td>
<td>–62.24</td>
<td>62.96</td>
<td>N = 2,639</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>3.60</td>
<td>–5.43</td>
<td>9.53</td>
<td>n = 38</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>6.87</td>
<td>–68.01</td>
<td>57.19</td>
<td>T = 69.45</td>
</tr>
<tr>
<td>GKI</td>
<td>6.84</td>
<td>8.96</td>
<td>–37.89</td>
<td>75.25</td>
<td>N = 2,755</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>3.79</td>
<td>1.05</td>
<td>15.62</td>
<td>n = 38</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>8.15</td>
<td>–45.59</td>
<td>67.91</td>
<td>T = 72.5</td>
</tr>
<tr>
<td>GKO</td>
<td>3.02</td>
<td>6.65</td>
<td>–39.20</td>
<td>62.60</td>
<td>N = 2,663</td>
</tr>
<tr>
<td></td>
<td>Between</td>
<td>2.99</td>
<td>–0.36</td>
<td>12.02</td>
<td>n = 38</td>
</tr>
<tr>
<td></td>
<td>Within</td>
<td>6.02</td>
<td>–42.81</td>
<td>58.99</td>
<td>T = 70.08</td>
</tr>
<tr>
<td>VIX</td>
<td>20.46</td>
<td>7.49</td>
<td>11.03</td>
<td>58.74</td>
<td>T = 92</td>
</tr>
<tr>
<td>INT</td>
<td>–0.087</td>
<td>0.706</td>
<td>–1.932</td>
<td>2.017</td>
<td>T = 91</td>
</tr>
<tr>
<td>INT_10Y</td>
<td>–0.062</td>
<td>0.271</td>
<td>–0.860</td>
<td>0.775</td>
<td>T = 91</td>
</tr>
<tr>
<td>COMMP</td>
<td>0.012</td>
<td>0.090</td>
<td>–0.380</td>
<td>0.358</td>
<td>T = 91</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations.

Note: NKF = net capital flows; GKI = gross capital inflows; GKO = gross capital outflows; VIX = Chicago Board Options Exchange Market Volatility Index; INT = federal funds rate; INT_10Y = 10-year Treasury bond real rate; COMMP = broad index of commodity prices.

---

\(^{14}\) Nonetheless, the main results are robust to alternative orderings within the group of international variables, as discussed later.
Global Financial Shocks and Gross Capital Flows in Latin America

Figure 9.3  Response of Net Capital Flows to Global Financial Shocks

Source: Authors' calculations.
Note: Response to a one standard deviation shock to the VIX (5 units), the federal funds interest rate (0.66 percentage point), and the 10-year Treasury bond interest rate (0.23 percentage point). Time horizon in quarters. Variables defined and explained in Annex Table A9.2.1.

Figure 9.4  Response of Gross Capital Flows to Global Financial Shocks

Source: Authors' calculations.
Note: Response to a one standard deviation shock to the VIX (5 units), the federal funds interest rate (0.66 percentage point), and the 10-year Treasury bond interest rate (0.23 percentage point). Time horizon in quarters. Variables defined and explained in Annex Table A9.2.1.

RESULTS

Benchmark Specification

Figures 9.3 and 9.4 illustrate the dynamic response of capital flows to EMEs to external shocks in our benchmark model, using net and gross flows, respectively. The full set of responses of capital flows to global shocks, as well as a characterization of the magnitude and persistence of the shocks, is presented in Figure A9.2.1 in Annex 9.2.

Increases in global uncertainty (left panels in Figures 9.3 and 9.4) are found to have a very limited negative impact on net capital flows to EMEs. This result largely reflects the marked response of gross capital outflows. Indeed, while a VIX shock leads to a sizable and sustained reversal in gross inflows, the impact is largely offset by a decline in gross outflows (that is, asset repatriation by local investors). Specifically, a one standard deviation shock to the VIX (about 5 points) leads to an average decline in gross inflows of about 1½ percent of annual GDP over six quarters and to a decline in gross outflows of a broadly similar magnitude.

©International Monetary Fund. Not for Redistribution
A shock to the U.S. short-term (real) interest rate also leads to a decline in net flows to EMEs (middle panels in Figures 9.3 and 9.4), although the economic significance is relatively small. Indeed, a one standard deviation shock (about 0.7 percentage points) leads to a cumulative decline in net capital inflows of about 0.2 percent of annual GDP over two quarters. This fall in net inflows reflects both a decline in gross capital inflows and an increase in gross capital outflows. These results suggest that domestic investors do not play a meaningful stabilizing role in the context of short-term foreign interest rate shocks.

A shock to the 10-year Treasury bond rate, in turn, appears to have a significant—and distinct—impact on capital flows to EMEs (right panels in Figures 9.3 and 9.4). This finding is especially relevant at the current juncture, since the main effect of the Federal Reserve’s exit from QE will be, at least in the short term, an upward drift in the longer-term interest rates in the United States. Gross inflows decline markedly after an increase in the 10-year rate, with the impact being significantly larger than in response to short-term interest rate shocks. Furthermore, the estimated effect is economically meaningful, pointing to a cumulative decline of gross inflows of 1.8 percent of GDP over six quarters in response to an increase of 100 basis points in the 10-year Treasury bond rate. In contrast to the case of short-term rate shocks, we find that domestic residents play a stabilizing role by repatriating foreign assets. The extent of that stabilizing role, however, is substantially smaller than the fall in gross inflows. Therefore, the impact on net capital inflows is negative, as in the case of the short-term rate shock. These results appear broadly in line with the anecdotal evidence on capital flows following the QE tapering shock of May 2013, which showed that, in many EMEs, the retrenchment of foreign investors was partially offset by asset repatriation by residents.

Controlling for U.S. GDP growth in the model ensures that the estimated effects discussed above reflect those of pure U.S. interest rate shocks, rather than the endogenous response of interest rates to U.S. output shocks. These can be interpreted as unexpected changes in markets’ expectations about the path of monetary policy rates, either because of surprises in inflation or changes in perceptions about the Federal Reserve’s “reaction function”. This is a key point,

15 Interpreting this result is not straightforward and goes beyond the scope of this chapter. The decline in gross inflows is as expected, as foreign investors pull away from EMEs in light of the change in interest rate differentials. Why local investors behave asymmetrically by reducing their holdings of net foreign assets is less clear. While home bias or heterogeneity in investors’ assessments of asset valuations may be possible explanations, it is not obvious why they do not play a role in case of a short-term rate shock. A glance at the dynamics of the responses may shed some light. While the decline in gross outflows occurs with a lag (starting two quarters after the shock), the drop in gross inflows starts in the same quarter of the shock. This may be consistent with foreign investors reacting promptly to the change in interest rate differentials, typically associated with local currency depreciation and drops in the price of local assets, which may subsequently induce local investors—focused on the domestic purchasing power of their wealth—to repatriate foreign assets in order to “lock-in” valuation gains.
especially in assessing the effect of QE tapering on capital flows at the current juncture. In this context, whether the rise in interest rates reflects improved economic conditions in the United States or a pure monetary policy shock could have very different implications in terms of the impact on capital flows to EMEs. In this regard, although not the main focus of the chapter, an interesting result from the estimated PVAR model is that net capital inflows to EMEs respond positively to a positive disturbance to U.S. GDP growth. This occurs despite the associated increase in the U.S. interest rate (Figure 9.5), suggesting that the effect through real linkages outweighs the impact through financial channels. Furthermore, a positive response of net flows reflects a repatriation of external assets by residents that is larger than the fall in nonresident capital inflows. This finding suggests that a normalization of U.S. monetary policy that occurs primarily as a result of an improving growth outlook would have only a moderate impact on EMEs.

Figure 9.5  Response of Gross Capital Flows to Other Foreign Shocks

Source: Authors’ calculations.

Note: Response to a one standard deviation shock to U.S. real GDP growth (0.6 percentage point) and commodity prices (7.5 percentage points). Time horizon in quarters. See Annex Table A9.2.1 for definitions of variables.
Finally, the analysis finds that a positive shock to international commodity prices tends to have a positive impact on gross capital inflows (foreign investors increase their net purchases of domestic assets). Net inflows also increase, though to a lesser extent than gross inflows, owing to the positive response of gross outflows (residents increase their net purchases of external assets).

The results discussed above are robust to alternative specifications of the model (not presented here). Specifically, we check the results in a model with additional lags, as well as changing the ordering of the variables in the Choleski decomposition, both within the group of global variables and the gross capital flow series.

Extensions

Financial Integration

The analysis examines whether results depend on the country’s degree of financial integration with the rest of the world. To this end, we split the sample in two groups based on each country’s average degree of financial integration during the sample period, distinguishing those that were above or below the median value for the whole sample. Financial integration is measured as the sum of total foreign assets and foreign liabilities, in percent of GDP, using the updated version of the dataset created by Lane and Milesi-Ferretti (2007).

Interesting differences are found between the more-integrated and less-integrated economies (Figure 9.6). While global uncertainty shocks do not appear to have a statistically significant effect on net capital inflows to financially integrated EMEs, they do have a sizable impact on the less-integrated economies. Although both groups are subject to a sharp drop in gross capital inflows, the extent of asset repatriation by local investors is much larger in the more financially integrated economies (fully offsetting the drop in gross inflows). Short-term interest rate shocks, in turn, have a negative impact on net inflows to both groups of countries, yet the impact is larger in financially integrated economies. This mainly reflects the fact that the increase in gross outflows tends to be larger in the more financially integrated economies, where domestic investors appear to be highly sensitive to this type of shock. Finally, foreign investors reduce their accumulation of local assets (that is, gross inflows decline) and local investors reduce their holdings of foreign assets (that is, gross outflows fall) in response to a shock to the 10-year Treasury rate in both groups of countries. Gross flows appear to be, at least on impact, more sensitive in the case of the more financially integrated economies. The offsetting effect of asset repatriation is relatively small, so net capital inflows decline in both groups of countries.

Alternatively, we split the sample using a measure of financial integration based on the degree of capital account openness, as measured by Quinn, Schindler, and Toyoda (2011). The results are roughly similar (Figure 9.7). Uncertainty shocks do not have a significant impact on net capital flows to EMEs.
with more open capital accounts, as asset repatriation by residents fully offsets the drop in gross capital inflows. After short-term interest rate shocks, in contrast, there is no asset repatriation by residents, as they actually increase their purchase of foreign assets. A shock to the 10-year Treasury bond rate has a negative impact on net capital inflows, as the decline in gross outflows is not large enough to
high financial openness
Low financial openness
Response of NKF to VIX shock
Response of NKF to INT shock
Response of NKF to INT_10Y shock
Response of GKI to VIX shock
Response of GKI to INT shock
Response of GKI to INT_10Y shock
Response of GKO to VIX shock
Response of GKO to INT shock
Response of GKO to INT_10Y shock

Figure 9.7 Response of Capital Flows to Global Financial Shocks: The Role of Capital Account Openness

Source: Authors’ calculations.
Note: See Annex Table A9.2.1 for definitions of variables.
1 Based on overall index of capital account openness, as measured by Quinn, Schindler, and Toyoda (2011).

completely offset the fall in gross inflows. In economies with more capital account restrictions, we find that results are qualitatively similar but entail much smaller magnitudes in the response of both gross inflows and outflows, as expected given the partial restrictions on capital mobility.
The analysis next examines the response of different types of capital flows to global shocks. With this aim, we break up the series of net and gross flows into their foreign direct investment (FDI) and non-FDI components. We find qualitatively similar responses for both types of flows to global uncertainty shocks (Figure 9.8), but, as expected, much larger sensitivities in the case of non-FDI flows.
flows (mainly portfolio and other debt flows). The response of non-FDI (gross and net) flows to a U.S. short-term interest rate shock is similar to that of total flows, with declines in gross inflows and increases in gross outflows. However, the impact of such shocks on FDI (gross and net) inflows appears to be insignificant. The impact of a shock to the U.S. 10-year interest rate on non-FDI (gross and net) flows is similar to that on total flows. Both net and gross inflows decline, while gross outflows also fall—although the magnitude of asset repatriation is relatively small. The sensitivity of FDI gross flows to a shock to the 10-year rate is much lower, with the impact on net flows being insignificant. The responses of the two types of flows to U.S. growth shocks are also different (Figure A9.2.2 in Annex 9.2). While improvements in economic activity in the United States appear to induce non-FDI net inflows to EMEs, the response of net inflows of FDI is negative. Finally, both FDI and non-FDI net and gross inflows react positively to increases in commodity prices.

**Regional Perspective**

Potential differences across regions are explored by splitting the sample into four EME regions: Asia, Europe, Latin America, and others. Qualitatively, the main results of the benchmark specification hold for the most part for all regions. There are, however, differences across them in terms of the magnitude of the impact of the shocks analyzed (Figure 9.9). Most interesting to note is:

- Global uncertainty shocks appear to have a particularly large impact on net inflows to Latin American (and to a lesser extent Asian) EMEs. This reflects a sizable decline of gross inflows (twice as large as in the benchmark specification), only partially offset by asset repatriation by residents. In emerging Europe, in contrast, the effect on both gross and net inflows is not significant.

- The negative impact of U.S. short-term interest rate shocks on net flows appears to be (qualitatively) more uniform across regions, although it is considerably larger in emerging Europe. In this region, the sharp decline is mostly driven by the large fall in gross inflows (the increase in gross outflows by local investors also contributes, but to a much lesser extent). On the other hand, in Asia and Latin America the decline in net inflows is largely explained by increases in foreign asset accumulation by residents.

- A shock to the U.S. 10-year interest rate has a negative impact on net capital inflows in all EME regions, except in emerging Europe. The fall in net flows is especially large in Latin America, reflecting a substantial decline in gross inflows that is not offset by the decline in gross outflows. Interestingly, only in this region (and to a lesser extent in Asia) do local investors respond to shocks to the U.S. 10-year rate by repatriating foreign assets.

---

16 A breakdown of non-FDI flows into portfolio and other debt-creating flows is not possible given data inconsistencies in some countries in the earlier part of our sample.
Figure 9.9  Response of Capital Flows to Global Financial Shocks: A Regional Perspective

Source: Authors’ calculations.
Note: See Annex Table A9.2.1 for definitions of variables and Annex Table A9.2.2 for list of countries.
CONCLUSIONS

This chapter studied the dynamic response of gross capital flows in EMEs to different global financial shocks, with a focus on the possible stabilizing role played by domestic investors in offsetting the behavior of foreign investors. The analysis finds evidence of such a role, but its existence and magnitude depend on the type of shock.

Local investors appear to offset the behavior of nonresidents in the face of global uncertainty shocks, as well as shocks to long-term U.S. interest rates. In the
former case, sizable asset repatriations largely offset the retrenchment of nonresidents, except in Latin America. In this region, global uncertainty shocks appear to have a particularly large negative impact on net inflows, reflecting a sizable decline of gross inflows (twice as large as in the other EMEs), which is only partially offset by residents’ asset repatriation. In the case of long-term U.S. interest rate shocks, the offsetting effect is much more limited (with shocks causing net outflows from EMEs). In the case of short-term U.S. interest rate shocks, on the other hand, residents and nonresidents appear to behave alike (shifting capital toward higher interest rates), although magnitudes appear to be economically moderate.

These results suggest that, while increased financial integration over the past two decades may have raised the exposure of EMEs to global financial shocks, increased foreign asset holdings are likely to play an important—though not complete—stabilizing role. The findings also have important implications for assessing the possible impact of the U.S. Federal Reserve’s exit from quantitative easing going forward. In particular, the analysis finds that a rise in long-term U.S. interest rates would have only moderate effects on capital flows to EMEs if it is mainly driven by positive developments in U.S. economic activity. If, in contrast, the rise largely reflects a pure U.S. interest rate shock, the impact would be more sizable, as asset repatriation would only play a partial stabilizing role.
ANNEX 9.1. A SIMPLE EVENT ANALYSIS

As a first attempt to explore the potential impact of global financial shocks on capital flows to emerging market economies (EMEs), a simple event analysis is performed. The exercise entails an examination of net and gross capital flows for a sample of 38 EMEs, centering them at the quarter of the largest variation of the VIX, the federal funds rate, and the U.S. 10-year Treasury bond interest rate within the shock episodes depicted in Figure 9.1 (Table A9.1.1 presents the details about the episodes). The focus is primarily on adverse shocks (that is, sharp increases in each of these variables). Flows are de-meaned to exclude possible country-specific level effects.

This simple exercise fails to unveil any discernible pattern (Figure A9.1.1), except in the case of uncertainty shocks. Spikes in global uncertainty appear to affect capital flows to EMEs significantly, with a marked deceleration in net inflows (upper left panel). The decline in net inflows is largely driven by the behavior of gross inflows, which display a sizable reversal during these episodes. Gross outflows, on the other hand, appear to play a meaningful offsetting role only in some cases (as illustrated by the drop in the line corresponding to the 25th percentile). Furthermore, there is no evidence of acceleration in gross outflows, pointing to asymmetric behavior of residents, who do not exacerbate reversals in gross capital inflows, and in some cases help to offset them.

Interestingly, in the case of (U.S.) interest rate shocks (both short- and long-term rates), the analysis finds no clear pattern for the response of capital flows. These results hold, broadly, across different EME regions (Figures A9.1.2–A9.1.4). The lack of a clear pattern is likely to reflect the joint occurrence of shocks, as global financial conditions are typically highly correlated with economic activity and commodity prices (Figure A9.1.5). This high correlation stresses the importance of disentangling the effect of financial shocks from other (real) external shocks in a multivariate setting. It should be noted that such a correlation is also relevant in the case of uncertainty (VIX) shocks. However, while in the latter cases the effect of economic activity and financial shocks on EMEs’ flows are likely to be of the same sign (with weaker economic activity as well as distress in global financial markets negatively affecting flows to EMEs), this is unlikely to be the case for U.S. interest rate shocks.

---

17 See the list of countries in Table A9.2.2 in Annex 9.2.
### TABLE A9.1.1
Episodes of Global Financial Shocks

<table>
<thead>
<tr>
<th>VIX Shocks</th>
<th>U.S. Federal Funds Interest Rate Shocks</th>
<th>10-Year U.S. Treasury Bond Interest Rate Shocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episode</td>
<td>VIX Level</td>
<td>Start</td>
</tr>
<tr>
<td>1990:Q1</td>
<td>1990:Q4</td>
<td>9.6</td>
</tr>
<tr>
<td>1997:Q4</td>
<td>1997:Q4</td>
<td>22.5</td>
</tr>
<tr>
<td>1998:Q3</td>
<td>1999:Q1</td>
<td>21.5</td>
</tr>
<tr>
<td>2008:Q4</td>
<td>2009:Q2</td>
<td>25.1</td>
</tr>
<tr>
<td>2011:Q3</td>
<td>2011:Q4</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations.

Note: Based on quarterly averages. In percent, except for the VIX index. VIX = Chicago Board Options Exchange Market Volatility Index.
Figure A9.1.1 Capital Flows to Emerging Markets around Negative Global Financial Shock Episodes (Percent of GDP)

Sources: IMF, Balance of Payments Statistics; and authors’ calculations.

Note: Negative episodes refers to increases in global uncertainty or interest rates. De-meaned series. Gross outflows (inflows) refer to asset (liability) side flows—that is, positive numbers denote outflows (inflows).
Figure A9.1.2  Capital Flows to Emerging Markets around Global Uncertainty Shock Episodes (Percent of GDP)

Source: IMF, Balance of Payments Statistics; and authors’ calculations.
Note: De-meaned series. Gross outflows (inflows) refer to asset (liability) side flows—that is, positive numbers denote outflows (inflows).

Figure A9.1.3  Capital Flows to Emerging Markets around Federal Funds Rate Shock Episodes (Percent of GDP)

Sources: IMF, Balance of Payments Statistics; and authors’ calculations.
Note: De-meaned series. Gross outflows (inflows) refer to asset (liability) side flows—that is, positive numbers denote outflows (inflows).
Figure A9.1.4 Capital Flows to Emerging Markets around U.S. 10-Year Treasury Bond Interest Rate Shock Episodes (Percent of GDP)

Sources: IMF, Balance of Payments Statistics; and authors’ calculations.
Note: De-meaned series. Gross outflows (inflows) refer to asset (liability) side flows—that is, positive numbers denote outflows (inflows).

Figure A9.1.5 Global Financial Conditions, U.S. Output, and Commodity Prices (Percent, unless otherwise stated)

Sources: Cleveland Federal Reserve; and Haver Analytics.
1 Chicago Board Options Exchange Market Volatility Index.
2 Real interest rates based on forward-looking (1-year and 10-year) inflation expectations.
3 IMF broad commodity price index. Annual percentage change.
ANNEX 9.2. ADDITIONAL TABLES AND FIGURES

Figure A9.2.1  Benchmark Model: Impulse Responses

Source: Authors’ calculations.
Note: See Annex Table A9.2.1 for definitions of variables.
Figure A9.2.2  Response of Gross Capital Flows to Other Foreign Shocks: Type of Flows

Source: Authors’ calculations.
Note: Response to a one standard deviation shock to U.S. real GDP growth (0.6 percentage point) and commodity prices (7.5 percentage points). Time horizon in quarters. See Annex Table A9.2.1 for definitions of variables.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definitions</th>
<th>Details</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>GKI</td>
<td>Gross capital inflows</td>
<td>Total liabilities in terms of trend nominal GDP in U.S. dollars: ((FDI_{Liab} + PI_{Liab} + OI_{Liab})/GDP). Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>GKO</td>
<td>Gross capital outflows</td>
<td>Total Assets in terms of trend nominal GDP in U.S. dollars: ((FDI_{Assets} + PI_{Assets} + OI_{Assets})/GDP). Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>NKF</td>
<td>Net capital flows</td>
<td>Net liabilities flows in terms of trend nominal GDP in U.S. dollars: GKI - GKO. Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>GKO_FDI</td>
<td>Direct investment abroad</td>
<td>Net acquisition of financial assets: FDI, in terms of trend nominal GDP in U.S. dollars. Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>GKI_FDI</td>
<td>Direct investment in reporting countries</td>
<td>Net incurrence of financial liabilities: FDI, in terms of trend nominal GDP in U.S. dollars. Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>NKF_FDI</td>
<td>Net foreign direct investment</td>
<td>Net FDI in terms of trend nominal GDP in U.S. dollars: (GKI_{FDI} – GKO_{FDI}). Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>GKO_FDI</td>
<td>Non–foreign direct investment assets</td>
<td>Net acquisition of financial assets portfolio investment and other investment, in terms of trend nominal GDP in U.S. dollars. Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>GKI_FDI</td>
<td>Non–foreign direct investment liabilities</td>
<td>Net incurrence of financial liabilities; portfolio investment and other investment, in terms of trend nominal GDP in U.S. dollars. Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>NKF_FDI</td>
<td>Net non–foreign direct investment</td>
<td>Net Non-FDI, in terms of trend nominal GDP in U.S. dollars: (GKI_{NFDI} – GKO_{NFDI}). Forward de-meaned (Helmert transformation).</td>
<td>IMF, Balance of Payment BP6TS; and authors’ calculations.</td>
</tr>
<tr>
<td>GDP</td>
<td>Nominal detrend GDP, in U.S. dollars</td>
<td>Hodrick–Prescott filter.</td>
<td>IMF, World Economic Outlook</td>
</tr>
<tr>
<td>VIX</td>
<td>Chicago Board Options Exchange Market Volatility Index</td>
<td>Forward de-meaned (Helmert transformation).</td>
<td>Wall Street Journal</td>
</tr>
<tr>
<td>INT</td>
<td>Real federal funds rate</td>
<td>Federal funds rate deflated by expected inflation.</td>
<td>Federal Reserve Bank of Cleveland</td>
</tr>
<tr>
<td>COMMP</td>
<td>Broad index of real commodities prices</td>
<td>Forward de-meaned by Helmert transformation.</td>
<td>IMF, World Economic Outlook</td>
</tr>
<tr>
<td>USGDP</td>
<td>Real U.S. GDP growth</td>
<td>Forward de-meaned by Helmert transformation.</td>
<td>IMF, World Economic Outlook</td>
</tr>
<tr>
<td>Dum_IIP</td>
<td>Degree of financial integration based on international investment position (IIP)</td>
<td>Take value 1 if IIP in terms of GDP of the country is greater than or equal to the median of the sample.</td>
<td>Lane and Milesi-Ferretti updated database</td>
</tr>
<tr>
<td>Dum_kapoen</td>
<td>Net degree of openness on net capital account</td>
<td>Take value 1 if the degree of openness is greater than or equal to the median of the sample, if more open.</td>
<td>Chinn-Ito Index</td>
</tr>
<tr>
<td>Dum_kao</td>
<td>Degree of openness on capital outflows</td>
<td>Take value 1 if the degree of openness is greater than or equal to the median of the sample, if more open.</td>
<td>Chinn-Ito Index</td>
</tr>
<tr>
<td>Dum_kai</td>
<td>Degree of openness on capital inflows</td>
<td>Take value 1 if the degree of openness is greater than or equal to the median of the sample, if more open.</td>
<td>Chinn-Ito Index</td>
</tr>
</tbody>
</table>
TABLE A9.2.2

Sample of Countries

<table>
<thead>
<tr>
<th>IFS code</th>
<th>Name</th>
<th>IFS code</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>213</td>
<td>Argentina</td>
<td>273</td>
<td>Mexico</td>
</tr>
<tr>
<td>911</td>
<td>Armenia</td>
<td>686</td>
<td>Morocco</td>
</tr>
<tr>
<td>913</td>
<td>Belarus</td>
<td>728</td>
<td>Namibia</td>
</tr>
<tr>
<td>223</td>
<td>Brazil</td>
<td>564</td>
<td>Pakistan</td>
</tr>
<tr>
<td>918</td>
<td>Bulgaria</td>
<td>283</td>
<td>Panama</td>
</tr>
<tr>
<td>228</td>
<td>Chile</td>
<td>288</td>
<td>Paraguay</td>
</tr>
<tr>
<td>924</td>
<td>China</td>
<td>293</td>
<td>Peru</td>
</tr>
<tr>
<td>233</td>
<td>Colombia</td>
<td>566</td>
<td>Philippines</td>
</tr>
<tr>
<td>238</td>
<td>Costa Rica</td>
<td>964</td>
<td>Poland</td>
</tr>
<tr>
<td>960</td>
<td>Croatia</td>
<td>968</td>
<td>Romania</td>
</tr>
<tr>
<td>258</td>
<td>Guatemala</td>
<td>922</td>
<td>Russia</td>
</tr>
<tr>
<td>944</td>
<td>Hungary</td>
<td>456</td>
<td>Saudi Arabia</td>
</tr>
<tr>
<td>534</td>
<td>India</td>
<td>199</td>
<td>South Africa</td>
</tr>
<tr>
<td>536</td>
<td>Indonesia</td>
<td>578</td>
<td>Thailand</td>
</tr>
<tr>
<td>439</td>
<td>Jordan</td>
<td>186</td>
<td>Turkey</td>
</tr>
<tr>
<td>916</td>
<td>Kazakhstan</td>
<td>926</td>
<td>Ukraine</td>
</tr>
<tr>
<td>941</td>
<td>Latvia</td>
<td>298</td>
<td>Uruguay</td>
</tr>
<tr>
<td>946</td>
<td>Lithuania</td>
<td>299</td>
<td>Venezuela</td>
</tr>
<tr>
<td>962</td>
<td>FYR Macedonia</td>
<td>582</td>
<td>Vietnam</td>
</tr>
<tr>
<td>548</td>
<td>Malaysia</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Includes countries classified as emerging market and developing countries according to the IMF’s World Economic Outlook classification. IFS = IMF, International Financial Statistics.

REFERENCES


International Monetary Fund (IMF), 2013, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, September.


Spillovers to Latin America from the Normalization of U.S. Monetary Policy

ALEXANDER KLEMM, ANDRE MEIER, AND SEBASTIÁN SOSA

Since the beginning of 2014, the U.S. Federal Reserve has started to reduce the scale of its bond purchases. Although the Federal Reserve’s stance remains highly expansionary, this “tapering” process marks the first stage in the anticipated normalization of U.S. monetary policy. Given the novelty of the Federal Reserve’s quantitative easing (QE) program, there are many question marks regarding how its unwinding will affect the rest of the world. Repeated bouts of financial market turmoil since May 2013 have raised concerns that sustained increases in U.S. interest rates could destabilize emerging market economies (EMEs) that have benefited from ultra-low external financing costs and received large capital inflows in recent years. This chapter examines how prospective changes in U.S. monetary conditions could affect the Latin American region, focusing in particular on spillovers through trade flows, bond, and foreign exchange markets.

SPILLOVER CHANNELS

The Federal Reserve’s decision to start tapering its bond purchases points to what is a priori a big positive for global economic activity, namely the strengthening of the recovery of the U.S. economy. Higher U.S. demand for imports will support the Latin American economies, although the size of this impact varies across countries. One of the greatest beneficiaries is likely to be Mexico, whose manufacturing industry has become highly integrated into the North American supply chain. Indeed, Mexico’s exports to the United States far exceed those of all other large countries in Latin America, both in absolute terms and relative to GDP (Figure 10.1). A stronger U.S. recovery would also help some economies in Central America with close U.S. trade links. Most of South America, however, would benefit only marginally.

The flip side of an improving economic outlook for the United States is the gradual removal of the extraordinary monetary stimulus that the Federal Reserve has imparted since 2008. In the short term, the main effect should be some upward drift in longer-term U.S. interest rates, as the horizon over which policy

1Beyond the impact of positive spillovers through merchandise trade, many countries in Central America would also benefit from more tourism and workers’ remittance flows from the United States.
rates are expected to stay close to zero shrinks. IMF staff projections are premised on a smooth adjustment, with 10-year yields increasing by some 120 basis points from current levels by end-2015. This is consistent with the argument in Chapter 3 of the April 2014 World Economic Outlook that U.S. real interest rates will remain relatively low for some time (IMF, 2014a). However, more abrupt changes in U.S. bond yields are possible, either because of news about the likely path of future policy rates or because of sudden shifts in the term premium (the gap between long-term bond yields and the average of expected short-term interest rates over the same horizon). Term premium shocks could arise, in particular, from remaining uncertainty over the timing and modalities of the exit from QE.

Higher long-term U.S. interest rates have a direct effect on EME debt denominated in U.S. dollars. As recently as two decades ago, this category of debt represented the bulk of public debt in Latin America. Accordingly, tighter Federal Reserve policy ineluctably drove up the marginal funding costs of governments (and other borrowers)—typically by more than one-for-one, as higher U.S. interest rates tend to coincide with wider spreads on foreign-currency EME debt (Table 10.1). Over the past decade, however, this vulnerability has diminished appreciably in Latin America, as most countries have shifted their issuance toward local-currency debt (Figure 10.2).
<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Methodology</th>
<th>Measure of U.S. Monetary Stance</th>
<th>Main Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arora and Cerisola (2001)</td>
<td>1994–2001; 11 EMEs</td>
<td>Country-specific regressions</td>
<td>10-year Treasury bond yield and federal funds rate</td>
<td>Positive relationship with EME spreads (average elasticities of 0.78 and 0.82 for 10-year and federal funds rates, respectively)</td>
</tr>
<tr>
<td>Uribe and Yue (2006)</td>
<td>1994–2001; 7 EMEs</td>
<td>Vector autoregressions model</td>
<td>3-month Treasury bill real rate</td>
<td>A 1 percentage point rise in U.S. interest rates raises EMBI yields by ½ percentage point on impact, and by 1¾ percentage points after one year</td>
</tr>
<tr>
<td>Hartelius, Kashiwase, and Kodres (2008)</td>
<td>1991–2007; 33 EMEs</td>
<td>Fixed effects panel</td>
<td>3-month federal funds rate</td>
<td>A 1 percent increase in the 3-month-ahead expected federal funds rate leads to an increase in spreads by 5 percent</td>
</tr>
<tr>
<td>Csonto and Ivaschenko (2013)</td>
<td>2001–13; 18 EMEs</td>
<td>Fixed effects and pooled mean group estimation</td>
<td>Federal funds rate, 3-month and 10-year Treasury yield</td>
<td>No statistically significant effect on EME spreads in the long term</td>
</tr>
</tbody>
</table>

Note: EMEs = emerging market economies; EMBI = J.P. Morgan Emerging Markets Bond Index.
This is not to deny that sizable direct exposures persist in some cases, notably in economies with fully dollarized financial systems, such as Ecuador and Panama, or those with limited capacity to issue local-currency debt. In addition, the region’s large firms have borrowed significant amounts abroad in recent years, notably through corporate bond markets. While this trend creates new vulnerabilities, many firms are initially shielded by the relatively long tenor of the bonds they issued. Near-term maturities are relatively moderate in general, delaying the direct effect of tighter U.S. financial conditions on refinancing costs and rollover risk (Figure 10.3), although potential currency mismatches bear close monitoring.

Focus on Local Bond Markets

The gradual dedollarization of public debt has boosted the resilience to exchange rate changes among the emerging economies in Latin America. In principle, it has also created greater scope for domestic financing costs to differ from foreign interest rates. However, domestic monetary policy settings and broader financial conditions clearly are not immune to external developments in a world of large cross-border flows and increased foreign investment in local EME bond markets.2 One tentative indication is the nearly universal, albeit differentiated, rise in long-

Figure 10.2 Selected Latin American Countries: Public Debt Denominated in Foreign Currency: 2013 versus 2003 (Percent of GDP)

Sources: National authorities; and IMF staff calculations.
Note: Includes debt instruments linked to foreign currency. Definition of the government sector varies somewhat across countries.

---

term bond yields across EMEs since the May 2013 “taper shock” in the United States (Figure 10.4). The impact of higher bond yields on domestic demand will vary across countries, but is likely to be significant in many cases, given the deepening of domestic credit markets over the past decade. Lower EME equity prices in the wake of an interest rate increase would add to the contractionary impact, though a weaker exchange rate should generally be supportive for growth.

Two channels, in particular, account for the synchronized rise in bond yields apparent from Figure 10.4. First, rising U.S. bond yields lower the attractiveness of investments in other currencies, putting pressure on EME exchange rates. These pressures may lead central banks to raise policy rates to avert excessive pass-through to domestic inflation (or other destabilizing effects related to capital outflows and currency depreciation). A higher path for short-term policy rates, in turn, affects longer-term bond yields. Second, term premiums are likely to be positively correlated across countries, reflecting common trends in uncertainty and risk aversion. Third potential explanation for the synchronized rise in interest rates is that it represents a generalized improvement in the growth outlook. However, the evidence seems to rule out this possibility. Countries facing the largest rise in interest rates have tended to experience the sharpest downward revisions in growth forecasts (Figure 10.5). Put differently, domestic financial conditions have tightened the most not in countries featuring the brightest near-term growth.

Figure 10.3 Latin America: Foreign-Currency Bonds Outstanding by Maturity Date (Billions of U.S. dollars)

Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Includes all bonds denominated in advanced economy currencies with original maturity greater than one year that were outstanding as of early January 2014. Corporate bonds identified based on issuer’s “country of risk.”

For a deeper analysis of common trends in long-term real interest rates, see Chapter 3 of the April 2014 World Economic Outlook (IMF, 2014a) and Turner (2014).
Figure 10.4 Selected Economies: Changes in Policy Rates and Domestic Bond Yields since end-April 2013 (Percentage points)

Sources: Bloomberg L.P.; and IMF staff calculations.
Note: Shows change over the period April 30, 2013 to March 27, 2014. BRA = Brazil; CHL = Chile; COL = Colombia; HUN = Hungary; IDN = Indonesia; IND = India; ISR = Israel; KOR = Korea; MEX = Mexico; MYS = Malaysia; PER = Peru; PHL = Philippines; POL = Poland; THA = Thailand; TUR = Turkey; USA = United States; ZAF = South Africa.

1 Bond yield data for Brazil and Chile reflect bonds with a residual maturity of nine years toward the end of the sample period.

Figure 10.5 Selected Economies: Changes in Policy Rates, Domestic Bond Yields, and Growth Forecasts since end-April 2013 (Percentage points)

Sources: Bloomberg L.P.; and IMF staff calculations.
Note: BRA = Brazil; CHL = Chile; COL = Colombia; HUN = Hungary; IDN = Indonesia; IND = India; ISR = Israel; KOR = Korea; MEX = Mexico; MYS = Malaysia; PER = Peru; PHL = Philippines; POL = Poland; THA = Thailand; TUR = Turkey; USA = United States; ZAF = South Africa.

1 Change in average growth forecast among analysts surveyed by Bloomberg L.P. between April 30, 2013 and March 27, 2014.
2 Change over the period April 30, 2013 to March 27, 2014.
3 Change in 10-year domestic bond yield between April 30, 2013 and March 27, 2014.
Changes for Chile and Israel were negative. Yield data for Brazil and Chile reflect bonds with a residual maturity of nine years toward the end of the sample period.
prospects, but in those facing a combination of inflation and exchange rate pressures (Figure 10.6). On further inspection, these attributes also correlate closely with elevated current account deficits and significant earlier appreciation of the real exchange rate. The underlying problem, therefore, may be a recent history of strong capital inflow pressures that pushed up real exchange rates—fueling wider external deficits—and led central banks to keep monetary policy looser than they otherwise would have.4

**SENSITIVITY OF BOND YIELDS TO U.S. MONETARY SHOCKS**

Turning to a more formal investigation, this chapter traces the response of 10-year local-currency government bond yields to U.S. monetary shocks. The shocks are identified in a U.S.-specific vector autoregression (VAR) model with sign restrictions. Positive monetary shocks are identified as innovations that drive up 10-year U.S. Treasury bond yields, while depressing the price of equities. As such, they are distinguished from positive news shocks, which raise both bond yields and equity

---

4See also Eichengreen and Gupta (2014), Mishra and others (2014), and Sahay and others (2014).
prices.\textsuperscript{5} In essence, monetary shocks capture unanticipated changes in the perceived outlook for monetary policy that are unrelated to changes in growth expectations or investor risk sentiment. The analysis focuses on shocks affecting long-term U.S. bond yields, as these capture perceived changes in the monetary stance even under unconventional policies, such as QE or “forward guidance.”

**Bond Market Turmoil in 2013: Structural Break or Anomaly?**

Using a simple regression approach for daily data going back to 2004, this chapter finds that the response of 10-year U.S. bond yields to the monetary shocks described above is very steady, with yields rising by about three basis points in response to a standardized positive shock. The response of local-currency EME bond yields is more variable, but typically hovers in a range of one to two basis points, implying that they co-move less than one-for-one with U.S. bond yields, including in Latin America (Figure 10.7).\textsuperscript{6} However, the estimated sensitivity surged markedly in 2013, with most EME bond yields exhibiting betas (that is, responses relative to the change in the U.S. yield itself) well in excess of one.\textsuperscript{7} For the most intense period of EME turmoil in 2013 (that is, from May 21 to September 5), these high betas explain between 30 and 80 percent of the observed increase in bond yields for most EMEs (Figure 10.8).

Does this striking rise in the impact of U.S. monetary shocks on EME bond yields signal a lasting change, coinciding with an inflection point in Federal Reserve policy? It is difficult to be sure, but there are a few indications to the contrary. First, the sensitivity of EME bond yields has eased again in recent months. Second, we find no evidence of a structural break in 2008–09, when QE was first launched, casting doubt on the notion that the impact of U.S. monetary policy changed fundamentally with the shift to unconventional policy. Third, there is no evidence in our sample that upward moves in U.S. bond yields have systematically larger effects on EME yields than downward moves. Despite these considerations, however, it would not seem prudent to dismiss the taper shock as a total anomaly.

One factor that may explain the outsized changes in EME bond yields in mid-2013 is the extreme market situation prior to the taper shock—interest

\textsuperscript{5}News shocks capture other sources of news that could affect bond yields, notably growth surprises or variation in risk sentiment. For more details on the empirical approach, see the 2014 IMF Spillover Report (forthcoming).

\textsuperscript{6}The regression relates EME bond yield changes to the contemporaneous and one-day-lagged value of the U.S. monetary and news shocks to allow for delayed effects on markets in the Asian and European time zones.

\textsuperscript{7}By contrast, the response to news shocks fluctuates around zero for the average EME over the sample period, suggesting that the positive co-movement induced by growth surprises (higher U.S. growth reduces slack in EMES, leading to tighter monetary conditions) is broadly offset by the negative co-movement owing to risk appetite shocks (higher risk appetite raises U.S. bond yields but lowers EME yields). We also find no significant response of EME yields to U.S. growth shocks in regressions that include the Goldman Sachs daily U.S. growth surprise index as an additional regressor.
Figure 10.7  Normalized Response (“Beta”) of Domestic Bond Yields to U.S. Monetary Shocks

Sources: Bloomberg L.P.; and IMF staff calculations.

Note: Based on country-specific, 6-month rolling regressions of daily changes in 10-year domestic government bond yields on the contemporaneous and one-day lagged U.S. monetary and news shocks. The betas shown above are computed by adding the two coefficients on the U.S. money shock from the country-specific regression, and dividing by the sum of the corresponding two coefficients from the U.S. bond yield regression.

1 Economies with data availability for January 2004–February 2014: China, Hong Kong SAR, Hungary, India, Indonesia, Korea, Mexico, Philippines, Poland, Singapore, South Africa, and Thailand.

2 Panel varies, due to data availability, but in all periods shown includes at least four of the following countries: Brazil, Chile, Colombia, Mexico, and Peru. Yield data for Brazil and Chile combine bonds with 9 and 10 years’ residual maturity.

Figure 10.8  Selected Economies: Factors Explaining Changes in Bond Yields during the “Taper Shock” (Basis points)

Sources: Bloomberg L.P.; and IMF staff calculations.

Note: “Taper shock” refers to the period May 21, 2013 to September 5, 2013, based on a regression of daily changes in 10-year government bond yields on identified U.S. shocks. Yield data for Brazil and Chile combine bonds with 9 and 10 years’ residual maturity.

1 Includes impact of other external or domestic factors captured by the regression constant and residuals.
rates in most EMEs had hit record-low levels, both in nominal and real terms, as many investors were positioned for persistently loose monetary conditions and low volatility. This situation made markets particularly vulnerable to news about a monetary turning point or a rise in uncertainty—as generated by the May 22 testimony by then Federal Reserve Board Chairman Ben Bernanke, which triggered the sell-off in global bond markets. Since then, long-term nominal and real interest rates in EMEs have normalized to some extent, although they remain below longer-term averages in most countries (Figure 10.9).

**Panel Regression Results**

The results from the daily yield regressions are broadly confirmed by a panel regression that uses monthly data and several control variables to explain changes in EME bond yields. As before, there is robust evidence for a positive response to U.S. monetary shocks and for a marked increase in that response in 2013. Also as before, the results do not point to a systematic difference in the response to positive versus negative U.S. monetary shocks. Perhaps more surprisingly, there is no evidence for yield sensitivities to be systematically related to typical indicators
of economic fundamentals over the entire sample period, although some of these variables are found to have a direct influence on yields (Table 10.2).  

**Limited Spillovers from Gradual Normalization, but Volatility Risks Remain**

Overall, the results presented suggest that a gradual and orderly normalization of U.S. monetary conditions should affect EME bond markets in a relatively moderate fashion. Local yields have historically tended to respond to U.S. monetary

---

8See also related work by Jaramillo and Weber (2013), Kamil and others (forthcoming), and Perrelli and Goes (forthcoming). Our own regressions use monthly data in first differences. Compared with some other studies, this may make it harder to gauge the full impact of economic fundamentals, which tend to display limited high-frequency variation within the same country.
shocks, but less than one-for-one. Other news shocks, which include positive U.S. growth surprises, appear to have even more limited (and possibly benign) effects on EME bond yields.9

Nonetheless, important risks remain. Renewed volatility in U.S. bond yields could trigger large, sudden moves in EME bond markets, especially if it were to coincide with other negative shocks to investor sentiment, such as adverse political or economic developments in EMEs. Based on the evidence of the mid-2013 market turmoil, the impact would tend to be larger in economies with weak external positions and limited capacity to maintain an accommodative policy stance. Market fluctuations could be heightened by the apparent decline in trading liquidity in recent years, as some banks have reduced their market-making activities.

**A CAPITAL FLOW PERSPECTIVE**

Further light can be shed on the possible impact of U.S. monetary policy normalization by focusing on capital flows rather than bond yields. As has been amply documented, the record-low real interest rates observed across EMEs in early 2013 were partly the reflection of strong portfolio capital inflows observed up to that point (Figure 10.10). This heightens the concern that rising U.S. interest rates could slow or reverse the flow of capital to EMEs.

To analyze the response of capital flows to shocks to long-term U.S. real interest rates, we build on the panel vector autoregression (PVAR) developed in Chapter 9. Besides the capital flow variables, the model includes country-specific fixed effects and a set of global variables, that is, U.S. real output growth, global uncertainty (proxied by the Chicago Board Options Exchange Market Volatility Index—VIX), changes in the real U.S. federal funds rate, changes in the 10-year real U.S. interest rate, and the log difference of a commodity price index. For details on the methodology and data, refer to Chapter 9.10

**Investor Reactions to Changes in Long-Term U.S. Interest Rates**

The results suggest that shocks to the real U.S. Treasury bond rate have a significant impact on capital flows to EMEs (Figure 10.11). Gross inflows decline markedly, falling almost 2 percent of GDP over six quarters in response to a 100-basis point increase in the real Treasury rate. The impact on net capital inflows, while also negative, is more muted, reflecting the stabilizing role played by domestic investors. Indeed, the latter tend to react by repatriating external assets, partly offsetting the retrenchment of foreign investors.

The results shown in Figure 10.11 appear broadly in line with the experience during the taper shock of 2013. In most Latin American countries, the

---

9 This is consistent with prima facie evidence from the previous U.S. monetary tightening cycle of 2004–06, when short- and longer-term interest rates in Brazil, Chile, Colombia, Mexico, and Peru rose less than in the United States, or even declined.
10 See also Adler, Djigbenou, and Sosa (2014).
Figure 10.10  LA5: Aggregated Portfolio Inflows (Percent of aggregated GDP)

Sources: National authorities; and IMF staff calculations.
Note: LA5 includes Brazil, Chile, Colombia, Mexico, and Peru. Gross inflows refer to the change in portfolio liabilities, net inflows to the change in portfolio liabilities minus the change in portfolio assets. For 2013, data are annualized based on quarterly data through the third quarter (through the second quarter only for Peru).

Figure 10.11  Response of Capital Flows to Emerging Market Economies to a U.S. Long-Term Interest Rate Shock (Percentage points of domestic GDP)

Source: IMF staff calculations.
Note: Response to a one standard deviation (that is, 23 basis points) shock to the real 10-year Treasury bond yield. Confidence intervals (5th and 95th percentiles) computed with Monte Carlo simulations (shaded areas). Gross inflows denote the change in international liabilities; gross outflows denote the change in international assets.
The retrenchment of foreign investors was partially offset by asset repatriation by residents, mitigating the negative impact on net flows.

As discussed in Chapter 9, by controlling for U.S. output growth in the PVAR, we ensure that the estimated effects reflect those of “pure” U.S. interest rate shocks, and not the endogenous response of interest rates to U.S. output shocks. In the context of the Federal Reserve’s exit from QE, however, rising interest rates may be predominantly the result of stronger economic prospects. For this scenario, we find that net capital flows to EMEs respond positively to an increase in U.S. GDP growth (Figure 10.12), despite the associated rise in U.S. interest rates. Although there is no clear-cut mapping from capital flows to asset prices, this finding broadly conforms with the main results from the yield regressions reported above—EMEs would not have to be particularly concerned about an orderly normalization of U.S. monetary policy that mirrors an improving growth outlook.

In contrast, markets are likely to suffer fresh bouts of volatility in the case of an independent shock to global risk sentiment. Indeed, such shocks (proxied by changes in the VIX) appear to have a particularly large impact on net inflows to Latin America. Specifically, there is a considerable decline of gross inflows (twice as large as in the average EME), which is only partially offset by residents’ asset repatriation.

**ILLUSTRATIVE RESULTS FROM A FULL-FLEDGED MACRO MODEL**

To sum up, the scenario of a strengthening U.S. recovery provides positive real-sector impulses to Mexico and several Central American economies, but is less
important for South America. A rise in U.S. bond yields, meanwhile, tightens financial conditions more broadly, but should have only moderate effects if it is gradual and driven by positive output developments in the U.S. economy. Of greater concern would be a pure U.S. interest rate shock, whose impact would be felt most acutely in the more vulnerable economies across the region. Exchange rate flexibility, in turn, should help to buffer adverse shocks to the extent that it facilitates an orderly rebalancing toward stronger net exports.

To illustrate the interplay of these different channels, we run simulations of the IMF’s Flexible Suite of Global Models (FSGM), which allows a general equilibrium analysis of the global economy with significant regional specificity. The first shock considered is a stronger-than-expected U.S. recovery that entails a faster normalization of U.S. monetary policy. To this is added a second shock, a simultaneous rise in EME risk premiums, as could result from a renewed surge in U.S. term premiums.

The results confirm that, among the larger countries in Latin America, Mexico fares reasonably well even in the scenario of the combined shocks, reflecting the positive U.S. spillovers through the trade channel (Figure 10.13). In comparison, output growth in Brazil and a few of the other South American countries would be adversely affected, as the rise in risk premiums dominates any positive output spillovers.
POLICY IMPLICATIONS

These illustrative simulations confirm the broad findings of this chapter and underscore the importance for countries across Latin America to further reduce their vulnerability to large increases in external interest rates. The key to achieving greater resilience lies in continuing to strengthen policy frameworks and in securing robust balance sheets that enable countries to enact countercyclical policies when faced with adverse shocks. Indeed, a sharp tightening of external financial conditions may require that individual countries use some of the buffers that have been built up in recent years, notably their large holdings of international reserves. Several countries have also taken advantage of strong recent investor appetite for long-maturity assets by increasing average debt duration. Should yield curves steepen markedly going forward, these countries may have some room to reduce duration to accommodate this shock, without compromising a prudent overall strategy for debt management.

REFERENCES


International Monetary Fund (IMF), 2014a, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, April.


———, 2014c, Regional Economic Outlook: Western Hemisphere, World Economic and Financial Surveys, Washington, DC, April.


11See also the policy recommendations in Sahay and others (2014). Separately, Chapter 2 of the April 2014 Global Financial Stability Report proposes specific steps toward financial deepening, including the promotion of larger local investor bases, to enhance resilience to external shocks (IMF, 2014b).


CHAPTER 11

Housing Markets in Latin America: Do We Need to Worry About a Bubble?

LUI S C UBEDDU, CAM ILO E. TOVAR, AND EVRIDI KI TSOUNTA

Easy financing conditions and favorable terms of trade have fueled credit and domestic demand in much of Latin America for more than a decade, with only a short interruption during the 2008–09 global crisis (Figure 11.1). The credit expansion has been particularly impressive for the mortgage sector, where legal reforms and government subsidies have also played a role. This strong growth—from generally low mortgage credit levels—to a large extent reflects a process of financial deepening necessary to address the significant housing deficits in the region (Figure 11.2).

However, given the region’s long history of credit booms gone wrong, there are valid concerns about the potential buildup of financial sector excesses, even if current credit indicators appear manageable. Experience shows that credit-driven bubbles build slowly but can sour quickly. Indeed, even though housing market crashes have been rare in the region, Colombia’s experience in the late 1990s is a useful reminder of the systemic effects that even a small mortgage sector can have on the economy. Moreover, as seen in the recent U.S. housing crisis, problems in a small market (for example, the subprime sector) can become systemic, especially in new markets with significant data gaps.

The increase in mortgage credit in many countries of the region has been accompanied by an increase in home prices. In fact, the average real home price for the more financially integrated economies of the region (Brazil, Chile, Colombia, Mexico, Peru, and Uruguay) rose at an annual rate of over 7½ percent between 2009 and 2013. While the average price increase is well below that in emerging Europe in the run-up to the global financial crisis, it is somewhat above that in emerging Asia during the same time period.

This chapter documents developments in the housing and mortgage markets in Latin America during the past decade, comparing them to those of other

This chapter updates an earlier work published as Cubeddu, Tovar, and Tsounta (2012).

1 The Economic Commission for Latin America and the Caribbean estimates the housing deficit between 42 and 51 million units. Meanwhile, the Ministerial Commission on Housing and Urbanization for Latin America and the Caribbean found that only 60 percent of families in the region had adequate housing in 2007. For country-specific data on the housing deficit see UN Habitat (2011, Chapter 3).
emerging market economies. In addition, and despite serious data limitations, the chapter assesses whether (1) growth in mortgage credit is excessive compared to its long-term trend; (2) trends in house prices reflect changes in economic fundamentals; and (3) the extent to which vulnerabilities may be building in the household and banking sectors.

Relying on standard statistical and econometric techniques, the analysis finds little evidence of excessive growth in mortgage credit in much of the region. In Brazil, while mortgage credit has been growing very rapidly in recent years
(supported by the expansion of government-sponsored housing credit programs), the mortgage-credit-to-GDP ratio is still low relative to that of other emerging market economies. Similarly, while there is evidence of minor house price misalignments in a few countries of the region (Peru and, to a lesser extent, Brazil), it cannot be concluded that there is a bubble in the real estate market. However, excesses and vulnerabilities are not always captured by contemporaneous indicators, only becoming visible if the current rates of mortgage credit and house price growth are sustained for an extended period.

To broaden the assessment of vulnerabilities, this chapter also examines the exposure of household and bank balance sheets to the real estate sector. The analysis finds that the number of nonperforming mortgage loans is still relatively low, and that mortgages continue to represent a small share of banks’ assets. Similarly, household indebtedness indicators (where available) suggest that financial burdens remain at manageable levels, although they are rising, especially for low-income households.

The overall findings should be interpreted with caution, since a proper assessment of the mortgage credit and housing situation is hindered by the fairly limited and weak information available for the real estate sector. House price data are only available for some countries—notably the largest Latin American economies—and even when available, time series are usually of short span and coverage is often limited to large metropolitan areas. In addition, there is little information on the stock and flows of housing and construction activity, as well as on housing-specific financial soundness indicators and household balance sheets. Addressing these data gaps remains an urgent priority in the region.

This chapter first documents recent developments in the mortgage credit and real estate sector in Latin America, then highlights the data gaps that hinder a comprehensive assessment of the risks and vulnerabilities of the real estate sector. Notwithstanding these constraints, the chapter then provides an assessment of misalignments in the levels of mortgage credit and house prices, followed by a discussion on the state of household and financial balance sheets in the region, policy recommendations, and conclusions.

DEVELOPMENTS IN THE MORTGAGE CREDIT AND REAL ESTATE SECTOR

Mortgage Credit

During the past decade, much of Latin America has experienced an unprecedented expansion in overall credit, and mortgage credit in particular. Favorable external conditions, sustained economic growth, stronger fundamentals, and legal reforms have raised living standards and improved financing conditions, helping
to unleash housing finance. Real mortgage credit in the more financially integrated economies of the region (Brazil, Chile, Colombia, Mexico, Peru, and Uruguay) grew by an annual average of 12 percent between 2003 and early 2014, and was less affected by the global financial crisis than other sectors (such as consumption and corporate credit). Growth in mortgage credit has been particularly strong in Brazil, where the inflation-adjusted stock of mortgage loans increased nine-fold since 2003, albeit from a low base (Figure 11.3).

Structural reforms in property and credit markets as well as government efforts to broaden access to credit have been critical. For example, both Brazil (2005) and Mexico (2007) enacted bankruptcy reforms to strengthen creditor rights\(^3\) and overhauled their credit registries to enable banks to better gauge the creditworthiness of debtors.\(^4\) In addition, Brazil (where three-quarters of all housing credit has been provided by state-owned banks) relied extensively on mortgage credit subsidies, while Mexico provided mortgage insurance and guarantees through a government agency to support the residential mortgage-backed securities market (Scatigna and Tovar, 2007). The expansion of mortgage credit in Latin America has also gone hand-in-hand with the development of the domestic bond market in local currency and the lengthening of the term structure of yield curves, which in some cases has reached 20–30 years (Jeanneau and Tovar, 2008).\(^5\)

Despite the rapid credit growth in recent years, however, financial intermediation levels in most of Latin America (with the notable exception of Chile) remain

\(^3\)Since its inception in 2000, the insolvency law in Mexico has been used on very few occasions.
\(^4\)Warnock and Warnock (2008) show that housing finance is positively correlated with the enforceability of legal rights, as well as with the existence of systems to assess credit risk.
\(^5\)See Garcia (2009) for a discussion of housing finance developments in Chile, including the impact of changes in pension fund regulations on mortgage finance.
Rising mortgage credit has gone hand-in-hand with the expansion of the construction sector. The share of construction in GDP has grown sharply during the past decade in the more financially integrated countries of Latin America, reaching levels above those of emerging Asia, yet remaining below the peaks observed in emerging Europe prior to the Lehman crisis (Figure 11.4). In Brazil, the number of construction companies and projects is well above 2010 levels, despite some recent correction (SECOVI, 2012), and employment in the construction sector has grown by over 13 percent since 2009, with the share of construction in total employment reaching 7.7 percent by end-2013. Similarly, in Colombia building permits almost doubled between 2009 and 2013, reflecting in part an expansion of government housing-related subsidies, including through the extension of loans and residential leasing for “social interest” (vivienda de interés social) housing programs, and the introduction in 2013 of an interest subsidy program targeting middle-income earners (IMF, 2014).

House Prices

The increase in mortgage credit and construction activity has coincided with a significant increase in house prices in many Latin American countries. The average home price in the six more financially integrated economies in the region rose by an annual real rate of more than 7½ percent between 2010 and early 2014. While the average price increase is well below that in emerging Europe in the run-up to the Lehman crisis, it is somewhat above that in emerging Asia. However, in level terms Latin America’s house prices remain low by international comparison.

In particular, according to the Global Property Guide (2012), home property prices in some metropolitan areas of the region generally do not appear out of line

---

6According to Jha (2007), less than a quarter of all housing in Latin America is financed through formal mechanisms, with the exception of Chile, where mortgage financing represents around half of all house purchases (Morandé and Garcia, 2004; Central Bank of Chile, 2009). Similarly, in Mexico, between 1980 and 2003 more than half of all constructed housing units were built by the households themselves; less than 20 percent of these were built with formal financing (UN Habitat, 2011).

7However, housing is not the only factor behind this rising share; commercial real estate and public works also contributed to the rise.
<table>
<thead>
<tr>
<th>Country</th>
<th>Housing Indicators</th>
<th>Household Indicators</th>
<th>Financial Soundness Indicators¹</th>
<th>Access to Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Available Since</td>
<td>Frequency</td>
<td>Coverage</td>
<td>Housing Starts/Permits</td>
</tr>
<tr>
<td>United States</td>
<td>1987 monthly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Canada</td>
<td>1999 monthly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Latin America</td>
<td>Brazil 2010 monthly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Chile 2004 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Colombia 1997 quarterly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Mexico 2005 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Peru 1998 quarterly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Uruguay 2000 monthly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Memorandum items:</td>
<td>China 2005 monthly city</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>India 2010 quarterly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Indonesia 2002 quarterly city</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Malaysia 1999 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Philippines 1994 quarterly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Emerging Europe</td>
<td>Bulgaria 1993 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Croatia 2006 monthly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Estonia 2004 monthly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Hungary 1998 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Latvia 2004 monthly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Lithuania 1994 monthly city</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Poland 2004 monthly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Romania 2009 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Russia 2000 quarterly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Turkey 2007 monthly national</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Ukraine 2000 monthly metropolitan</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Sources: Eurostat; Global Property Guide; Haver Analytics; IMF, Financial Soundness Indicators (FSI); and World Bank, 2012 Doing Business Indicators.

¹ Information based on data reported in the FSI (black). In some instances, it was complemented with readily available data (green) from national sources.

² Data refer to start date of the series, frequency, and coverage. Some countries have more than one index, we report the one with the highest frequency.

³ Data not reported in the FSI but are available from national sources.

⁴ World Bank index that measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and thus facilitate lending. The index ranges from 0–10, with higher (green) and lower (red) values.

⁵ World Bank index that measures rules and practices affecting the coverage, scope, and accessibility of credit information available through a credit registry. The index ranges from 0–6, with higher values (green) indicating greater availability of credit information.
when measured relative to the country’s income per capita as well as rental prices (Figure 11.5), although they are approaching frothy levels in a few countries (Brazil, Chile, Colombia, and Peru).8

8 For a discussion of the significance of the house-price-to-rent ratio as a measure of overvaluation, see Davis, Lehnert, and Martin (2008).
However, these measures need to be interpreted with caution since they only capture real estate prices in the higher-income segments of metropolitan areas, and do not necessarily reflect the situation at the national level and across the income distribution. The next section further examines the question of real estate overvaluation.

MAKING THE MOST OF IMPERFECT DATA

Assessing risks and vulnerabilities in Latin America’s real estate sector are hindered by weak and limited information. Data on housing prices and real estate activity remain scant in the region, despite recent progress. Only Brazil, Chile, Colombia, Mexico, Peru, and Uruguay publish housing price data, but in some instances these time series’ have short spans, and coverage is often limited to large metropolitan areas. Moreover, in several instances the data do not distinguish between new and existing homes, as well as between commercial and residential real estate. Little information is available on the stock and flows of housing, or on construction activity (including employment, prices of inputs, and land prices) (Table 11.1). Appropriate data on housing transactions are also limited. Moreover, an additional challenge is posed by the fact that trends can vary depending on whether prices are measured in local or foreign currency.

Notwithstanding severe shortcomings in data, policymakers and analysts in the region still need to assess whether the pace of expansion of mortgage credit is excessive and whether movements in house prices can be explained by economic fundamentals. Despite the limitations, this section engages in this quixotic endeavor and tackles these questions with the data available.

Identifying Mortgage Booms

A credit expansion is identified here as a boom when the level of credit exceeds the underlying trend—estimated using end-adjusted rolling Hodrick Prescott filters—by a threshold equal to 1.5 times the standard deviation of the trend as used by Mendoza and Terrones (2008) and Gourinchas, Valdés, and Landerretche (2001). The analysis is implemented for a sample of nine countries (Brazil, Colombia, China, Hong Kong SAR, Indonesia, Korea, Malaysia, Peru, and Thailand) using monthly data between January 2000 and March 2014. Mortgage bank credit data are available from national sources, and include the mortgage

---

9Hoek-Smith and Diamond (2003) find that in Brazil and Mexico only households around the 70th income percentile qualified for mortgage financing in early 2000; in Peru the corresponding number was at the 65th percentile. In a series entitled “Housing Finance Mechanisms,” UN Habitat (various years) discusses, among other issues, mortgage access constraints in select emerging market economies.

10Housing prices in the region are often published by a wide variety of agencies, and using different methodologies, which makes cross-country comparisons more cumbersome.

11A clear example of this is Uruguay, where the assessments may vary depending on the currency in which the analysis is performed. See IMF (2011c).
claims on the private sector by deposit money banks as well as public finance corporations (where available).

The deviation from the long-term trend in the logarithm of real mortgage credit in country $i$, date $t$, is denoted as $M_{it}$, and the corresponding standard deviation of this cyclical component as $\sigma(M_i)$. Country $i$ is defined as having experienced a credit boom when $M_{it} \geq 1.5\sigma(M_i)$, that is, when the deviations from trend in mortgage credit exceed the typical expansion of credit over the business cycle by a factor of 1.5 or more. The long-term trend is calculated using the Hodrick-Prescott (HP) filter with the smoothing parameter set at 129,600, as is typical for monthly data. The filter is rolled month-over-month with the seed set in January 2006; the seed was adjusted accordingly for countries with data limitations. In other words, this expanding trend extends the sample over which the trend is computed by one month as each successive month in the sample is added.

The analysis suggests that mortgage growth is above levels dictated by past long-term trends in a few economies in the region, notably Brazil (Figure 11.6). In Brazil, the maximum deviation from trend credit growth in recent years seems particularly large, with moderate deviations recorded in other countries. However, the results should be viewed with caution, since the technique used here does not capture changes in trend credit growth or structural breaks that might arise due to the adoption of particular policies. In that regard, the significant increase in Brazilian mortgage credit coincides with the introduction and subsequent expansion of the housing program (*Minha Casa, Minha Vida*) aimed at low-income

![Figure 11.6 Episodes of Real Credit Surges (Maximum deviation since mid-2009, percent)](source: IMF staff calculations based on national sources. Note: Estimates based on end-adjusted rolling Hodrick-Prescott filters estimated using monthly data since 2000 when available. The smoothing parameter, $\lambda$, was set at 129,600, and the filter was rolled month-over-month with the seed set in January 2006. In countries where sample size was an issue, the seed was adjusted accordingly. The threshold is defined as 1.5 times the standard deviation of the level relative to trend. 1 Average of sample that includes China, Hong Kong SAR, Indonesia, Korea, Malaysia, and Thailand.)
Housing Markets in Latin America: Do We Need to Worry About a Bubble?

Despite these caveats, the rapid expansion of mortgage credit still warrants careful monitoring of this market segment. Moreover, it is important to ensure that credit risks remain under control, an issue that will be discussed later in the chapter.

Identifying Housing Price Booms

An econometric model is constructed to investigate the existence of house price bubbles for the six more financially integrated economies of Latin America. The idea is to determine the extent to which the recent performance of house prices can be explained by economic fundamentals. Much like Tumbarello and Wang (2010) and Tsounta (2009), we determine the existence of cointegration relationships to uncover the long-term relationship between real house prices and their fundamentals with variables expressed in levels.\(^\text{13}\)

House prices and income (as well as other fundamentals) are found to be cointegrated (Cubeddu, Tovar, and Tsounta, 2012), suggesting that the gap between actual prices and estimated prices, estimated using an error correction model, may be a useful indicator of when house prices are above or below their equilibrium values.\(^\text{14}\) The model we estimate consists of two to four cointegrating I(1) variables, real house prices, \(P_t\), real interest rate, \(R_t\), real per capita GDP, \(Y_t\), and population, \(S_t\), depending on the country considered. All variables are in logarithms except for the real interest rate, which is in levels. The error-correction equation for \(P_t\), in its entirety is:

\[
\Delta P_t = a[P_{t-1} - \beta_0 - \beta_1 R_{t-1} - \beta_2 Y_{t-1} - \beta_3 S_{t-1}] + \lambda_1 \Delta P_{t-1} + \lambda_2 \Delta Y_{t-1} + \lambda_3 \Delta R_{t-1} + \lambda_4 \Delta S_{t-1} + \varepsilon_t, \quad t = 1, \ldots, T,
\]

where \(0 < a < 1\), is the error correction term, \(\beta\) and \(\lambda\) are estimated parameters, and \(\Delta\) is the difference operator. Using similar vector error correction models for Brazil, Chile, Colombia, Mexico, Peru, and Uruguay, we find real GDP per capita, population, and the real lending rate—a proxy for the real mortgage rate—to be important determinants of equilibrium prices in all six countries (Table 11.2).\(^\text{15}\) Moreover, the coefficients are generally statistically significant and of the right sign, although the importance of each variable in explaining price movements differs significantly across countries. Our stylized model has the following implications:

\(^{12}\)The Minha Casa, Minha Vida program was introduced to reduce the housing deficit and inequality gap. Under the program, the authorities are planning to build 3.4 million new houses (in partnership with the states, municipalities, and private sector) to be allocated to families on a means-tested basis. As of April 2014, 2.4 million houses had been built.

\(^{13}\)For a detailed description of the data and sources for house prices, see Cubeddu, Tovar, and Tsounta (2012).

\(^{14}\)Vector error correction models are preferable to single equation models with variables expressed in percentage changes (as in Hunt and others, 2009; IMF, 2004, Box 2.1) because they allow the estimation of equilibrium values.

\(^{15}\)The specification varies slightly for each country since a common specification did not yield a cointegration relationship for each country.
In the long term, a 1 percent increase in population—a proxy for the formation of households—will raise the equilibrium house price by about 2 percent in Chile and 5 percent in Peru.16

Real GDP per capita—a proxy for households’ purchasing power and borrowing capacity—has a significant positive effect on house prices with an elasticity ranging from 0.1 (Mexico) to around 2.0 (Colombia). These estimates are in line with other findings in the literature as summarized in Iossifov, Čihák, and Shanghavi (2008).

The real mortgage rate that affects households’ ability to borrow also has a negative and generally statistically significant impact on house prices in Brazil, Chile, Mexico, and Peru; in the long run, a 1 percentage point increase in the interest rate will lead to a fall in house prices of 0.1 percent in Chile and 1.5 percent in Peru.17 These coefficients are broadly in line with other estimates in the literature, although there is a large dispersion ranging from −0.9 for the Netherlands (Hofman, 2005) to −6 for the United Kingdom (Hunt, 2005).

The negative sign of the coefficient of the error correction term for all six countries suggests that, indeed, the system is correcting back to its long-term equilibrium, with a pace of about one-half of the disequilibrium per quarter in Mexico and Chile and a much slower pace in the remaining sample countries.

---

16Egert and Mihalječjk (2007) show that the average long-term elasticity of house prices to the working-age population share is close to 4 for 19 countries in the Organisation for Economic Co-operation and Development.

17This coefficient expresses the long-term relationship between real house prices and mortgage interest rates and should not be used to gauge the short-term impact of interest rate changes on house prices.
In addition, the econometric results allow us to conclude that:

- House price dynamics in Latin America can mostly be explained by the basic stylized model of economic fundamentals (IMF, 2011b).
- Prices remain aligned with fundamentals and within a one-standard deviation range from the trend in most countries (Figures 11.7 and 11.8). The most dynamic market is Peru, where house prices currently deviate by almost 10 percent from levels dictated by economic fundamentals (and above the one-standard deviation). The misalignment was much greater in 2012–13. Nonetheless, Peru’s price-to-rent ratio is relatively low by regional

**Figure 11.7** Selected Latin America: Actual and Estimated Real House Prices
Source: IMF staff calculations.
and international comparison, suggesting that, if any, signs of overvaluation are modest.\footnote{Moreover, the price data for Peru capture only trends in the higher-income areas of Metropolitan Lima, and it is not clear whether the same price dynamics can be replicated in other areas of the capital or the rest of the country.} Brazilian house prices are found to be at the upper bound of the deviation distribution. It is also worth noting that the recent run-up in house prices in some countries (notably Uruguay and Colombia) appears to...
reflect some catching up from undervalued house prices in the mid-2000s. House prices in Chile and Mexico appear to be the most aligned with economic fundamentals, though there was some misalignment in mid-2000s in Chile.

- Our stylized model captures the large bubble experienced in Colombia in the mid-1990s that led to the mortgage crisis (see Box 11.1). House prices are estimated to have exceeded the trend by as much as 60 percent in the mid-1990s, only returned to levels dictated by fundamentals in the mid-2000s. In Uruguay, house prices undershot economic fundamentals following the crisis in the early 2000s and are now approaching levels dictated by fundamentals.

A drawback to this analysis is the considerable uncertainty about the right technique to model equilibrium house prices, including the possible biases that may arise due to model specification (for example, failing to capture macroeconomic volatility or inward migration) and the ensuing “omitted variable bias” or unstable estimated relationships. However, this is intrinsic to most of techniques found in the literature (Gallin, 2003; Gurkaynak, 2005; Kluyev, 2008; Girouard and others, 2006; Tsounta, 2009; Allen and others, 2006; and IMF, 2004, Box 2.1). As mentioned previously, the relatively short time series for data on prices and its limited coverage also constrain the analysis.

THE HOUSEHOLD DEBT BURDEN AND FINANCIAL BALANCE SHEETS

Financial stability concerns related to the fast growth in mortgage credit and real estate prices are counterbalanced by the relatively low exposure of banks in the mortgage market, the small share of nonperforming mortgages, the strength of household balance sheets, and sound prudential practices. In particular recent data suggest that:

- Mortgages account for less than 20 percent of banks’ total credit in many countries in Latin America, and banks have a sound funding structure that relies little on cross-border funding or complex instruments.

- In line with the trends for aggregate bank credit quality in the region, the share of nonperforming mortgage loans is relatively low, averaging about 2–3 percent of total mortgage credit for the more financially integrated economies.\(^1\)

- The few existing household indebtedness indicators suggest that the average debt burden for most countries remains at manageable levels, although debt burdens have been on the rise in recent years (Figure 11.9).

\(^1\) Although not discussed in this chapter, mortgage credit quality can have important implications for fiscal policy depending on the degree of exposure of public banks.
Box 11.1 Colombia’s Mortgage Crisis of the Late 1990s: A Cautionary Tale

The Colombian mortgage crisis of the late 1990s illustrates the possible systemic effects of problems in the housing market. The crisis had its origins in the early 1990s, when a process of financial deregulation set the stage for unsustainable credit growth and asset price overvaluation (Figure 11.1.1) amidst weak regulatory and supervisory frameworks.

Reforms aimed at increasing competition and efficiency in the Colombian financial system in the early 1990s led to rapid expansion of bank assets along with undesirable changes in their liability structure. A period of easy external financing conditions triggered massive capital inflows that were intermediated by the domestic financial system. Asset prices (including housing prices) rose quickly and credit boomed (bank credit as a share of GDP doubled between 1991 and 1997). At the same time, financial institutions adopted aggressive funding practices in an environment of increased competition.

Weak regulatory and supervisory systems and internal risk management models made the financial system vulnerable. Internal risk models were ill-suited for assessing borrowers’ capacity to pay, and collateral was frequently overvalued. Weak regulation and supervision practices did not prompt an increase in capital requirements or loan-loss provisions to mitigate growing risks as the process unfolded. In addition, there were important informational blind spots that prevented the adequate assessment of risks.

When external conditions became less favorable and the economy began to slow in 1995, housing prices started to fall. This process was compounded by the sudden stop of external financing that followed the Asian and Russian crises and domestic political problems. By 1998 interest rates reached historical highs, and households found themselves unable to continue servicing mortgages. Properties were seized, nonperforming loans skyrocketed, and banks specializing in mortgage lending became illiquid or insolvent.

In 1999, the government was forced to intervene. Financial institutions were nationalized, closed, or recapitalized, and Colombia suffered its first recession since 1933. The crisis also set back the development of the nation’s housing market. In the end, the total fiscal cost of the crisis—including the effects of judicial rulings that further undermined creditors’ rights—exceeded 15 percent of GDP (FOGAFIN, 2009).

Figure 11.1.1 Colombia: Selected Economic and Credit Indicators

Sources: Banco de la Republica (Colombia); DANE; FOGAFIN (2009); and IMF staff calculations.

©International Monetary Fund. Not for Redistribution
Some countries in the region have a history of implementing prudential measures for the mortgage market. Colombia, for example, introduced loan-to-value (LTVs) and debt-to-income (DTIs) limits for mortgage borrowers in 1999, following the housing crisis (see Box 11.1). As of end-2013, mortgage LTVs averaged about 55 percent and mortgage debt service could not exceed 30 percent of disposable income (IMF, 2014).

However, one cannot draw comfort from recent data trends, since the situation could quickly change, particularly should GDP growth slow and financial
conditions tighten sharply. Credit quality measures tend to be a lagging indicator of financial distress, while household leverage measures are often understated during periods of strong income growth and record low unemployment. Moreover, many loans are new, and defaults are typically rare early in the life of a loan. It also seems that banks are extending loans to households with unknown credit and payment histories; such households tend to be more vulnerable during downturns.

CONCLUSIONS AND POLICY RECOMMENDATIONS

This chapter documented developments in mortgage credit and the housing sector in Latin America during the past decade and compared them with those in other emerging market economies. Although data limitations hamper a more rigorous analysis of trends, vulnerabilities, and risks, the analysis found few signs of misalignments in the mortgage and real estate sector. Moreover, house prices in most markets are not far from equilibrium levels. Thus, although the analysis does not envision any immediate vulnerability, if left unattended the current credit and house price growth levels could result in dangerous misalignments down the road. Housing price corrections tend to have significant economic and social ramifications, particularly where the share of employment in construction, which employs relatively unskilled workers, has grown and is larger than justified by fundamentals.

Action is needed to close information gaps by developing more comprehensive and timely information on home prices (with national coverage, distinguishing between new and existing homes and between commercial and residential real estate, and measured in terms of repeat sales) and housing construction activity (housing stock and flows, employment by sector, and prices of construction inputs, including land prices). Supervisory authorities should continue to strengthen the infrastructure needed to maintain current information on housing-specific financial soundness indicators and household balance sheet data.20 The latter are critical for assessing credit risks based on leverage ratios and meaningful affordability indicators. Progress on this issue also lags behind that in other regions.

Better data would also facilitate stronger oversight of the overall situation. Internal risk models to gauge misalignments in housing and other credit sectors can help with risk assessments. Further efforts are needed to improve property rights,21 credit registries, and the underwriting standards of mortgage loan origi-

---

20 Brazil, Chile, and Colombia have household financial or expenditure surveys aimed at collecting micro data on households’ real and financial assets. The data provide a picture of credit access and debt concentration among different household income segments, improving the assessment of credit risk and the implications of household debt for financial stability (Persson, 2009).

21 According to UN Habitat (2011), more than a third of Latin American homeowners may have tenure that falls short of full legal title, with informal housing estimated to constitute anywhere between 25 and 50 percent of the urban housing stock in Latin American countries (concentration of informality ranges significantly across cities ranging from 10 percent in Buenos Aires to 50 percent in Quito and Caracas).
nators and brokers, especially given the rising importance of the securitization market that is in its very early stages in some markets. Standards should take into account the value of the underlying property (based on sound independent appraisals) and the borrower’s creditworthiness (via credit registries), with proper verification of the submitted information. These efforts should be complemented by measures to strengthen creditor rights and programs to increase consumer financial literacy, particularly as credit access expands to lower-income households. Attention should also be given to the financial implications associated with the rapid expansion of new forms of housing financing (for example, trusts) in some markets, and to mortgage securitization.

Finally, if vigor in the housing sector is sustained, targeted macroprudential measures similar to those recently adopted in Asian economies should be considered. In this context, the use of loan-to-value and debt-to-income limits could be particularly useful to dampen credit and house price growth; the limits may need to be lower for emerging market economies, as they tend to suffer deeper recessions with more severe financial downturns than advanced economies (Claessens, Kose, and Terrones, 2010, 2011). The adoption and implementation of LTV and DTI limits might be particularly challenging in some Latin American countries. LTV limits are less effective where a larger share of mortgage origination is outside the regulated sector, and where household debt and income are difficult to verify.

REFERENCES


22 Efforts should be made to reduce the costs, duration, and effectiveness of enforcement and foreclosure processes in the event a borrower defaults. The security of collateral and a relative lack of borrower credit history information have been cited as areas of weakness in the region (UN Habitat, 2011). Warnock and Warnock (2008) find that the size of housing finance systems worldwide—including Latin America—are positively correlated with the enforceability of legal rights relating to foreclosures.


International Monetary Fund (IMF), 2004, World Economic Outlook, World Economic and Financial Surveys, Washington, DC, September.


———, 2011b, Regional Economic Outlook—Western Hemisphere, Watching Out for Overheating, World Economic and Financial Surveys, Washington, DC, April.


UN Habitat, 2011, Affordable Land and Housing in Latin America and the Caribbean, Adequate Housing Series,” Vol. 1, United Nations Human Settlements Program.


Index

[Page numbers followed by b, f, or t refer to boxed text, figures, or tables, respectively.]

A
Argentina
commodity exports, 43–44
current susceptibility to external shocks, 119
distortionary economic policies in, 15
efforts to address economic imbalances in, 15
emerging economic challenges for, 15
energy supply issues in, 12
projected effects of external shocks on debt sustainability in, 141, 143
public debt dynamics in 2000s, 121–22
recommended reforms to promote growth, 15–16
See also Latin America and the Caribbean

Asia
economic growth in, versus growth in LAC, 19, 22f, 23, 23f
effects of global financial shocks on capital flows in, 199, 200–201f, 206f
financial integration patterns and trends, 173, 173f
investment rates in, 12
terms-of-trade windfall in, 104
trade patterns in, 71, 76, 77f, 78
vulnerability to external financial shocks, 169, 182–83, 182f

B
Banks. See Financial sector
Bolivia
commodity price fluctuations in, 46
current susceptibility to external shocks, 119
export-led income windfall in 2000s for, 8

projected effects of external shocks on debt sustainability in, 142, 143
public debt dynamics in 2000s, 121–22

See also Latin America and the Caribbean
Bond maturity dates, 216, 217f
Bond yields
emerging challenges for LAC in, 10–11
global financial shock outcomes in EMEs, 171, 171f
implications for EME of U.S. monetary policy, 226
implications of U.S. monetary policy, 216–17, 218f
patterns and trends, 9f
projected U.S., 214
sensitivity to U.S. monetary shocks, 219–24, 221f, 223t
synchronized rise in U.S. and EMEs, 217–19, 218f, 220
Brazil
business environment of, 12f
commodity exports, 43
construction sector activity in, 235
credit markets, 234, 239–40
current susceptibility to external shocks, 119
education outcomes in, 12f
housing market, 241, 243
infrastructure quality in, 12, 12f
procyclicality of fiscal policies of, 149, 159–60, 162
projected effects of external shocks on debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
See also Latin America and the Caribbean

©International Monetary Fund. Not for Redistribution
Business environment
in LAC countries, 12f
recommended reforms to improve,
14–15
total factor productivity growth and,
31–32, 32f

C
Capital account restrictions, 173, 173f.
See also Financial openness
Capital accumulation
modeling contributions to growth from,
19–21, 25–26
modeling sustainability of growth from,
26–27
projected growth rate of, output growth rate potential and, 28–30
as source of growth in LAC, 21, 22f, 32, 33f, 34f
Capital flows
causes of reversal episodes, 187
domestic investment during financial crises and, 187, 188, 193, 195, 196,
201–2, 224–26
effects of global financial shock on, 171, 171f, 181, 186–88
effects of uncertainty shocks on, 188, 189t, 192, 192f, 195–97, 198–99, 198f, 201–2, 203, 205f
effects of U.S. interest rate shocks on,
188, 189t, 192f, 193–94, 198f, 199, 201–2, 203, 205f, 207f, 224–26, 225f
effects of U.S. output shocks on, 193–94, 194f, 226, 226f
financial integration mediating global shock effects on, 195–97, 196f
global financial shock effects on types of, 198–99, 198f, 208f, 209f
international commodity price shocks and, 195
international comparison of global financial crisis effects on, 186f
LAC economic performance in 2000s and, 7
modeling global financial shock effects on, 189–91, 203
regional differences in effects of global financial shocks on, 199, 200–201f, 206f
Chile
business environment of, 12f
capital flows, 186f
commodity price fluctuations in, 46
current susceptibility to external shocks, 119
education outcomes in, 12f
export-led income windfall in 2000s for, 8
growth patterns in, 23
housing market in, 241, 244
infrastructure quality in, 12f
procyclicality of fiscal policies of, 149, 159–60, 162
projected effects of external shocks on debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
total factor productivity growth in, 24–25
See also Latin America and the Caribbean
China
implications for LAC of economic growth rates in, 41, 58–60, 59f, 61–62, 61f
influence on global commodity markets, 74
Colombia
business environment of, 12f
commodity price fluctuations in, 43, 44f, 46
construction sector activity in, 235
credit rules in, 245b, 246
current susceptibility to external shocks, 119
education outcomes in, 12f
housing market, 244
infrastructure quality in, 12f
mortgage crisis, 245b
procyclicality of fiscal policies of, 149, 162
projected effects of external shocks on debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
See also Latin America and the Caribbean
Commodity dependence, 75, 76, 77f, 90, 92–93f
Commodity export concentrations, 75–78, 92–93f
Commodity prices
in assessment of fiscal policy cyclicalitiy, 155–56, 157
category comparisons and relationships, 73–75, 73f, 74f, 75f, 76–77
category distribution of recent increases in, 42, 47, 71
commodity export concentration and sensitivity to, 76, 78
demand in China as factor in, 58–60, 60f, 61–62
determinants of macroeconomic performance during shock episodes, 79–91
distinguishing features of LAC economies, 71
economic effects of stabilization in, 55, 56–58, 61
economic growth linkage with, 49–50, 50f, 78–79
effects of global financial shocks on, 170, 171f
effects on EME capital flows from positive shocks to, 195, 207f
emerging challenges for LAC from recent trends in, 10
implications of declines in, for medium-term growth, 39–41
income windfall for exporters in 2000s, 8, 96
LAC’s economic performance in 2000s and, 8, 10
levels versus growth of, economic growth and, 41, 46–47, 58
patterns and trends, 10f, 39, 40f, 45–47, 45f, 46f, 47f, 61, 64f, 71, 72–74, 73f
projected, 39, 47–49, 48f
projected economic growth effects of changes in, 41, 54–62
recommended policy response to projected patterns in, 62
See also Global vector autoregression to model commodity price-growth linkage
Construction sector, 235, 237f
Corporate debt, 14
Current account balances during terms-of-trade booms, 105, 105f
international comparison, 174f
terms-of-trade shocks mediated by, 81, 81f, 84, 91
See also External balances

D
Debt sustainability
current susceptibility to external shocks, 119
methodology for assessing, 117–19, 124–36, 125f
policy responses to ameliorate shock effects on, 132–35, 137–39, 141–42
projected effects of Lehman-like event on, 132, 138, 140–42
projected effects of protracted global slowdown on, 131, 138, 139, 140–42
projected effects of temporary financial shock on, 131, 137–38, 140
projected effects of temporary real shock on, 131, 137–38, 140
recent patterns in external indicators, 123–24
recent patterns in fiscal indicators, 120–23
vulnerability of LAC countries to external shock effects on, 119, 143

Demographic patterns and trends
constraints to labor growth, 28, 29f
emerging challenges for LAC, 4, 12
projected dependency ratio, 28, 29f
in projected output growth rate, 28
Dominican Republic
growth rate potential, 27
See also Latin America and the Caribbean

E
Economic accomplishments of LAC in 2000s, 3, 4–8, 117, 118f
credit ratings reflecting, 7
emerging challenges to, 3–4, 10–13, 16
policies and conditions underlying, 3
recommended reforms to address emerging challenges to, 13–15
See also Growth in LAC; Medium term economic prospects
Ecuador
commodity price fluctuations in, 46
current susceptibility to external shocks, 119

©International Monetary Fund. Not for Redistribution
procyclicality of fiscal policies of, 159
projected effects of external shocks on
debt sustainability in, 142, 143
public debt dynamics in 2000s,
121–22
See also Latin America and the
Caribbean
Education
emerging challenges for LAC, 12
international comparison of student
performance, 12
learning outcomes in LAC, 12
recommended policies to promote
economic growth, 14–15
total factor productivity growth and,
32, 32
El Salvador
growth patterns in, 23
procyclicality of fiscal policies of, 149,
159–60, 162
See also Latin America and the
Caribbean
Emerging market economies (EMEs)
capital flow responses to global financial
shocks in, 185–202
domestic output response to global
financial shocks in, 168
economic linkage with advanced
economies, 168
effects of 2008 global financial crisis
in, 167
effects of U.S. monetary policy on,
10–11, 214, 215
financial integration patterns and
trends, 173, 173
financial sector outcomes of global
financial shocks in, 171, 171
fiscal policy cyclicality in, 149, 152, 157
international comparison of global
financial shock outcomes, 177
182–83, 182
labor market, 29
market uncertainty effects in business
cycle of, 168
modeling effects of large external shocks
in, 175–79
projected demand in, 10, 10
protective factors for, in response to
external shocks, 167, 168–69, 185
trade sector outcomes of global financial
shocks in, 170, 171, 176
vulnerability of, to external shocks, 167,
168–69, 182–83, 185
EMEs. See Emerging market economies
Employment
construction sector, 235
emerging challenges for LAC, 11–12
patterns and trends, 7
prospects for growth, 28, 29
as source of output growth in LAC,
23–24
Energy markets
current subsidies, 14
emerging challenges for LAC, 12
Energy sector, 25
Equity prices, emerging challenges for
LAC in, 10–11
Europe
effects of global financial shocks on
capital flows in, 199, 200–201
vulnerability to external financial
shocks, 169, 182–83, 182
Exchange rates
external shocks in EMEs mediated
by regime flexibility, 168–69, 179,
180–81, 180, 183
implications of rising bond yields for,
217–19, 219
in public debt dynamics in LAC, 120,
121
recent trends, 10–11, 11
recommended reforms to support
continued growth, 14
terms-of-trade shocks mediated by
flexibility in, 84, 87–90, 90
External balances
accomplishments in LAC in 2000s, 4–7,
117, 118
debt sustainability analysis methodology,
124–36, 125
f determinants of debt dynamics, 147
emerging challenges in LAC, 13, 15
external financial shocks in EMEs
mediated by, 179, 180, 181, 181
international comparison, 174
patterns and trends, 6–7, 6
projected effects of external shocks on,
142

©International Monetary Fund. Not for Redistribution
recent policy trends contributing to widening of, 10
terms-of-trade shocks mediated by, 84
See also Current account

External conditions
contributing to LAC’s economic performance in 2000s, 3, 8, 117
debt sustainability analysis methodology, 117–19, 124–36
emerging challenges for LAC economies, 3, 10–11
projected effects of adverse scenarios on debt sustainability, 131–43
saving patterns in recent terms-of-trade boom affected by, 110–15, 113–14

terms-of-trade shocks mediated by, 86

Financial integration
deco coupling trends in EMEs, 168
exchange rate flexibility and, in mediating effects of external shocks, 168–69, 180–81, 181f
external financial shocks in EMEs mediated by degree of, 167, 168–69, 176–77, 179, 180–81, 180t, 183, 188, 202
global financial shock effects on EME capital flows mediated by, 195–97, 196f
global patterns and trends, 173, 173f
international comparison of, 172f
measurement of, 172
terms-of-trade shocks mediated by, 86, 90

transmission of external financial shock effects mediated by, 172

Financial openness
global financial shock effects on EME capital flows mediated by, 195–97, 197f
global patterns and trends, 173, 173f
international comparison of, 172f
terms-of-trade shocks mediated by, 83, 84–86, 90

Financial sector
global financial shock outcomes in, 171, 171f

intermediation levels, 234–35
LAC’s economic performance in 2000s, 7
mortgage share of, 233, 244–47
recommended policy reforms to support growth of, 14
regulation and supervision of, 14
risk of global shocks for, 169, 170f, 170t
sources of improved soundness in 2000s, 7
total factor productivity growth and deepening of, 31, 32f

Fiscal policy
institutional and rules strengthening, 162
stimulus packages, 13
transparency, 162
See Procyclicality of LAC fiscal policies

Fiscal stimulus policies, 13

Flexible Suite of Global Models, 227

Foreign direct investment
effects of global financial shocks on, 198–99, 198f
share of capital inflows from, 7

Foreign financing
emerging challenges for LAC in, 10–11
LAC’s growth in 2000s supported by, 8

Global financial crisis (2008–09)
bond yield changes and, 220–22
external debt patterns after, 124
fiscal stimulus outcomes in LAC, 13
outcomes in emerging market economies, 167
policy response in LAC, 8
protective factors in LAC’s recovery from, 3, 8
public debt patterns after, 122–23
Global vector autoregression to model commodity price–growth linkage, 41–42
findings from, 54–62
goodness of fit tests for, 54
limitations of, 62
net commodity price index for, 42–43, 64f, 65f
policy implications of findings from, 62
specifications and methodology, 50–54, 63–66

©International Monetary Fund. Not for Redistribution
Governance challenges for LAC growth, 12–13
Growth in LAC
commodity price linkage with, 49–50, 50f, 78–79
emerging challenges to, 4, 11–13
estimated effects of negative terms-of-trade shocks on, 87
in exporting economies of LAC, 8
gap between 1990s and 2000s, 21, 22f
versus growth in Asia, 19, 22f, 23, 23f
international comparison of past global financial shock outcomes, 177f.
182–83, 182f
methodology for analyzing supply-side sources of, 19–21, 25–26
methodology for estimating potential for, 26–27
output gap estimations, 152, 153b
patterns and trends, 5f, 11, 17, 18f, 37t, 39, 40f
potential output growth rate projections, 27–31, 27f, 31f, 32
projected, 17
projected effects of commodity price scenarios on, 41, 54–62
prospects for, 19
public debt patterns and, 121
reforms to address emerging challenges to, 13–15
regional disparities in, 19, 21, 23f
strategies for improving total factor productivity to promote, 31–32
supply-side sources of, 17–19, 21–25, 22f, 32, 33f, 34f
See also Economic accomplishments of LAC in 2000s
credit access and, 231
evidence of bubble formation in, 232–33, 240–44, 241t, 247
financial stability concerns, 244–47
international comparison, 235, 236t
nonperforming loans, 233, 244
recommendations for oversight, 247–48
See also Mortgage credit in LAC
Human capital
emerging challenges for LAC, 12
as source of output growth in LAC, 24

I
Income inequality
determinants of recent reductions in, 7
recent economic performance in LAC and, 4, 7

Inflation patterns and trends, 4, 5f
Infrastructure
emerging challenges for LAC, 12
quality in LAC, 12f
recommended policies to promote economic growth, 14–15
Interest rates
effects of sharp movements in U.S., on EME capital flows, 185, 188, 189t, 192f, 193–94, 195, 198f, 199, 201–2, 203, 205f, 207f, 224–26, 225f
emerging challenges for LAC in, 10–11
historical shocks in U.S., 204t
LAC’s growth in 2000s supported by, 8
projected U.S., 213–14
in public debt dynamics in LAC, 120, 121f, 123
recent U.S. patterns, 186f
saving patterns in recent terms-of-trade boom affected by global, 112
synchronized rise in, 217–19
U.S., LAC debt and, 214
See also Quantitative easing in U.S.
Internal balances
accomplishments in LAC in 2000s, 4
emerging challenges in LAC, 13
See also Public debt

H
Honduras
commodity price fluctuations, 46
procyclicality of fiscal policies of, 160
See also Latin America and the Caribbean
Household debt, 244, 246f
Housing market
assessment challenges, 233, 238, 244, 246–47
Labor constraints to growth, 28, 29f
modeling contributions to growth from, 19–21
modeling sustainability of growth from, 26–27
output growth rate potential and, 28–30
as source of growth in LAC, 19, 21, 22f, 23, 24f, 32, 33f, 34f
See also Employment
LAC. See Latin America and the Caribbean
Latin America and the Caribbean (LAC)
capital account restrictions, 173, 173f
commodity dependence and export concentration, 76–78, 77f, 78f, 90, 92–93f
commodity price patterns, 10f, 39, 40f, 45, 45f, 46f, 47f, 61, 64f, 72–74
economic accomplishments in 2000s, 3, 4–8, 5f, 6f, 9f, 17, 117, 118f
effects of U.S. output and risk premium shocks, 227, 227f
emerging challenges for, 3, 4, 10–13
exports to U.S., 213, 214f
external debt trends in 2000s, 123–24
financial integration patterns and trends, 173, 173f
in global comparison of vulnerability to external financial shocks, 169
international comparison of effects of global financial shocks on capital flows in, 199, 200–201f, 206f
main commodity exports, 63f
public debt denominated in U.S. dollars, 214, 216, 216f
public debt dynamics in 2000s, 120–23
public debt patterns, 161, 161f
recommended reforms to address emerging economic challenges in, 13–15, 228
terms-of-trade booms in, 98, 99f
See also Economic performance in LAC; Growth in LAC; Mortgage credit in LAC; specific country
Long-term growth, policy reforms to support, 14

Macroeconomic policies and performance
domestic sensitivity to external financial shocks mediated by, 172
effects of global financial crisis ameliorated by, 8
effects of terms-of-trade shocks mediated by, 79–91
emerging challenges for LAC economies, 13, 15
external financial shocks in EMEs mediated by, 167, 168–69
international comparison of, 174f, 175
recommended reforms to address emerging challenges to, 13–15
strengthening of, in LAC’s recent growth period, 7
See also Exchange rates
Medium-term economic prospects
commodity price projections, 47–48, 48f
implications of international commodity price trends, 39–41
projected economic growth effects of changes in commodity prices, 41
recommended reforms to improve, 13, 14–15
Mexico
business environment of, 12f
capital flows in, 186f
credit markets in, 234
current susceptibility to external shocks, 119
education outcomes in, 12f
growth patterns in, 23
housing market in, 241, 244
implications of U.S. economic recovery for, 213
infrastructure quality in, 12f
procyclicality of fiscal policies of, 149, 159–60, 162
projected effects of external shocks on debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
See also Latin America and the Caribbean
Middle East and North Africa oil-exporting countries, 96, 98, 101, 104, 105–6, 105f, 107–9
Mining sector, 25
Money policy
bond yield sensitivity to changes in
U.S., 219–24, 221f, 223t
reforms to promote growth, 14
U.S., effects on EMEs, 214, 215t, 227, 227f
See also Quantitative easing in U.S.
Mortgage credit in LAC
assessment challenges, 233, 238, 246–47
construction sector activity and, 235
evidence of boom conditions in,
238–40, 239f
financial balance sheets and, 244–47
recent trends, 231, 233–35, 234f
recommendations for oversight, 247–48
risk of bubble formation, 231, 232–33,
247
Mutual fund flows, 171, 171f

N
National saving
average rates of, 105–6, 105f, 115
domestic and foreign distribution of,
107–9, 109f
external factors influencing, 110–15,
113–14t
marginal rate patterns, 106–10, 108t,
115
recommended policies to promote
economic growth, 15
in response to terms-of-trade boom, 96,
104–10, 105f, 115
strategies for improving output growth,
31

P
Panama
growth rate potential, 27
See also Latin America and the
Caribbean
Paraguay
commodity price fluctuations, 46
current susceptibility to external shocks, 119
projected effects of external shocks on
debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
See also Latin America and the
Caribbean
Peru
business environment of, 12f
current susceptibility to external shocks, 119
education outcomes in, 12f
growth rate potential in, 27
housing market in, 241, 242–43
infrastructure quality in, 12f
projected effects of external shocks on
debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
See also Latin America and the
Caribbean
Poverty, 7
Primary balance
components of, 122f, 145f, 146f
external financial shocks in EMEs
mediated by, 179
international comparison, 174f
public debt and, 6f, 122
terms-of-trade shock effects on, 90f
trends in LAC, 118f, 123
Procyclicality of LAC fiscal policies
asset and commodity prices in analysis
of, 155–56, 157
automatic and discretionary policy
responses, 152–54
data sources on, 156–57
historical evidence for, 149
intra-LAC differences in, 149, 159–60,
160t, 162
measures of cyclical stance in analysis of,
152–54
methodology for analyzing, 149,
150–56, 151t
output gap estimation in analysis of, 152,
157, 159, 160t
recent patterns in, 149, 157, 158t
role of GDP composition in analyzing,
154–55
significance of cyclical stance in fiscal policy
decisions, 149–50
Productivity
recommended policies to promote
economic growth, 14–15
See also Total factor productivity
Public debt
cyclical of LAC fiscal policies and,
161–62
determinants of, in LAC in 2000s, 120–23, 121f, 122f, 144–46f
economic performance in LAC in 2000s, 3, 4, 6f, 161, 161f
effects of global financial crisis, 122–23
foreign-currency debt share of, 4
international comparison, 174f
maturity, 4, 6f
policy responses to ameliorate shock effects on, 138–39, 141–42
sustainability analysis methodology, 124, 125f, 127–36
Public spending, emerging challenges in LAC, 4, 13

Q
Quantitative easing in U.S.
effects on capital flows in EMEs, 187, 188, 193, 202
EME bond yields and, 220–22, 221f
implications for EME foreign currency bond yields, 216–17
implications for global recovery from Great Recession, 185, 213

R
Regulation
financial sector, 14
housing market oversight, 247–48

S
Sovereign spread equation, 130

T
Taxes
automatic stabilizing effects as cyclical fiscal policy, 152–54
in composition of GDP, 154–55
Terms of trade
cross-sectional modeling of effects of shocks to, 79–83, 85f
current account balances mediating shocks to, 81, 81f, 84, 91
econometric modeling of effects of shocks to, 83–86
effects of prior boom in, mediating negative shocks to, 81–83, 84
emerging challenges for LAC in, 10
exchange rate flexibility mediating effects of shocks to, 84, 87–90, 90f, 91
external factors mediating saving patterns in recent boom, 112–15, 113–14f
features of historical boom periods, 96–98, 97f
growth outcomes of negative shocks to, 87
historical episodes of, 80, 80f
income windfall from recent boom in, 8, 96, 98–104, 102f, 103f, 115
LAC’s economic performance in 2000s and, 8, 9f
measures of commodity price fluctuation, 42–43
panel setting approach to modeling effects of shocks to, 79, 86–90, 88–89f, 110–11, 113–14f
persistence of shocks to, 80, 97–98, 97f, 112
policy conditions mediating effects of shocks to, 72, 90–91
savings patterns in boom period in LAC, 96, 104–10, 105f, 115
Total factor productivity
future challenges for LAC economic performance, 19
modeling contributions to growth from, 19–21
modeling sustainability of growth from, 26–27
patterns and trends in LAC, 18, 24–25, 25f
projected growth rate of, output growth rate potential and, 28–31, 31f
as source of growth in LAC, 18, 19, 21, 22f, 23, 25, 33f, 34f
strategies for improving, 31–32
Trade
commodity dependence in LAC, 71, 76, 77f, 78f
distinguishing features of LAC’s, 71
global financial shock effects on, in EMEs, 170, 171f
LAC exports to U.S., 213, 214f
main commodity exports from LAC, 63f
measure of commodity dependence, 75
measure of commodity export concentration, 75–76
See also Commodity prices; Terms of trade

U
Uncertainty spikes, 168, 185, 186f
effects on capital flows in EMEs, 188, 189f, 192, 192f, 195–97, 198–99, 198f, 201–2, 203, 205f
historical episodes, 204t
See also Volatility index
United States
bond yield sensitivity to monetary shocks, 219–24, 221f, 223t
bond yields in 2000s, 9f, 10–11, 11f
effects of interest rate shocks in, on EME capital flows, 192f, 193–94, 198f, 199, 201–2, 203, 205f, 207f, 224–26, 225f
effects on EME capital flows of interest rate shocks in, 185, 188, 189f, 195, 199
global implications of economic recovery in, 213, 226–27
historical interest rate shocks in, 204t
interest rate regime, 10–11
LAC exports to, 213, 214f
monetary policy responses to global financial shocks, 185, 186f
output shock effects on EME capital flows, 193–94, 194f, 207f, 226, 226f, 227f
projected interest rates, 213–14
See also Quantitative easing in U.S.
Uruguay
business environment of, 12f
commodity price fluctuations in, 43, 44f, 46
current susceptibility to external shocks, 119
education outcomes in, 12f
housing market in, 244
infrastructure quality in, 12f
projected effects of external shocks on debt sustainability in, 142, 143
public debt dynamics in 2000s, 121
See also Latin America and the Caribbean

V
Vector autoregression modeling for debt sustainability analysis, 128–30
Vector autoregression modeling global financial shock effects on capital flows in EMEs, 189–91
Venezuela
commodity price fluctuations in, 46
current susceptibility to external shocks, 119
emerging economic challenges for, 15
energy supply issues in, 12
export-led income windfall in 2000s for, 8
external imbalances, 15
procyclicality of fiscal policies of, 159
projected effects of external shocks on debt sustainability in, 141, 143
projected effects of external shocks on debt sustainability of, 139–40
public debt dynamics in 2000s, 121–22
reforms to promote growth in, 15–16
See also Latin America and the Caribbean
Volatility index, 168, 169, 180t. See also Uncertainty spikes

W
Wages, 7