3. Commodity Price Cycles: The Perils of Mismanaging the Boom

As a net commodity-exporting region, Latin America—and especially South America—has significantly benefited from the commodity price boom of recent years. At the current juncture, however, uncertain global economic prospects have raised questions about its vulnerability to a sharp fall in commodity prices and the policies that can shield it from such a shock. This chapter examines the region's commodity dependence and the history of commodity price busts in the last four decades to address these questions. Despite shifting trade structures in some countries, Latin America is—on average—as reliant on commodities today as 40 years ago. With commodities responding sensitively to global output fluctuations, the region is particularly vulnerable to a global economic slowdown. However, we find evidence that policies in the run-up of sharp terms of trade drops—especially when those are preceded by booms—play an important role in shaping the economic impact. 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." With improved fundamentals in many of these dimensions, the region appears to be better placed to withstand a turnaround in commodity prices today than in the past.

3.1. Introduction

Increasing uncertainty about global economic prospects has raised questions about the region's vulnerability to a change in external conditions. In particular, what would the impact of a sharp and sustained reversal in commodity prices be? What policies could mitigate this impact? Is the region better prepared today than in the past to cope with this type of shock? This chapter answers these questions by taking a historical view of the behavior of commodity prices, the region's commodity dependence, and the determinants of output performance during episodes of large terms of trade drops (which are, most of the time, induced by marked movements in commodity prices).[1]

The chapter is organized as follows: Section 3.2 presents key stylized facts on commodity prices that put the recent boom in historical perspective and provide insights about the idiosyncratic behavior of different commodities and the comovement among them. Section 3.3 documents the extent of the region's commodity dependence (over time and compared with emerging Asia), highlighting key differences across subregions and some marked shifts in individual countries' trade structures. Section 3.4 studies the role of specific policies and fundamentals—particularly during the boom phase of the commodity price cycle—in determining the impact on domestic output of the subsequent negative terms of trade shocks. Section 3.5 discusses key conclusions and policy implications.

3.2. A Historical Perspective on Commodity Prices

Except for a brief interruption during the 2008–09 global crisis, commodity prices have increased sharply over the last decade, with the IMF broad commodity price index reaching levels similar (in real terms) to those recorded during the commodity

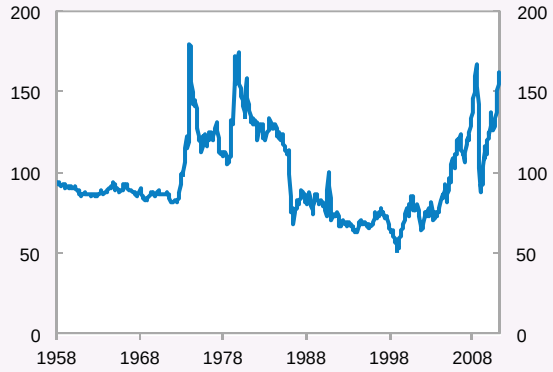
Note: This chapter was prepared by Gustavo Adler and Sebastián Sosa, with research assistance from Alejandro Carrión and Ben Sutton.

[1] Our focus is on the effect of these shocks on output. Chapter 3 of the September 2011 *World Economic Outlook,* in turn, examines the effects of international commodity price swings on inflation across different countries (and assesses the appropriateness of monetary policy responses).

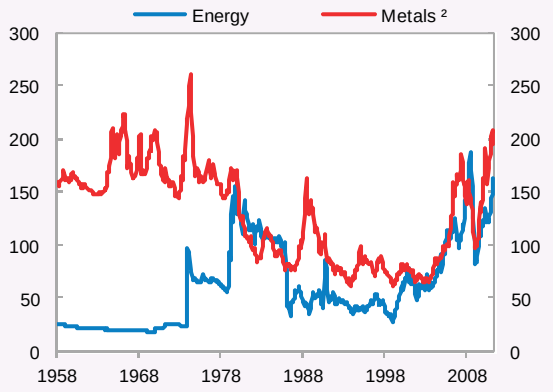
Figure.3.1. The current boom is remarkable in historical perspective in regard to energy and metals, but not so much in regard to food.

Commodity Prices in Historical Perspective, 1958–2011 [1]
(Index in real terms, 2005 = 100)

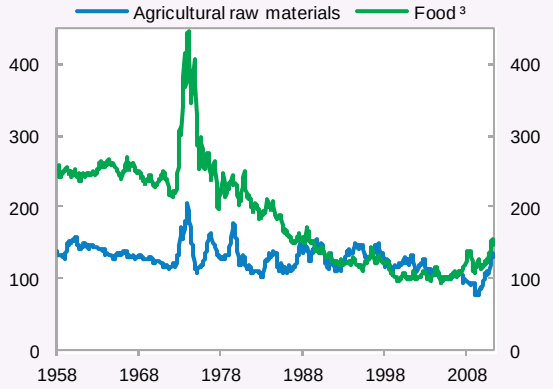
Broad index



Energy and metals



Food and agricultural raw materials



Sources: IMF, *International Financial Statistics*; and IMF staff calculations.
[1] See footnote 2 in the main text for an explanantion of how nominal prices are deflated to construct real price series.
[2] Excludes gold and silver.
[3] Includes agriculture food, meat and fishery.

price booms in the 1970s (Figure 3.1).[2] 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.

Real 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 (around 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 and 65 percent below their peak level. This pattern is common to most of the cereals exported by the region (corn, wheat, rice, soybeans, etc.).[3]

Table 3.1. Commodity Price Behavior, 1958–2011[1]

	Persistence		Volatility
	Autocorrelation coefficient (24 months)	HLS[2] (years)	Std. dev. (dlog) (percent)
Energy	0.70	9	8.2
Metals	0.70	9	3.9
Agricultural raw materials	0.26	2	3.0
Food	0.80	11	2.9
Cereals [3]	0.58	4	5.8

[1] Based on monthly data.
[2] Half-life of a unit shock (HLS) is the length of time (in years) until the impulse response of a unit shock to prices is half its initial magnitude.
[3] Include maize, rice, soybeans, and wheat.

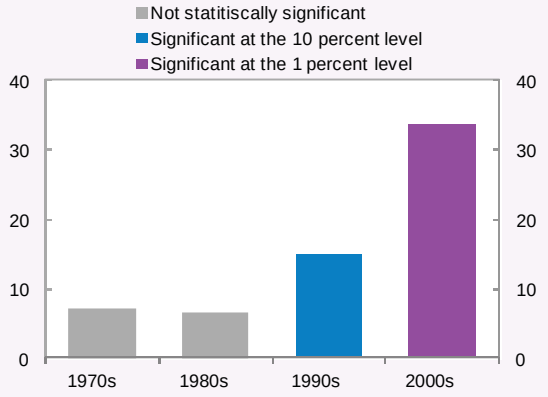
[2] References to commodity prices across the chapter are always in real terms. Commodity prices—in U.S. dollars—are deflated by a weighted average of the wholesale price indices (WPIs) of five countries (France, Germany, Japan, the United Kingdom and the United States) whose currencies comprise the 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).

[3] The evolution of agricultural raw material prices is similar to that of food prices, though the long-run decline has been less marked.

Food prices have also been less volatile and their shocks more persistent than those of metals and energy (Table 3.1)—although there are also marked differences within the food category, as prices for agricultural goods tend to display relatively high volatility and low persistence.

Figure 3.2. Unlike previous decades, commodity prices have comoved closely in the last 10 years.

Comovement across Commodity Prices[1]
(Groupwise correlation across categories, percent)



Sources: IMF, *International Financial Statistics*, and IMF staff calculations.
[1] Based on monthly percentage changes of IMF commodity price indexes for energy, metals and food, and on a statistic for a likelihood ratio test in which, under the null hypothesis, all pairwise correlations are equal to zero (i.e., the correlation matrix is equal to the identity matrix). See Valdes (1997) and Pindyck and Rotemberg (1990) for details.

At the same time, the comovement of prices of different commodities has changed significantly over time, reflecting the varying nature of underlying shocks (Figure 3.2). Prices across all categories have behaved very similarly in the last decade, due to the dominant role of global demand as a key common driver of price changes. They have also shown pronounced comovement in response to financial shocks, as seen during the 2008–09 crisis. In previous decades, however—and particularly during past commodity boom-bust cycles—the correlation was lower, 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, in which the oil supply shocks triggered a slowdown in global economic activity, negatively affecting the demand for and price of other commodities (Figure A in Annex 3.1).

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 last decade, the first principal component accounts for almost 85 percent of the variance of commodity prices, and prices of all categories are 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 (Table 3.2).

Table 3.2. Global Factors and Commodity Prices: Principal Component Analysis

	1970s–80s	2000s
Share of variance explained by first principal component	0.63	0.84
Measure of comovement with common global factor[1]		
Food	0.63	0.56
Energy	-0.36	0.59
Metals	0.68	0.58

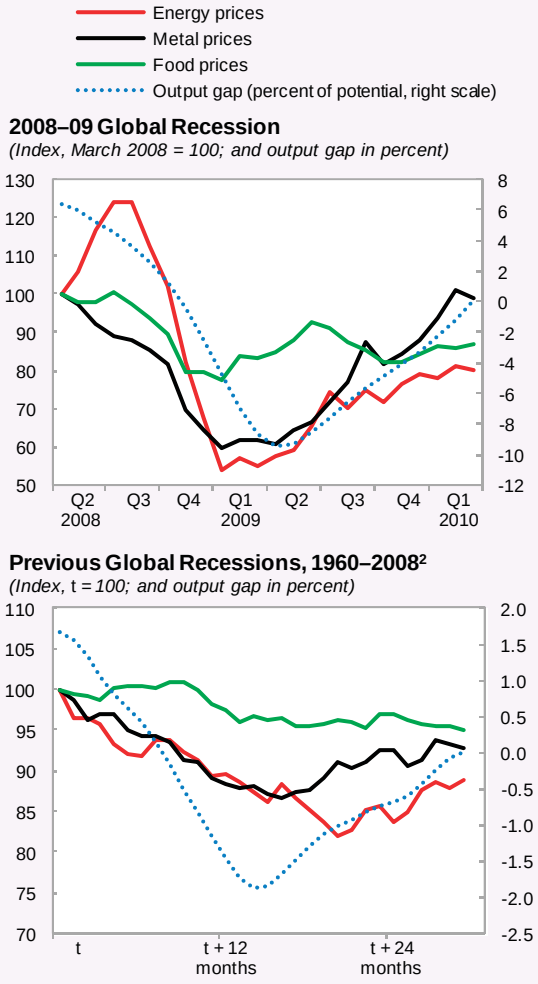
Source: IMF staff calculations.
[1] Loadings of first principal component.

Finally, despite their high correlation—especially recently—a glance at the behavior of commodity prices during global recessions suggests that there are notable differences across commodities in their sensitivity to the global cycle, with food prices being significantly less sensitive.[5] This has been the case during the 2008–09 Great Recession as well as in other slowdowns in the last four decades (Figure 3.3). These differences across categories suggest that the degree of vulnerability to a global slowdown may vary significantly even within the group of commodity-exporting countries,

[4] See the September 2006, April 2008, and October 2008 editions of the *World Economic Outlook* for more in-depth analyses of the underlying drivers of commodity prices in recent years.
[5] The lower sensitivity of food prices to global economic activity and their lower volatility likely reflect higher supply elasticity and lower income elasticity of demand (relative to other commodities).

Figure 3.3. Commodity prices are quite sensitive to global output, except for food prices.

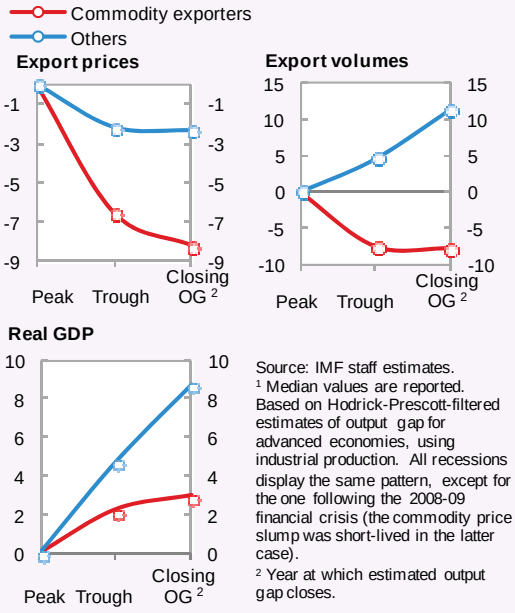
Commodity Prices During Global Recessions, 1960–2010[1]



Source: IMF staff calculations.
[1] Recessions defined on the basis of estimated output gap for advanced economies (using industrial production series). A slowdown is considered a recession if the output gap reaches at least –1. 5 percent of potential output for at least a quarter. Reported commodity prices are in real terms.
[2] *t* corresponds to the month of the peak value of the cyclical component of output, before ouput falls below potential. Only the first 30 months are reported as length of recessions varies across cases. Oil shocks of 1969 and 1973 are excluded.

Figure 3.4. Commodity exporters have been significantly more affected by global recessions than other emerging market economies.

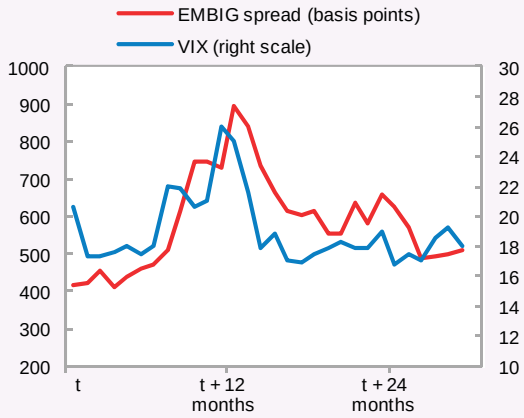
Macro Performance of Commodity Exporters and Other Emerging Economies during Global Recessions, 1980–2010 [1]
(Median cumulative growth, peak year = 0)



Source: IMF staff estimates.
[1] Median values are reported. Based on Hodrick-Prescott-filtered estimates of output gap for advanced economies, using industrial production. All recessions display the same pattern, except for the one following the 2008-09 financial crisis (the commodity price slump was short-lived in the latter case).
[2] Year at which estimated output gap closes.

Figure 3.5. Recent recessions have been accompanied by tightening of financing conditions for emerging markets.

Financial Conditions During Global Recessions, 1995–2010[1]



Source: IMF staff calculations.
[1] Simple average. Recessions defined on the basis of output gap estimated from advanced markets' industrial production series. A slowdown is considered a recession if the estimated output gap reaches at least –1. 5 percent of potential output for at least a quarter. (*t*) corresponds to month of the peak value of the cyclical component of output, before output falls below potential. Only the first 30 months are reported as length of recessions varies across episodes.

depending on the specific commodities countries specialize in.

Consistent with global recessions being accompanied by lower commodity prices, net commodity exporters have been particularly affected during those episodes (Figure 3.4). Recent recessions have also been, in general, associated with tighter financing conditions for emerging markets (Figure 3.5). Thus, the possibility of a "triple" shock—that is, weaker terms of trade, lower external demand, and tighter global financial conditions—is a tangible risk for many Latin American commodity-exporting economies.[6]

3.3. How Commodity Dependent Is Latin America?

How dependent is Latin America on commodity exports? How has this dependence evolved over time? How does it compare with emerging market economies in Asia?

The degree of commodity dependence, as well as its evolution over time, differs significantly across regions and subregions of Latin America (Figures 3.6 and 3.7, and Figure B in Annex 3.1).

- South America is the most commodity-dependent subregion, and this feature has become more pronounced over time (net commodity exports 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 products but now also a net importer of energy).
- The trends in emerging Asia greatly differ from those in Latin America, as the former has evolved from being a net commodity exporter (reaching around 6 percent of GDP in 1970) to being a net importer (almost 3 percent of GDP) in 2010. This 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.

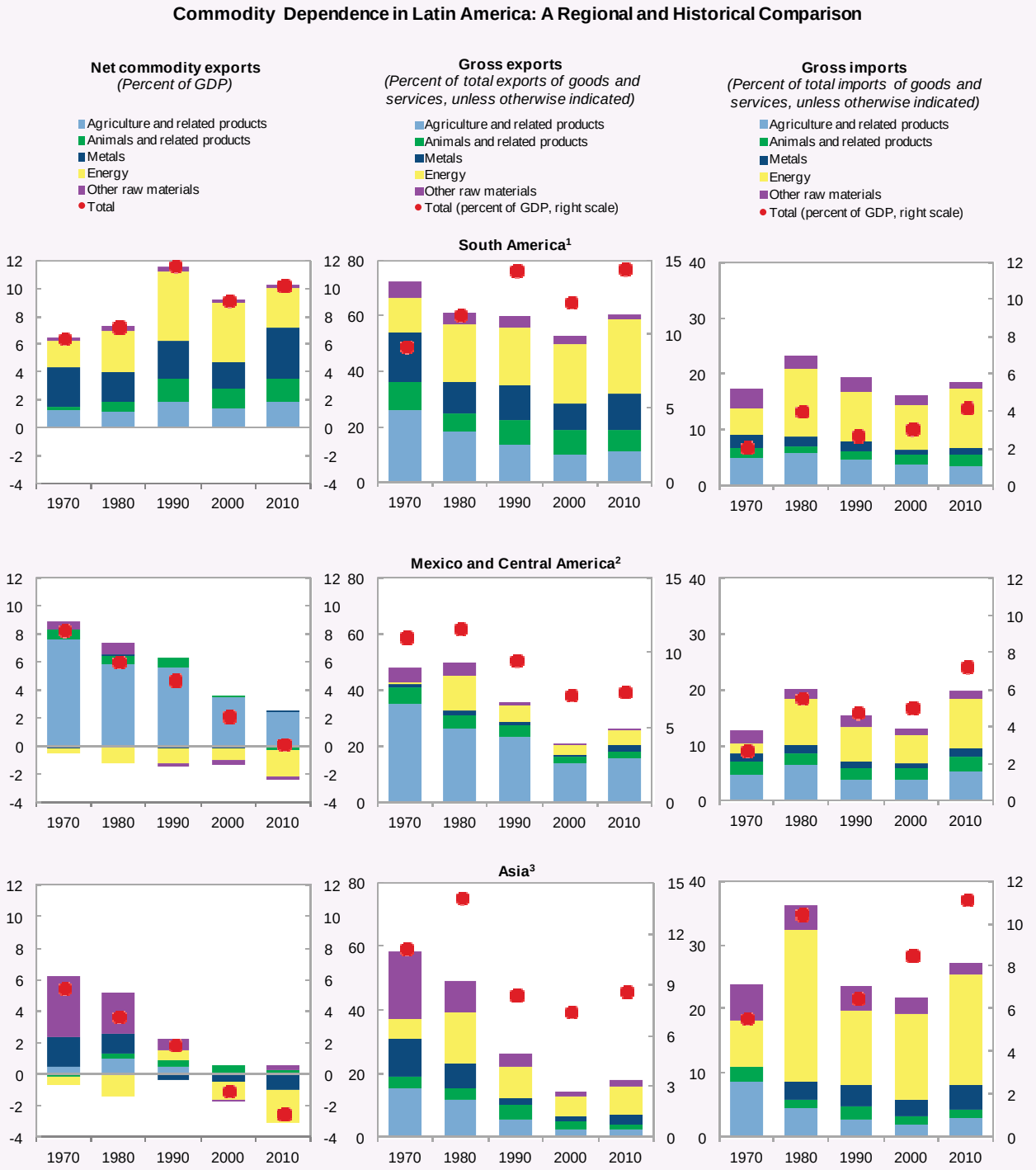
While increasing reliance on commodities (as percent of GDP) has made some countries in the region more vulnerable to commodity price shocks, even larger increases in non-commodity exports (trade openess has grown markedly) have led in many cases to a more diversified export structure, arguably making these economies more flexible to withstand commodity price shocks (Figures 3.6 and 3.7, and Figure C in Annex 3.1).[7]

- Several countries in South America (Argentina, Brazil, Uruguay) have diversified away from commodities, although the latter still account, on average, for 60 percent of their total exports of goods and services. Interestingly, this diversification has not taken place in the case of the heavy metal or energy exporters (Chile, Colombia, Ecuador, Peru, and Venezuela).
- In Mexico and Central America, the importance of commodity exports has also halved (from 50 percent of total exports to around 25 percent) between 1970–80 and 2010.
- Diversification in emerging Asia has been even starker, with commodity exports falling from

[6] A tightening of monetary policy in advanced economies could be another potential driver of lower commodity prices (see Box 3.1), though the likelihood of such an event is low in the near term.

[7] This source of strength has been pointed out by some authors (see, for instance, Calvo and Talvi, 2005), who have stressed the role of the relative size of the tradable sector (vis-à-vis the non-tradable sector) in determining the economy's ability to adjust to an external shock. A larger tradable sector would imply 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.

Figure 3.6. While South America has become more commodity dependent, Mexico and Central America—like emerging Asia—have reduced their dependence.



Sources: World Integrated Trade Solutions database; and IMF staff 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.

about 60 percent of total exports in the 1970s to less than 20 percent in 2010.

Finally, the changing dependence on commodities in many countries has also been, at least partly, driven by growing commodity imports—reflecting primarily the increasing need for energy in rapidly expanding emerging market economies.

- The share of commodities in Latin America's total imports has increased markedly as a percentage of GDP (although not in terms of total imports) with energy remaining the main category of commodity imports across the region.
- Emerging Asia has shown a similar pattern, with the exception of China—where commodity imports have increased both as a fraction of total imports and as a percentage of GDP.

In sum, Latin America remains—on average—as exposed to commodities-related risk as four decades ago, making it vulnerable to a sharp decline in commodity prices. At the same time, higher diversification (as non-commodity exports have grown even faster) has arguably made many of these countries more flexible to withstand such shocks. This is not the case, though, for energy and metal exporters, which are today particularly vulnerable to a global slowdown, given their higher overall commodity dependence and their greater concentration in commodities—heightened by their exposure to commodities that are more sensitive to the global economic cycle (Box 3.2).[8]

3.4. What Explains Economic Performance in the Face of Terms of Trade Busts?

Although high commodity dependence makes the region vulnerable to a sharp turnaround in commodity prices, the potential economic impact of such a shock is not obvious. This is partly because the degree of commodity reliance varies across countries, but also—and more importantly—because economic fundamentals and policies can play an important role in mitigating or amplifying the effects.

Furthermore, the frequent concurrence of terms of trade and other external shocks (global growth or

Figure 3.7. The region is still heavily commodity dependent.

Commodity Dependence and Export Diversification in Latin America, 2010

Sources: World Integrated Trade Solutions database and IMF staff calculations.

[8] A country's ultimate degree of vulnerability is, however, also determined by the flexibility and quality of their policy frameworks. The role of policies in shaping the impact of shocks is examined in the next section.

financial) makes it intrinsically difficult to observe the direct impact of price shocks, unless a multivariate setting is used (enabling the effect of different external factors to be disentangled from the price effect and its interactions with country economic fundamentals).

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 focus is on large terms of trade changes, as country fundamentals are likely to play a more important role when shocks are sizable (e.g., the flexibility of policy frameworks is more critical when the need for economic adjustment is large).

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, we explore 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 us to explore the importance of certain variables for which reliable data are available only for a shorter and more recent time span (e.g., degree of dollarization, fiscal stance).

Unlike other studies—which 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 ratios to GDP (that is, the direct impact of the changes in export and import deflators on the trade balance, given volumes).[9] Specifically:

$$TOT_t^A = \widehat{P_t^X}\left(\frac{X_{t-1}}{GDP_{t-1}}\right) - \widehat{P_t^M}\left(\frac{M_{t-1}}{GDP_{t-1}}\right)$$

where $\widehat{P_t^X}$ and $\widehat{P_t^M}$ denote the percentage change in export and import deflators, respectively, and $\frac{X_{t-1}}{GDP_{t-1}}$ and $\frac{M_{t-1}}{GDP_{t-1}}$ 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 (i.e., 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 3 percentage points of GDP, from peak to trough (with negative changes in at least two consecutive years).[10] This criterion identifies 98 episodes (Figure 3.8).[11] Interestingly, although there is a prevalence of episodes during the commodity shocks of the 1970s and 1980s, there are

[9] 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 economy's ability to adjust to an external price shock—as raised by Calvo and Talvi, 2003—but its direct income effect. Econometric results confirm that this measure of terms of trade is more informative than the traditional ratio of export to import prices, as the latter does not deliver statistically significant results.

[10] The threshold is somewhat arbitrary. It is set at a relatively high level to increase the likelihood of identifying an economic impact and at the same time not too high in order to preserve a reasonable sample size. 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.

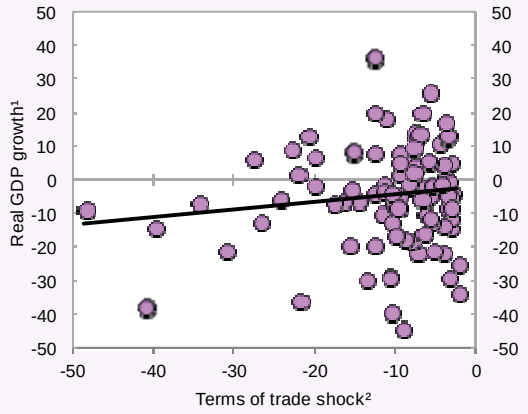
[11] The sample of countries includes both commodity exporters and importers, in order to disentangle the price effect from the effect of other external shocks that could be highly correlated with commodity prices (e.g., global growth). Terms-of-trade shocks induced by export prices do not appear to have a different impact than those induced by import prices (see Box 3.3).

Figure 3.8. Episodes of Terms of Trade Busts[1]
(Time span of each episode)

Source: IMF staff calculations.
[1] Episodes of negative (adjusted) terms of trade shocks of at least 3 percentage points of GDP, cumulative peak to trough. Lighter blue shading corresponds to episodes in which the terms of trade drop is not accompanied by a drop in real (U.S. CPI-deflated) export prices (i.e., the change in terms of trade comes from import prices).

Figure 3.9. Terms of trade shocks cannot explain, by themselves, economic performance, even for large shocks.

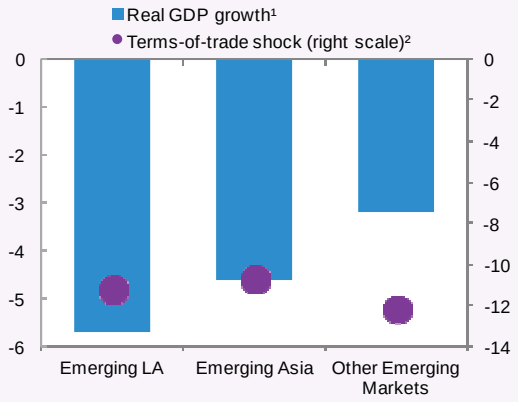
Terms of Trade Shocks and GDP Growth
(Cumulative, peak to trough)



Source: IMF staf calculations.
¹ Cumulative difference with respect to prebust (*t*–3 to *t*) growth. *t* is the last year before the drop in terms of trade.
² Cumulative direct effect in adjusted terms of trade, in percent of GDP.

Figure 3.10. Latin America appears to be more vulnerable to terms of trade shocks.

Performance by Region
(Percent, simple averages)



Source: IMF staff calculations.
¹ Cumulative difference with respect to prebust (*t*–3 to *t*–1) growth, in percentage points.
² Cumulative direct effect in terms of trade, in percent of GDP.

still a fair number of episodes dated in the last two decades—although the latter 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 3.9). In fact, only two-thirds of the episodes show negative cumulative growth (relative to the preshock average), and the fraction falls to one-half for the subsample of episodes taking place during the 2000s.[12]

A breakdown by region indicates that, for shocks of similar magnitude, Latin America appears to have been more affected than other regions (Figure 3.10). Since our measure of terms of trade already factors in the countries' degree of trade openness, this disparity in economic impact suggests that other economic fundamentals may have played a role in amplifying the impact of these shocks.

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 3.11):

- There is considerable difference between the best and the 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.
- 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 feature that closely resembles the current situation in Latin America.

Overall, macro performance during these episodes appears to reflect more than simply the effect of the terms of trade, to the extent that countries facing

[12] This reflects the importance of other external factors in driving economic growth, as the latter period was characterized by favorable global growth and financial conditions.

more favorable price dynamics do not appear to have outperformed the rest (Box 3.4). These stylized facts reinforce the need for a multivariate setting in order to properly examine the determinants of output performance in the face of large terms of trade shocks.

With this aim, 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:

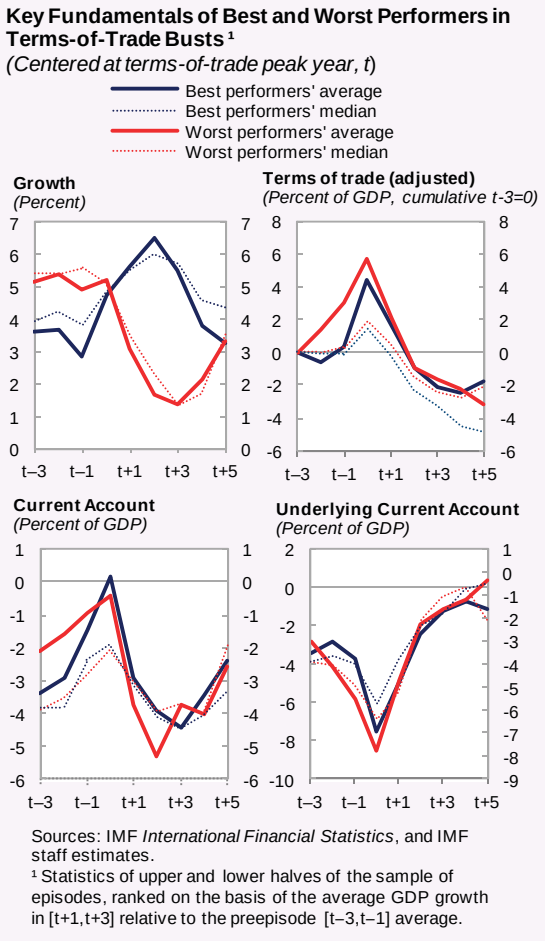
$$Y_i = \alpha + \beta_0 ToT_i^{A} + \beta'_k \mathbf{X}_i + \beta'_j \mathbf{Z}_i + \varepsilon_i$$

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);[13] ToT_i^{A} is the (adjusted) terms of trade cumulative change during the time span of episode i;, $\mathbf{X}_i$ is a vector of variables reflecting fundamentals and policies in the run-up to the shock, and $\mathbf{Z}_i$ is a vector of controls (external factors).

We focus on the following explanatory variables that—to different degrees—reflect economic policies:[14]

- 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).[15]
- The occurrence of a credit boom during the three-year period preceding the shock, as identified by either Gourinchas, Landerretche, and Valdes (2001) or Mendoza and Terrones (2008).

Figure 3.11. Good performers during terms-of-trade slumps do not appear to have faced better conditions.



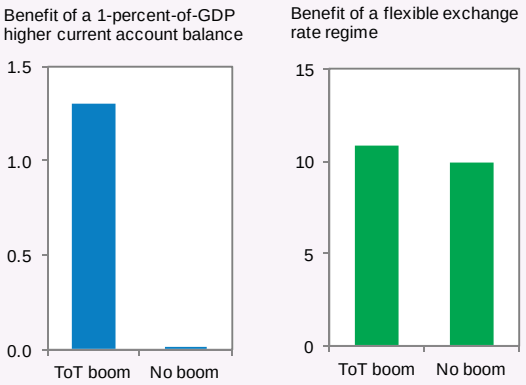
Sources: IMF *International Financial Statistics*, and IMF staff estimates.
[1] Statistics of upper and lower halves of the sample of episodes, ranked on the basis of the average GDP growth in [t+1,t+3] relative to the preepisode [t–3,t–1] average.

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

[13] 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.
[14] All explanatory as well as control variables are explained in detail in Annex 3.2.
[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).

Figure 3.12. Does it matter whether the bust was preceded by a boom?

Policies And Output Performance: Does It Matter if the Bust Was Preceded by a Boom?
(Percentage points of GDP growth)[1]



Sources: IMF, *International Financial Statistics*; and IMF staff calculations.
[1] Impact on cumulative output growth during the episode, as defined in the text. Based on column 10 of Table 3.3. *ToT boom* reflects the increase in the adjusted terms of trade (prior to the bust) of the 75th percentile of the sample (around 6 percent). *No boom* reflects the increase of the 25th percentile of the sample (roughly zero).

updated and extended version of the Lane and Milesi-Ferretti (2007) data set.[16]

Fiscal and financial sector variables are not included in this approach. In the case of fiscal variables, this reflects poor data quality and/or coverage for a number of episodes that date back 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.

The main results are as follows (Figure 3.12 and Table 3.3):[17]

- The output loss is smaller in countries with a stronger external position, as reflected in any of the current account measures (columns 1–2 and 6–9 in the table). The result holds when the change in 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 negative impact of a weak external position is larger, the larger the preceding terms of trade boom (columns 10–11).
- There is robust evidence that the decline in output is smaller in countries with more flexible exchange rate regimes (see columns 3–4 and 6–11), supporting the notion that exchange rate flexibility significantly enhances the economy's ability to adjust to real external disturbances.
- We find no evidence that countries' external (or public) debt position explains differences in

[16] The use of two different measures of financial openness allows us to properly interpret the results of the regression. See discussion of results.

[17] Regressions are estimated using ordinary least squares with robust standard errors. For the sake of brevity, in Table 3.3 we omit the coefficients of the external controls. Results may underestimate the effect of terms-of-trade shocks to the extent that some price movements arise from idiosyncratic shocks in countries with a large share in global supply of commodities (e.g. an unexpected increase in production of copper in Chile leading to a fall in international copper prices and, thus, on Chile's terms of trade).

Table 3.3. Cross-Sectional Approach: Results[1]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Dependent variable: Cumulative output growth during the bust (Y_i), relative to trend growth											
ToT^{A} [2]	0.264	0.284*	0.205	-0.113	0.160	0.0916	0.0115	0.159	0.0197	0.135	0.0959
	(0.23)	(0.17)	(0.20)	(0.19)	(0.15)	(0.26)	(0.27)	(0.23)	(0.22)	(0.199)	(0.200)
CA (percent of GDP, level in *t*) [3]	0.568*					0.615^{+}	0.648*			-0.105	-0.101
	(0.29)					(0.42)	(0.37)			(0.37)	(0.36)
CA_2 (percent of GDP, change *t*-3, *t*) [3]		0.503**						0.557*	0.456**		
		(0.20)						(0.30)	(0.23)		
ER Regime [4]			-10.59**			-9.084*		-10.50**		-9.589*	-13.54***
			(4.43)			(4.57)		(4.74)		(4.80)	(4.59)
FXVol [5]				0.946***			0.707**		0.701**		
				(0.32)			(0.34)		(0.32)		
KA openness [6]					-2.030*	-1.755	-2.036	-1.567	-1.991	-2.339^{+}	
					(1.21)	(1.50)	(1.50)	(1.58)	(1.45)	(1.45)	
Fin. Integ. [7]											0.071***
											(0.02)
CA x *ToT*^{A} *Prev* [8]										0.222***	0.133**
										(0.08)	(0.06)
ER Regime x *ToT*^{A} *Prev* [8]										-0.277	-0.209
										(0.51)	(0.48)
ToT^{A} *Prev* [8]										0.129	0.191
										(0.48)	(0.44)
Constant	-1.27	-3.43	0.62	-7.70**	-3.86	-0.29	-5.68**	-1.35	-7.57***	-0.86	-6.60
	(2.75)	(2.34)	(2.70)	(2.97)	(2.40)	(3.19)	(2.83)	(2.67)	(2.78)	(3.25)	(4.36)
Number of observations	91	93	79	68	92	70	64	73	66	70	70
R^2	0.103	0.114	0.131	0.119	0.102	0.207	0.213	0.211	0.206	0.305	0.332

Source: IMF staff calculations.

[1] Regressions estimated using ordinary least squares with robust standard errors (shown in parentheses). Regressions include controls for global factors (coefficients not shown).

[2] Cumulative change in the adjusted terms of trade measure, from peak to trough.

[3] Current account balance, percent of GDP, in period *t* or change from *t*–3 to *t,* as indicated.

[4] 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).

[5] Standard deviation of the monthly percentage changes of the nominal exchange rate (over a 12-month window).

[6] Chinn and Ito (2008) capital account openness index, average *t*–2 to *t*.

[7] Measure of financial integration, defined as the sum of total external assets and total external liabilities (in percent of GDP).

[8] Cumulative change in the adjusted terms of trade measure, in the three-year period before the shock.

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

output performance during the bust.[18] Similarly, neither international reserves nor credit booms appear to have played a role.[19]

A higher degree of capital account openness appears to be associated with larger output costs (columns 5–10), 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.[20] In fact, when using the measure of international financial integration, the result reverts. This is because the latter better captures the interaction of financial openess 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) are also significant determinants of output performance during the bust.

A Panel Approach

A large number of the episodes identified under the previous methodology date back 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 latter is financial dollarization, a feature that arose widely only during the 1980s, partly as a result of the move towards capital account liberalization. Hence, we complement the cross-sectional exercise with a panel approach that allows us to exploit the time series dimension of fiscal and financial variables, for which recent data are more reliable and show higher variation.

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

$$\hat{y}_{i,t} = \beta_0 + \beta_1 ToT^{A}_{i,t} + \beta_2^{'}\mathbf{X}_{i,t} + \beta_3^{'}\mathbf{F}_{i,t}I_{i,t} + \varepsilon_{i,t}$$

where $\hat{y}_{i,t}$ is country *i*'s real GDP growth at year *t*, $ToT^{A}_{i,t}$ is the adjusted measure of terms of trade; $\mathbf{X}_{i,t}$ is a vector of exogenous control variables (including world real GDP growth, the U.S. 10-year Treasury Bond yield, and the VIX); $I_{i,t}$ is a variable that takes the value of the terms of trade shock at year *t* ($ToT^{A}_{i,t}$) if the latter is lower than a certain threshold (set at -1.5 percentage points of GDP in our benchmark estimation);[21] and $\mathbf{F}_{i,t}$ 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 β_3 as it provides insights on which and to what extent certain economic fundamentals can exacerbate the effect of such shocks, over and above their direct effect.[22]

[18] This may reflect the fact that countries with stronger policies typically have greater access to markets and can afford higher debt ratios without raising concerns about debt sustainability.

[19] The muted result in regard to international reserves could reflect the fact that monetary authorities are often reluctant to make use of their reserve holdings to mitigate negative external shocks. This appears to have been the case, for instance, during the 2008 global financial crisis, when even countries with large amounts of reserves did not run down their holdings significantly.

[20] This caveat is particularly important in 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 countries.

[21] This threshold implies that about 20 percent of the annual observations are considered large and negative shocks.

[22] Under this specification the *direct* marginal effect of a large and negative terms of trade shock can be computed as ($\beta_1 + \beta_3'\mathbf{F}_{EM}$) where $\mathbf{F}_{EM}$ 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 $\beta_3'(\mathbf{F}_{i,t} - \mathbf{F}_{EM})$. Results are

(continued)

The following set of macroeconomic fundamentals is explored:

- Public and external debt, current account, and net foreign assets (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 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 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 one 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).[23] This second specification allows us to explore specifically 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 3.4):

- While terms of trade appear to explain relatively little of the variance in growth (see R^2 in column 1), the estimation captures an unambiguous and statistically significant effect: a 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.[24]

We find 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 3.13 and Table 3.4):[25]

- A stronger fiscal position at the time of the shock can help mitigate its impact—arguably reflecting more space to undertake countercylical 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.
- 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 cycles.[26]

robust to an alternative specification that incorporates the level of policy variables, in addition to their interactions with $I_{i,t}$. Results also hold if the dependent variable is measured relative to potential growth (with the latter proxied by the 10-year moving average).

[23] 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 latter is lower than -1.5 percentage points of GDP and the previous three years were characterized by positive terms of trade shocks.

[24] The introduction of the external variables as controls reduces only marginally the coefficients of terms of trade, suggesting that the correlation between these other factors and terms of trade is relatively low in the sample. To a great extent this reflects the fact that the sample includes both commodity exporters and importers. Any correlation between global financial and growth variables and commodity prices tends to disappear when the full sample is used (unlike the case of the subsample of commodity exporters). This highlights the advantage of including commodity importers, to better disentangle the price effect from the impact of other global shocks.

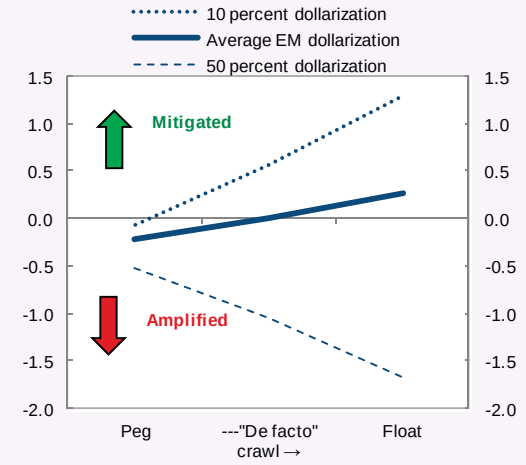
[25] Each chart in Figure 3.13 reports the mitigation effect—of having better fundamentals than the average emerging market economy, one dimension at a time—to a -1 percent of GDP terms-of-trade shock. See footnote 23.

[26] There is less clear evidence of such effect in other cases (not preceded by booms).

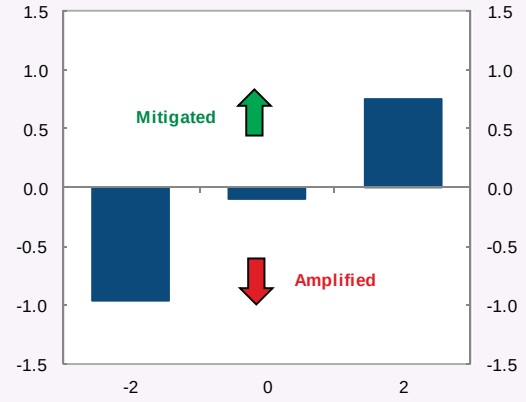
Figure 3.13. Policies can play a critical role in amplifying or mitigating the impact of terms of trade shocks

Amplification/Mitigation by Key Economic Fundamentals [1]
(Effect of terms of trade shock for different levels of fundamentals)

Exchange rate flexibility and dollarization[2]



Primary balance[3]



Source: IMF staff estimates.
[1] Based on panel approach results (column 19 of Table 3.4). Each figure reports the mitigation effect—of having better fundamentals than the average emerging market economy, in one dimesion at a time—to a 1 percent of GDP negative terms of trade shock.
[2] Net effect, including interaction between exchange rate flexibility and the level of deposit dollarization.
[3] Percent of GDP.

- 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).[27]

[27] The positive coefficient on the interaction term likely reflects the impact of balance sheet effects in dollarized economies. Results may overstate the effect of dollarization to the extent that such a feature is not accompanied by significant currency mismatches.

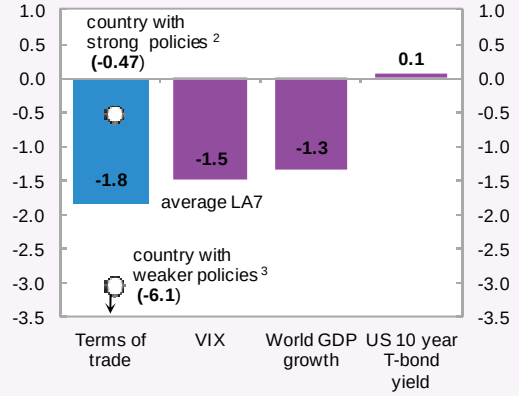
- In line with the results of the previous section, a more open capital account, on average, does not seem to smooth the external trade shock. The result reverts, however, if the measure of financial integration is used instead.

- 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.

On the other hand, external factors show robust results, with statistically significant coefficients of expected signs. Furthermore, the magnitude of these suggests that the impact of shocks to these variables could be as pronounced as those of price shocks—at least in a 2008/09 crisis-like event (Figure 3.14)—

Figure 3.14. Global growth and financial shocks can be as important as price shocks.

LA7: Impact of a 2008 Crisis-like Event[1]
(Percentage points of GDP growth)



Source: IMF staff calculations.
[1] Based on specification presented in column 19 of Table 3.4 evaluated at the average 2010 value of fundamentals for the LA7 group (Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay). Assumes shocks of (i) 40 percent drop in all commodity prices, leading to a -2.8 percentage points of GDP terms of trade shock (based on LA7's average net commodity exposure); (ii) a slowdown in global growth of 3.3 percent; (iii) a fall of 137 basis points in the US 10-year T-bond yield; and (iv) an increase of 14 points in the VIX. These assumptions are broadly consistent with developments during the 2008–09 crisis. As discussed in previous sections, a global recession would likely impact metal and energy prices more markedly than other (e.g., food) prices. Thus, the assumed 40 percent shock across all commodities may overstate the likely price shock for some countries and understate it for others.
[2] With floating exchange rate regime, 15 percent dollarization and balanced primary fiscal accounts.
[3] With de-facto crawling band (narrower than +/-5 percent), 30 percent dollarization and primary balance of -2 percent of GDP.

Table 3.4. Econometric Results of Panel Approach[1]

Sample period: 1970–2007	*Dependent Variable: GDP growth (annual, in percent)*																		
	Base	*With ext. controls*	*Amplification of large and negative shocks*							*Amplification of large and negative shocks preceded by booms*								
Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(15)**	**(16)**	**(17)**	**(18)**	**(19)**
Terms of trade [2]	0.131***	0.100***	0.077*	0.070	0.093+	0.070*	0.081**	0.084*	-0.023	0.069*	0.074*	0.061	0.024	0.090**	0.090**	0.004	0.002	0.002
	(0.037)	(0.035)	(0.045)	(0.049)	(0.058)	(0.036)	(0.035)	(0.047)	(0.072)	(0.037)	(0.040)	(0.043)	(0.053)	(0.035)	(0.034)	(0.054)	(0.055)	(0.055)
Lagged terms of trade [2]	0.082**	0.074**	0.070	0.122***	0.115***	0.068+	0.078**	0.080**	0.032	0.072	0.136***	0.119**	0.092**	0.087**	0.091**	0.033	0.031	0.032
	(0.036)	(0.036)	(0.053)	(0.032)	(0.042)	(0.041)	(0.037)	(0.039)	(0.055)	(0.052)	(0.034)	(0.045)	(0.038)	(0.036)	(0.034)	(0.055)	(0.056)	(0.056)
Lagged real GDP (level)		-0.002	-0.009	-0.000	-0.009	0.025***	0.002	-0.002	0.026**	-0.009	0.000	-0.010	0.025***	0.002	-0.002	0.025**	0.025**	0.025**
		(0.008)	(0.008)	(0.010)	(0.010)	(0.009)	(0.008)	(0.008)	(0.011)	(0.008)	(0.010)	(0.010)	(0.009)	(0.008)	(0.008)	(0.011)	(0.011)	(0.011)
World GDP growth		0.477***	0.462***	0.419***	0.407***	0.516***	0.439***	0.495***	0.452***	0.458***	0.393***	0.403***	0.513***	0.422***	0.486***	0.405***	0.401**	0.402**
		(0.091)	(0.090)	(0.090)	(0.090)	(0.140)	(0.087)	(0.085)	(0.149)	(0.092)	(0.083)	(0.090)	(0.139)	(0.088)	(0.087)	(0.149)	(0.150)	(0.150)
U.S. 10-year Treasury Bond Yield		-0.296***	-0.231***	-0.268***	-0.266***	-0.071	-0.288***	-0.297***	-0.035	-0.231***	-0.250***	-0.264***	-0.093	-0.278***	-0.294***	-0.042	-0.042	-0.043
		(0.069)	(0.066)	(0.081)	(0.080)	(0.086)	(0.069)	(0.071)	(0.064)	(0.065)	(0.079)	(0.078)	(0.080)	(0.069)	(0.071)	(0.064)	(0.064)	(0.064)
VIX		-0.107***	-0.110***	-0.098***	-0.119***	-0.096***	-0.113***	-0.108***	-0.107***	-0.111***	-0.101***	-0.119***	-0.099***	-0.116***	-0.111***	-0.109***	-0.110***	-0.110***
		(0.021)	(0.023)	(0.023)	(0.023)	(0.023)	(0.021)	(0.020)	(0.030)	(0.024)	(0.022)	(0.023)	(0.024)	(0.021)	(0.021)	(0.029)	(0.030)	(0.030)
Interaction of fundamentals and negative and large terms-of-trade shocks [3]																		
Exchange rate flexibility (t–1) [4]			-0.001		-0.015				0.053*	0.019		-0.042				-0.239***	-0.043	-0.181***
			(0.013)		(0.011)				(0.030)	(0.037)		(0.036)				(0.025)	(0.086)	(0.027)
Dollarization (t–1) [5]				0.004							0.050***							
				(0.004)							(0.018)							
Exchange rate flexibility * Dollarization (t–1) [6]					0.000				-0.000			0.007				0.006***	0.005***	0.006***
					(0.000)				(0.000)			(0.005)				(0.001)	(0.001)	(0.000)
Primary fiscal balance (t–1) [7]						-0.038***			-0.023***				-0.096***			-0.428***	-0.428***	-0.429***
						(0.013)			(0.008)				(0.021)			(0.020)	(0.035)	(0.014)
Capital account openness [8]							0.103		0.251					0.802***		2.437***		2.202***
							(0.121)		(0.258)					(0.270)		(0.320)		(0.255)
Financial integration [9]								0.059	-0.456+						0.390*		-1.573**	-0.491
								(0.099)	(0.281)						(0.217)		(0.599)	(0.342)
Constant	4.256***	6.332***	6.698***	6.191***	7.319***	2.470**	6.293***	6.335***	2.768**	6.744***	6.166***	7.408***	2.744***	6.288***	6.342***	3.109**	3.119**	3.122**
	(0.009)	(0.852)	(0.865)	(1.038)	(1.062)	(1.022)	(0.861)	(0.866)	(1.194)	(0.902)	(1.020)	(1.066)	(0.979)	(0.849)	(0.894)	(1.163)	(1.165)	(1.165)
Number of observations	2,025	2,025	1,567	1,571	1,227	1,130	1,970	1,879	760	1,567	1,571	1,227	1,130	1,970	1,879	767	760	760
R^2- within	0.023	0.089	0.090	0.084	0.109	0.125	0.091	0.098	0.100	0.090	0.102	0.110	0.128	0.097	0.103	0.100	0.100	0.101
R^2- between	0.006	0.004	0.154	0.008	0.133	0.039	0.003	0.004	0.261	0.164	0.055	0.172	0.006	0.001	0.002	0.234	0.236	0.242
R^2- overall	0.015	0.077	0.088	0.070	0.105	0.069	0.075	0.085	0.029	0.089	0.089	0.109	0.081	0.080	0.088	0.035	0.035	0.035
Number of countries	64	64	59	61	55	57	63	63	49	59	61	55	57	63	63	50	49	49

Source: IMF staff estimates.

[1] 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 are reported in parenthesis.

[2] Adjusted terms-of-trade-measure.

[3] 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).

[4] 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.

[5] Foreign currency deposits as a percentage of total deposits.

[6] Interaction of exchange rate flexibility measure and dollarization.

[7] Level, in percent of GDP.

[8] Index of Chinn and Ito (2008) normalized to range between 0 and 1 (1 being the most open).

[9] Total foreign assets plus total foreign liabilities, in percent of GDP. Countries with the level of the United States or higher are classified as fully integrated. For other countries, the measure is reported relative to the level of the United States.

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

although policies are also likely to play an important role in shaping such impact.[28]

3.5. Key Takeaways and Policy Implications

With many net commodity exporters, Latin America—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 Latin America and policies that could mitigate such impact. The rich history of terms of trade shocks in emerging and commodity-exporting advanced economies over the last four decades provides valuable insights on 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). This highlights the importance of countercyclical policies during the boom phase of commodity price cycles. 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—as balance sheet effects often limit the benefits of exchange rate flexibility. There is also strong evidence that countries that behave more prudently during the boom phase—preventing or limiting the deterioration of the underlying fiscal and external positions—perform better during the bust. Specifically, economies 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—arguably because it allows countercyclical fiscal policy to be undertaken.

The econometric evidence also points to the significance of other external factors—like global economic activity and financial conditions—in driving economic growth in emerging markets.

In the current environment, where global growth prospects and financial stability are the main sources of concern, a tail event scenario would likely entail a deterioration of external conditions in all fronts, further stressing the need for prudent macroeconomic management—along the lines discussed previously—while favorable conditions last.

[28] See April 2007 and May 2010 editions of the *Regional Economic Outlook: Western Hemisphere* for a discussion on these issues.

Box 3.1. U.S. Monetary Policy and Commodity Prices

The impact of monetary policy in the United States and other advanced countries on commodity prices has been studied extensively in the literature.[1] Understanding these effects is important for assessing the potential implications of changes in monetary conditions in advanced economies for Latin American commodity exporters.

Impact of U.S. monetary policy on commodity prices. Simple, illustrative ordinary least squares (OLS) regression analysis suggests a negative relationship between real commodity prices and U.S. monetary policy. This result holds for two alternative measures of U.S. monetary policy: changes in the federal funds real interest rate and the unanticipated component of those changes.[2] The estimated coefficient suggests that an increase in the real interest rate of 100 basis points would be associated with a decline in real commodity prices of about 6 percent.

U.S. Monetary Policy and Commodity Prices

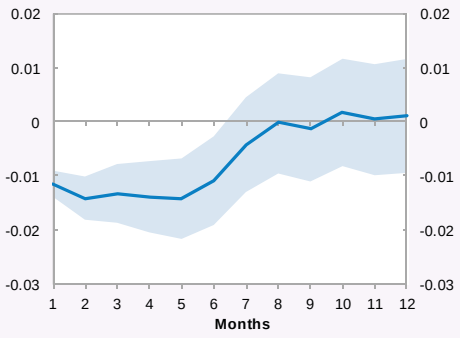
Dependent variable: Log (commodity prices)	(1)	(2)
C	4.503***	4.152***
	(0.017)	(0.031)
Federal Funds real interest rate	-0.063***	
	(0.007)	
Unanticipated interest rate	4.503	-0.442***
		(0.044)
Number of observations	268	268
R^2	0.222	0.271
Prob. (F-statistic)	0.000	0.000

Source: IMF staff calculations.

[1] OLS regression using monthly data for 1989:M1 through 2011:M4.
*** $p < 0.01$.

The analysis is complemented by estimating simple bivariate vector autoregressive (VAR) models including real commodity prices and the federal funds real interest rate.[3] Impulse responses suggest that a tightening in U.S. monetary policy is followed by a decline in real commodity prices, with the impact lasting for about 6 months (12 months in the case of an unanticipated shock). A 100-basis-point increase in the real interest rate would be followed by a fall in real commodity prices of 4 percent after 5 months, with the effects vanishing thereafter.

Response of Real Commodity Prices to a U.S. Monetary Policy Shock [1]



Source: IMF staff calculations.
[1] Response to a one-standard-deviation shock to the federal funds real interest rate ±two standard errors.

Channels of transmission. Lower interest rates may increase the price of commodities through a number of channels.[4] First, they affect commodity prices via stronger (domestic and global) growth. Second, they reduce the opportunity cost of carrying inventories, increasing the demand for commodities.[5] Third, they weaken the incentive to extract larger amounts of exhaustible commodities today, as the cost of holding inventories in the ground declines. Finally, they may encourage financial speculators to move into commodity contracts and away from Treasury bills.[5]

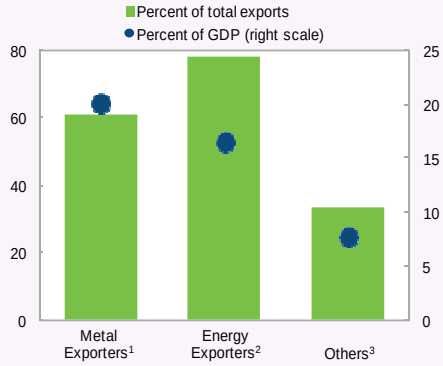
Note: This box was prepared by Sebastián Sosa.
[1] Moreover, during the commodity price surge of 2008 some commentators argued that loose monetary policy and persistently low interest rates in the U.S. and other advanced economies partly explained the commodity price hike
[2] Changes in monetary policy rates may be partly anticipated, with commodity prices moving at the time of information arrival rather than when the rate change actually takes place. Here the series of unanticipated rate changes from Chapter 4 of the April 2011 *World Economic Outlook* (IMF, 2011g) is used.
[3] The VARs are estimated using 12 lags, with real commodity prices being the last variable in the Choleski ordering.
[4] The study of the potential channels is beyond the scope of this box. For a discussion, see Frankel (2006) and Barsky and Kilian (2004).
[5] Box 1.4 of the September 2011 *World Economic Outlook* argues that although financialization has influenced commodity price behavior, there is not strong evidence to suggest that it either destabilizes or distorts spot markets.

Box 3.2. Latin America's Commodity Dependence and Export Diversification: Selected Cases

The analysis of commodity dependence beyond subregional aggregates shows interesting differences across countries, as well as sizable shifts in a few countries' trade structure over time:

- **Metal** (Chile and Peru) and **energy exporters** (Colombia, Ecuador, and Venezuela) have higher concentrations of their exports, with metals (energy) accounting, on average, for about 60 percent (80 percent) of total exports of goods and services. Moreover, these countries exhibit a higher degree of commodity dependence, with commodity exports amounting to 20 and 17 percent of GDP, respectively, compared to only 8 percent in other countries in the region.

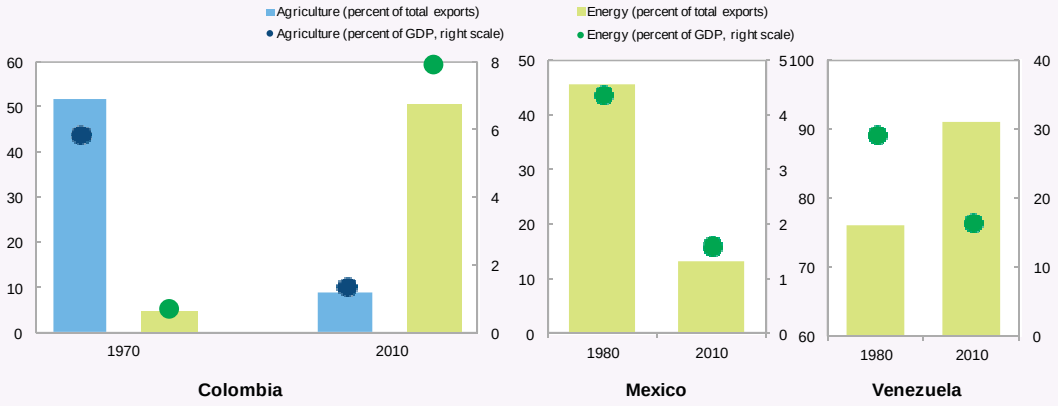
Commodity Dependence and Export Diversification in LAC, 2010



Sources: World Integrated Trade Solutions database, and IMF staff calculations.
[1] Metal exports > 5 percent of GDP. Includes Chile and Peru.
[2] Energyexports > 5 percent of GDP. Includes Colombia, Ecuador, and Venezuela.
[3] Includes Argentina, Brazil, Costa Rica, El Salvador, Guatemala, Mexico, and Uruguay.

- **Colombia** has exhibited a marked shift in its trade structure over the last four decades, even though the overall share of commodities has remained quite stable. Agricultural exports—which accounted for more than half 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. As a percentage of GDP, net agricultural exports declined from about 5 percent to close to balance, whereas net energy exports surged from around zero to 8 percent over the same period.
- **Mexico** and **Venezuela**, on the other hand, have recorded a substantial decline in net energy exports. In the first case, these exports have declined from 4½ to 1½ percent of GDP between 1980 and today, and in the latter case, this figure fell from 30 percent in 1990 to about 15 percent in 2010. Still, the two cases differ markedly in terms of the degree of product diversification, as energy exports in Mexico currently amount only to 13 percent of total exports, whereas they reach about 90 percent in the case of Venezuela.

Commodity Dependence and Export Diversification in Colombia, Mexico and Venezuela



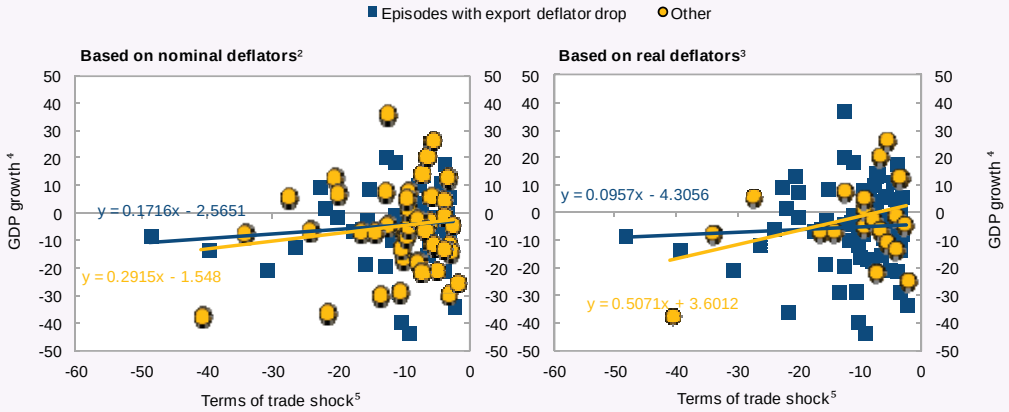
Sources: World Integrated Trade Solutions database; and IMF staff calculations.

Note: This box was prepared by Sebastián Sosa.

Box 3.3. Export- or Import-Induced Terms-of-Trade Shocks: Are They Different?

Identified episodes of large and negative (adjusted) terms-of-trade shocks include both cases in which the shock arises primarily from (falling) export prices and cases in which it arises from (increasing) import prices. The first type normally correspond to net commodity exporters during commodity price busts, and the second type to net commodity importers during commodity price booms (see the distribution of different types of cases across time in Figure 3.8). The use of both types of cases in our analysis raises the question of whether the source of a terms-of-trade shock—export or import price—makes a difference in terms of its economic impact. A simple split of the sample between these two types of cases points to no noticeable difference, in part because terms of trade alone appear to explain little of the cross-country growth variation. Econometric results that control for other external factors and macroeconomic fundamentals (see Section 3.4) corroborate this finding.

GDP Growth in the Face of Export- and Import-Induced Terms-of-Trade Shocks[1]
(Cumulative, peak-to-trough)



Source: IMF staff calculations.
[1] Economic performance in episodes of large (adjusted) terms-of-trade shocks, differentiating whether these shocks are accompanied by a drop in export prices or not.
[2] On the basis of nominal deflators.
[3] On the basis of real (U.S. CPI-deflated) export deflators.
[4] Cumulative difference with respect to pre-bust (t–3 to t) growth, in percentage points.
[5] Cumulative direct effect of terms of trade, in percent of GDP.

Note: This box was prepared by Gustavo Adler.

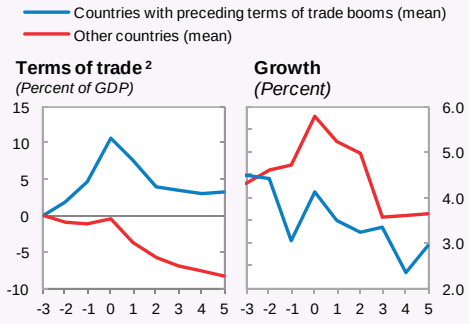
Box 3.4. The Cost of Mismanaging Abundance

A number of the identified episodes of sharp negative terms of trade shocks were preceded by significant improvements in such terms. Although those 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. We explore 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. 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 0 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.[1]

Policy responses appear to have played a role in explaining these "missed opportunities":

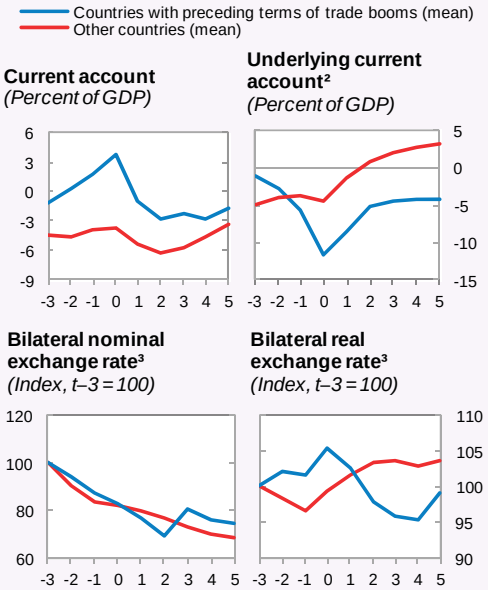
- Countries with preceding booms showed strong improvements in their current accounts during the boom, but significantly larger deteriorations in their underlying (price-adjusted) positions.
- Booming countries appear not to have allowed their nominal exchange rates to appreciate more, although their real exchange rates still appreciated more on account of higher inflation.
- Booming countries also missed the opportunity to strengthen 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.

Economic Performance in Countries with and without Preceding Terms of Trade Booms[1]



Source: IMF staff calculations.
[1]Based on splitting the sample of episodes of large and negative (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.
[2] Adjusted terms of trade, cumulative since t-3.

Key Fundamentals in Countries with and without Preceding Terms of Trade Booms[1]



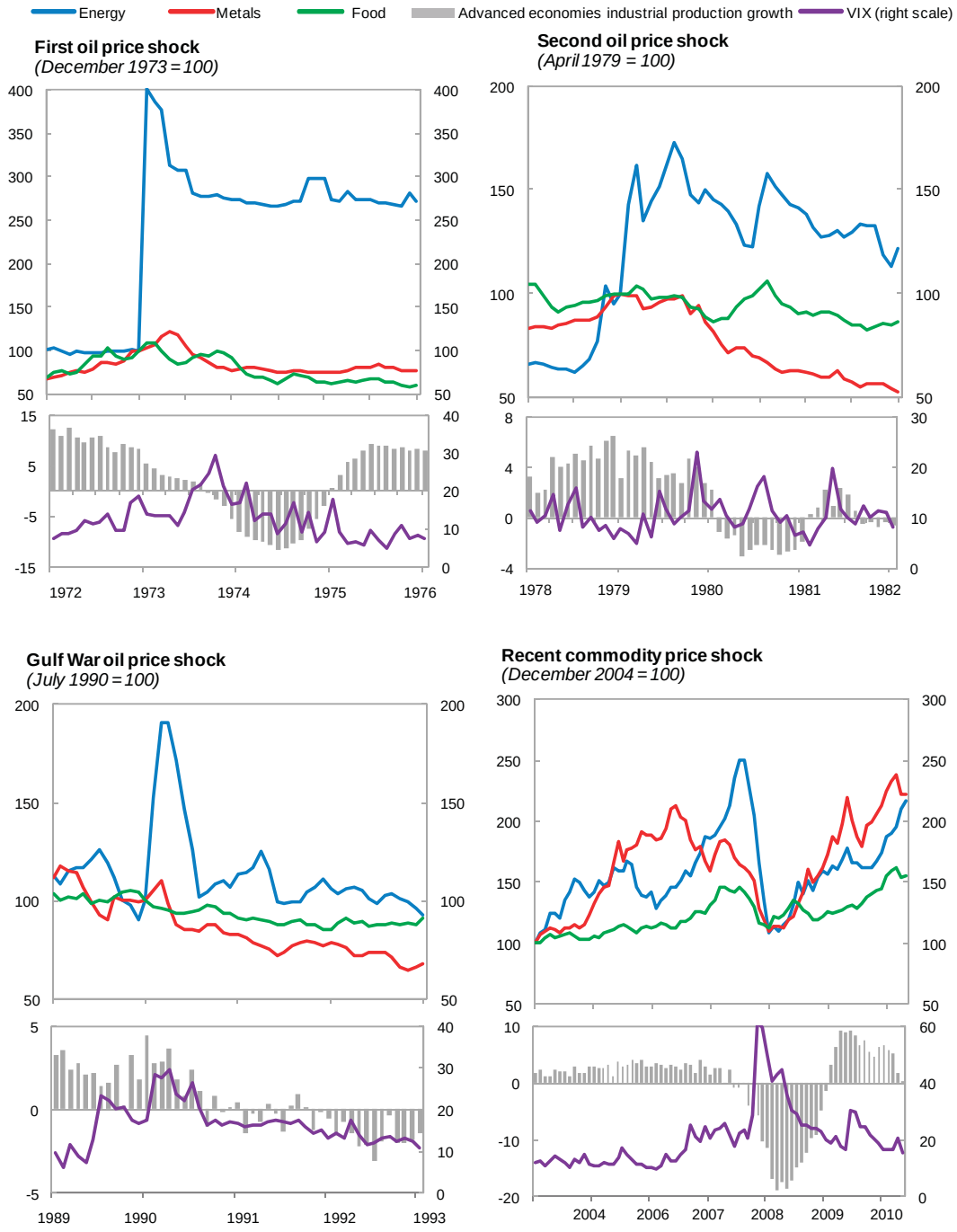
Source: IMF staff calculations.
[1] Based on splitting the sample of episodes of large and negative (adjusted) terms of trade shocks into two halves, based on the cumulative terms of trade changes between *t*-3 and *t*, where *t* is the year before the shock. Averages for each sub-sample are reported.
[2] Prices held constant at *t*-3 levels.
[3] Increases indicate appreciation.

Note: This box was prepared by Gustavo Adler.

[1] Series of medians (rather than averages) show very similar patterns.

Annex 3.1. Additional Figures

A. Episodes of Commodity Price Booms and Busts



Sources: IMF, *World Economic Outlook*; Haver Analytics; and IMF staff calculations.

B. Net Commodity Exports—Selected Latin American Countries
(Percent of GDP)

Sources: World Integrated Trade Solutions database; and IMF staff calculations.

C. Gross Commodity Exports—Selected Latin American Countries
(Percent of total exports of goods and services)

Sources: World Integrated Trade Solutions database; and IMF staff calculations.

Annex 3.2. Cross-Sectional Approach: List of Explanatory and Control Variables

Dependent variable: output performance during the episode of terms-of-trade bust	
Y	Cumulative deviation of GDP growth during the episode (*t*+1, *t*+*K*+1*)* from average growth in the five years prior to the shock (*t*-4,*t*), where *t* is the year before the shock, and *k* is the number of years with declining (adjusted) terms of trade, defined so that a lower (more negative) value means a greater output loss.
Terms of trade	
ToT^{A}	Cumulative change in adjusted terms of trade from *t*+*k* (trough) to *t* (peak).
ToT^{A} *Prev*	Cumulative change in adjusted terms of trade from *t*-3 to *t*.
External position	
CA	Current account balance, in percent of GDP, in period *t*.
CA_2	Current account balance, in percent of GDP, change from *t*-3 to *t.*
ExtDebt	External debt, in percent of GDP, change from *t*-3 to *t.*
FXRes	Foreign reserves, in percent of GDP, in period *t.*
FXRes_2	Foreign reserves, in percent of GDP, change from *t*-3 to *t.*
Fiscal Position	
PubDebt	Public debt, in percent of GDP, level in period *t*.
PubDebt_2	Public debt, in percent of GDP, change from *t-3* to *t.*
Other country conditions/fundamentals	
ER Regime	ER 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).
Volfx	Standard deviation of the monthly percentage changes of the nominal exchange rate (over a 12-month window), as a proxy for exchange rate flexibility.
KA Openness	Chinn and Ito (2008) capital account openness index, average *t*-2 to *t.*
Fin. Integ.	Measure of financial integration, defined as the sum of total external assets and liabilities, in percent of GDP.
Credit Boom	Dummy = 1 if a credit boom occurred in the three years preceding the shock, as identified by either Gourinchas, Landerretche, and Valdes (2001) or Mendoza and Terrones (2008).
Controls: external conditions	
U.S. Tbond	Change in U.S. Treasury bond real interest rate (in percent) after the shock: difference between average (t+1,*t*+*K*+1) and average (*t*-2,*t*).
VIX	Change in the VIX after the shock: difference between average (t+1,*t*+*K*+1) and average (*t*-2,*t*).
WGDPGrowth	World real GDP growth (in percent): difference between average (t+1,*t*+*K*+1) and average (*t*-2,*t*).