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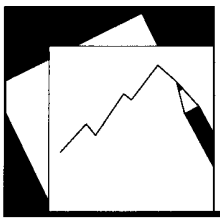

IMF Working Paper

Commodity Terms of Trade: The History of Booms and Busts

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Commodity Terms of Trade: The History of Booms and Busts

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Abstract

We compile a historical dataset covering nearly 40 years of booms and busts in the commodity terms of trade of over 150 countries. We discuss the characteristics of these events and their effects on macroeconomic performance and, in particular, compare the most recent commodity-price cycle with its historical precedents.

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I. INTRODUCTION

The link between commodity prices and macroeconomic performance has been hotly debated in the literature, with some studies finding that commodity booms raise growth while others suggest a "resource curse" that undercuts sustainable growth.[2] Unfortunately, the commodity-price data used in this literature reflect either the aggregate terms of trade, or else simply the price of one or two key commodity exports, rather than the theoretically more relevant country-specific measure of commodity-price fluctuations that depends on the composition of the particular country's commodity export and import baskets. This paper instead uses the first comprehensive dataset on country-specific commodity terms of trade, presented in Prati et al. (forthcoming). The key contribution of the study lies in identifying country-specific commodity-price cycles, and more specifically dating and characterizing commodity booms and busts for a sample of more than 150 countries over nearly 40 years starting in the early 1970s. Additionally, we begin the task of harvesting this dataset to analyze the link between commodity-price cycles and macroeconomic performance, how this link depends on various policy variables, and whether the experience of the past few years suggests a significant break with previous historical patterns.

The behavior of commodity prices, in terms of both their trend and their volatility, remains a subject of considerable controversy in academic, policy, and market circles alike.[3] Commodity prices had broadly been on a decline for a couple of decades until the turn of the 21st century. They then rose persistently, reaching very high levels by mid-2008, although they fell rapidly afterwards and have recently been very volatile. The latest boom in the price of energy and industrial inputs, including agricultural raw materials and metals, was particularly notable; the prices of food and beverages also increased, but less dramatically. By historical standards, the latest commodity-price boom was broad-based and sustained,

[2]See Deaton (1999) for Africa's experience, and Blattman, Hwang, and Williamson (2007) for a historical account. On the resource curse in particular, see Collier and Goderis (2007), as well as a literature survey by Van der Ploeg (2006).

[3]The behavior of commodity prices has remained a subject of controversy in the literature, ever since Prebisch (1950) and Singer (1950) found a downward trend in the data. See inter alia Cashin and McDermott (2002).

with the prices of many commodities—oil, metals, major food crops, and some beverages—rising sharply. Nonetheless, like its predecessors, this boom now appears to have been reversed, amid a deep global recession. It remains to be seen whether strong commodity price pressures reemerge as the global economy recovers.

What do the fluctuations in commodity prices, especially large fluctuations that are commonly referred to as booms and busts, imply for specific economies? Movements in commodity prices affect different countries differently depending on the composition of both their exports and imports; many developing countries export non-fuel primary commodities, but import energy. Booms in commodity prices do not therefore translate directly into terms-of-trade booms for all commodity exporters and busts for all commodity importers. To explore the country-specific dimension of global commodity price movements, it is useful to consider the commodity terms of trade: the ratio of commodity export prices to commodity import prices, with each price weighted by the share of the relevant commodity in the country's GDP or total trade.[4] Using commodity terms of trade allows us to define country-specific commodity price cycles, and therefore complement the literature describing cycles in specific commodities.[5]

In this paper, we compile a historical dataset covering nearly 40 years of booms and busts in the commodity terms of trade of over 150 countries. We discuss the characteristics of these events and their effects on key macroeconomic variables and, in particular, compare the most recent commodity-price cycle with its historical precedents. Our focus is on documenting the cycles and assessing their broad consequences in affected countries, rather than analyzing the driving forces behind these fluctuations.

Some key findings are as follows. First, commodity-price booms tend to be larger than commodity-price busts. Second, around 1/3 of all booms (busts) are followed by busts

[4]Deaton and Miller (1996) and Cashin, Cespedes, and Sahay (2004) construct country-specific commodity export prices in a similar way. The terms-of-trade measure used here takes into account both commodity export and import prices, and also adjusts for the importance of commodities in overall trade of each country. A similar terms-of-trade measure is used in IMF (2006).

[5]For dating cycles in individual commodities, and for the characteristics of these cycles, see Cashin, McDermott, and Scott (2002).

(booms) and the larger the boom, the larger the subsequent bust. Third, median annual growth is nearly 2 percentage points higher during commodity-price booms than during busts. Fourth, during both booms and busts, large real appreciations are associated with significantly lower growth. Fifth, the larger the pre-boom government deficit, the smaller the growth during the subsequent boom, possibly because larger initial deficits increase the potential for crowding out of private spending. Finally, it appears that higher growth during the latest commodity-price cycle was at least in part due not to global factors, but rather to factors specific to those countries that experienced a commodity terms-of-trade boom. Such factors may have included longer booms, smaller real appreciations than in the past, and better initial conditions—in particular, stronger initial fiscal positions.

The rest of the paper is organized as follows. First, we explain in detail our country-specific measure of the commodity terms of trade. Next, we discuss our procedure for identifying country-specific commodity booms and busts, analyze the key characteristics of such booms and busts, and discuss how the latest episodes compare with previous ones. Finally, we analyze the macroeconomic consequences of commodity booms and busts, again with a focus on differences between the latest episodes and previous ones.

II. THE COMMODITY TERMS OF TRADE

In order to focus on the effects of commodity-price fluctuations on countries that both export and import primary commodities, we use a country-specific measure of the commodity terms of trade (CTOT). For country j at time t, this variant of the more general terms of trade is defined as a ratio of weighted real commodity export prices to weighted real commodity import prices, as follows:

$$CTOT_{jt} = \prod_i (P_{it} / MUV_t)^{X_{ij}} / \prod_i (P_{it} / MUV_t)^{M_{ij}},$$

where P_{it} are the individual commodity prices, MUV_t is a manufacturing unit value index used as a deflator, X_{ij} is the share of exports of commodity i in country j's GDP, and M_{ij} is the share of imports of commodity i in country j's GDP. The weights (that is, the export and

import shares) are time-averaged and set to remain constant over time, so that any movements in the CTOT reflect only changes in commodity prices, rather than changes in export and import volumes in response to price fluctuations. Since the weights are defined in terms of GDP, this index takes into account cross-country differences not just in the composition of commodity export and import baskets, but also in the importance of commodities to the overall economy. Such weighting is equivalent to scaling exports and imports first by total trade (as in Prati et al., forthcoming), and then by the share of total trade in each country's GDP.

Commodity prices are taken from the IMF *Commodity Price System* database.[6] They are expressed in real terms through deflation by the United Nations' Manufacturing Unit Value index (MUV), which measures the unit values of exports of manufacturing goods (SITC groups 5 through 8) by 24 developed market economies. The MUV data are taken from UNCTAD's *Handbook of Statistics* database and the IMF's *World Economic Outlook* database. Exports and imports of individual commodities are obtained from the United Nations' COMTRADE database. Total GDP is taken from the World Bank's *World Development Indicators* and the IMF's *World Economic Outlook* databases. The CTOT are computed for a sample of 152 countries over the period 1970–2007.[7]

Figure 1 shows broad commodity-price indices, both covering all commodities, as well as disaggregated into energy, industrial inputs, and food and beverages. Figures 2 and 3 document the evolution of the CTOT across various country groups, both analytical and geographical. It is clear that developing economies have reaped uneven benefits from the most recent boom, reflecting differences in the composition and relative magnitudes of their commodity exports and imports. Indeed, the commodity terms of trade have moved in

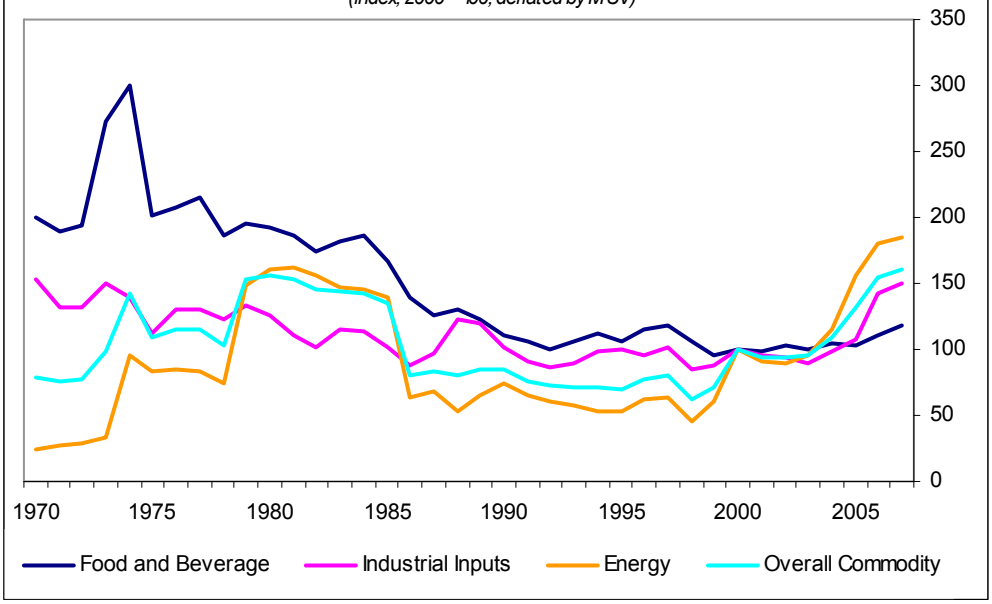
[6]Specifically, the CTOT index is based on the prices of 32 individual commodities: Shrimp; Beef; Lamb; Wheat; Rice; Corn (Maize); Bananas; Sugar; Coffee; Cocoa; Tea; Soybean Meal; Fish Meal; Hides; Soybeans; Natural Rubber; Hardlog; Cotton; Wool; Iron Ore; Copper; Nickel; Aluminum; Lead; Zinc; Tin; Soy Oil; Sunflower Oil; Palm Oil; Coconut Oil; Gold; Crude Oil.

[7]The number of countries in the sample by region is as follows: Advanced Economies, 22; Central and Eastern Europe, 15; CIS, 11; Developing Asia, 21; Middle East and Northern Africa, 15; Sub-Saharan Africa, 39; Latin America, 29.

different ways in fuel exporters and non-fuel commodity exporters over the past decades.[8] The most recent boom in energy prices gave a sizable boost to the commodity terms of trade of fuel exporters. Those of non-fuel commodity exporters on average also rose, but much more modestly.

Figure 1: Commodity Price Aggregates

(index; 2000 = 100; deflated by MUV)



At the regional level, the Middle East and North Africa and, to a somewhat lesser extent, sub-Saharan Africa and Latin America were the main beneficiaries of the recent commodity-price boom.[9] Differences in trade composition are behind these regional

[8]Fuel exporters are defined as those countries where fuel constitutes more than 50 percent of total exports. Non-fuel primary commodity exporters are analogously defined as countries where primary commodities other than fuel constitute more than 50 percent of total exports. By these definitions, fuel exporters in the sample include Algeria, Azerbaijan, Bahrain, Congo (Brazzaville), Ecuador, Gabon, Iran, Kazakhstan, Kuwait, Nigeria, Oman, Qatar, Russia, Saudi Arabia, Sudan, Syria, Trinidad and Tobago, Turkmenistan, United Arab Emirates, and Venezuela. The following sample countries are classified as non-fuel commodity exporters: Botswana, Burkina Faso, Burundi, Chile, Guinea, Guyana, Malawi, Mauritania, Mozambique, Papua New Guinea, Sierra Leone, Suriname, Tajikistan, Zambia, and Zimbabwe.

[9]It is however important to note that terms-of-trade effects vary significantly within regions. Since the recent boom benefited fuel exporters more than non-fuel commodity exporters, not all countries in sub-Saharan Africa and Latin America gained from it. See, for instance, IMF (2007).

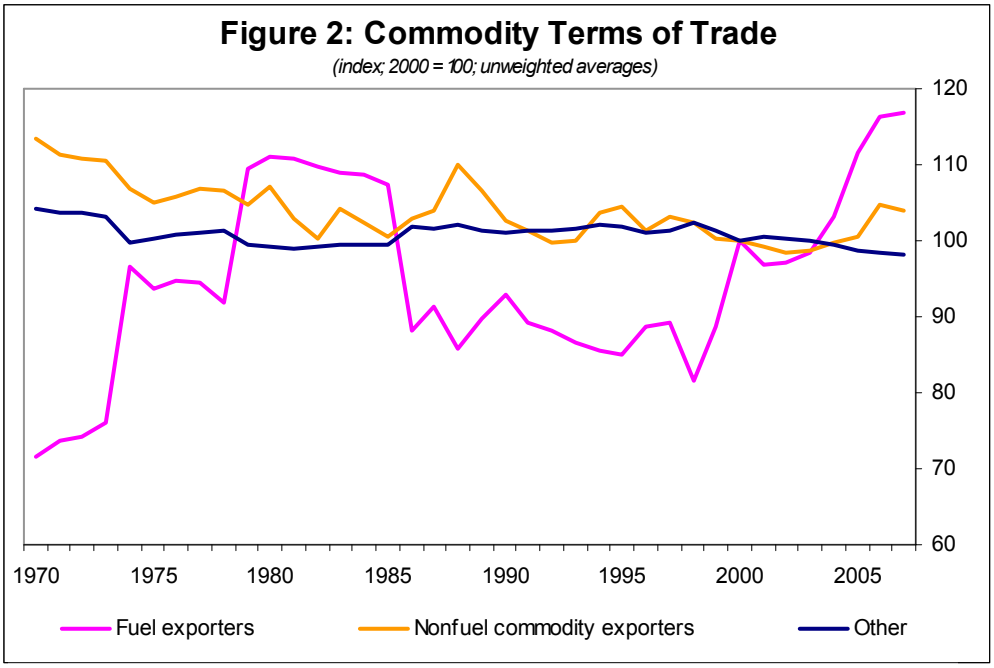


Figure 2: Commodity Terms of Trade
(index; 2000 = 100; unweighted averages)
120
110
100
90
80
70
60
1970
1975
1980
1985
1990
1995
2000
2005
Fuel exporters
Nonfuel commodity exporters
Other

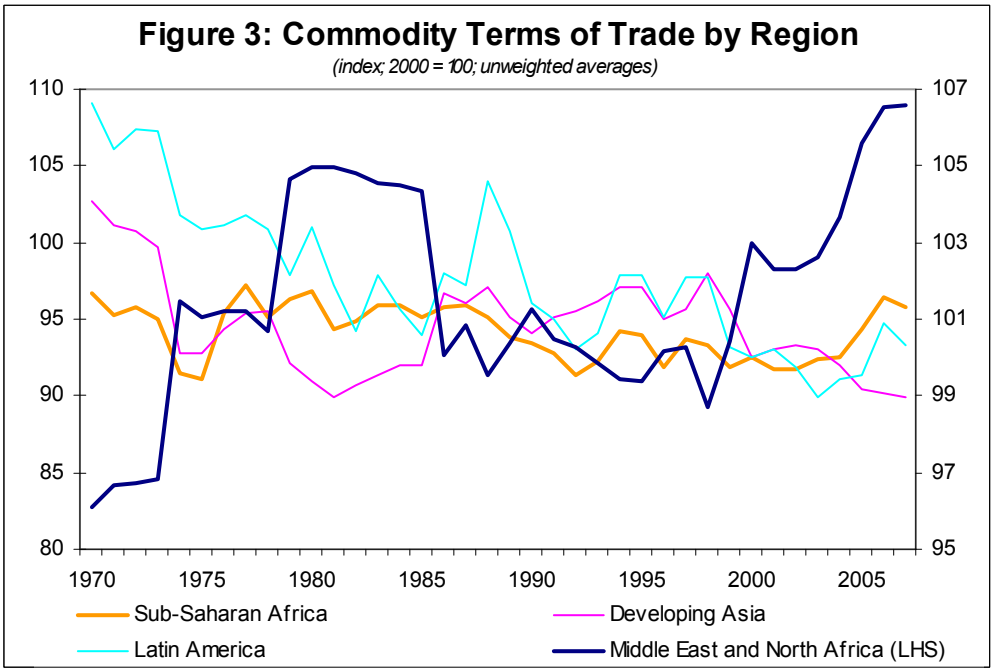


Figure 3: Commodity Terms of Trade by Region
(index; 2000 = 100; unweighted averages)
110
105
100
95
90
85
80
107
105
103
101
99
97
95
1970
1975
1980
1985
1990
1995
2000
2005
Sub-Saharan Africa
Developing Asia
Latin America
Middle East and North Africa (LHS)

patterns. Fuel exports play the most critical role in the Middle East and North Africa, where they now account for over ⅓ of regional GDP. Latin America depends on both fuel and non-fuel commodities to broadly similar degrees. Non-fuel commodities are especially important in sub-Saharan Africa, but fuels also account for a significant share of its regional economy.

It should be re-emphasized that the CTOT index in this paper takes into account cross-country differences in the importance of commodities to the overall economy. That is, in the above formula for the CTOT, the weights attached to each commodity equal its share in the specific country's GDP. This is especially important when analyzing the rates of change in the CTOT, which underlie the commodity-price cycle dating procedure discussed below. With this weighting procedure, for a given country, even assuming similar changes in both export and import prices, the CTOT rise (respectively, fall) more if commodity exports are more (respectively, less) important as a share of GDP than commodity imports. Additionally, using weights expressed in terms of GDP means that changes in the CTOT can be understood as the net trade gains or losses, relative to GDP, from commodity price shifts. Indeed, it can be shown that

$$\frac{\Delta CTOT}{CTOT} \approx \sum_i (X_i - M_i) \frac{\Delta(P_i / MUV)}{(P_i / MUV)},$$

so that the rate of change in the CTOT is an approximation to the aggregate net trade gain (or loss) from changes in real individual commodity prices, relative to GDP.

The CTOT index is related to, but conceptually different from, the standard terms-of-trade indices often used in analytical work. The differences reflect both the focus on commodities, and the above-mentioned cross-country differences in the importance of commodities to the overall economy. Figures 4–6 illustrate these differences in the context of three broad groups: fuel exporters, non-fuel exporters, and other countries. For fuel exporters as a whole, the CTOT and terms-of-trade indices track each other (and the price of oil) quite closely. For non-fuel exporters as a whole, more significant differences emerge; for instance, by 2007, the CTOT index lay significantly above its value in the early 1990s, whereas the terms-of-trade index was roughly on par with its earlier value. For other, non–commodity-

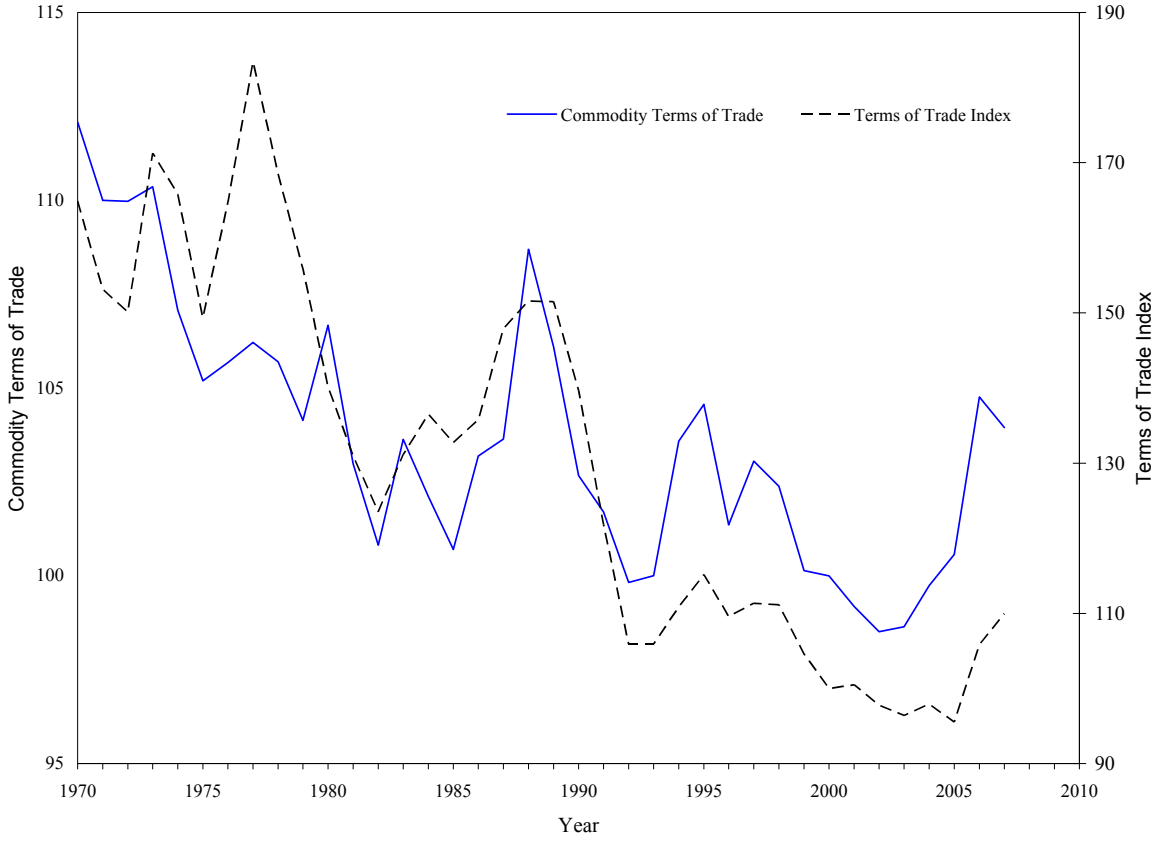
exporting countries, the qualitative differences among the indices are even larger, but not surprisingly both indices display relatively little variation in absolute terms. In the next section, we discuss the differences further, in the context of individual countries.

Figure 4: Commodity Terms of Trade: Fuel Exporters

III. IDENTIFYING COMMODITY BOOMS AND BUSTS

The commodity terms of trade (CTOT) are now used to identify country-specific booms and busts over the period 1970–2007. The dating procedure is an application of the Bry-Boschan algorithm for dating business cycles and largely follows Cashin, McDermott, and Scott (2002). It is based on finding turning points (peaks and troughs) in the country-specific CTOT series. These turning points are determined using annual country-specific

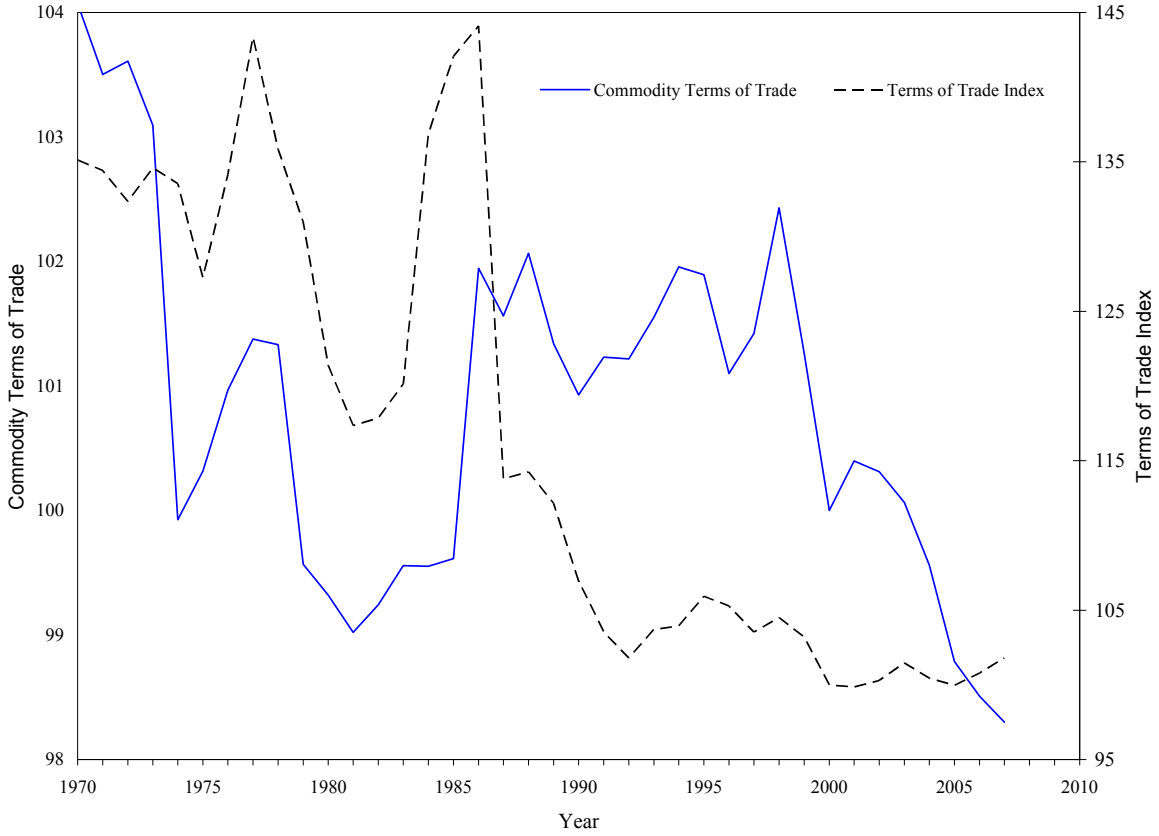
Figure 5: Commodity Terms of Trade: Non-Fuel Commodity Exporters



data (this implies that cycles can only be identified if they are not too short). For each country, the procedure yields a set of upturns (trough-to-peak) and downturns (peak-to-trough) in the CTOT, that is, a set of CTOT cycles.

Our focus, however, is on identifying large movements in the CTOT, since these are most likely to be related to macroeconomic performance. Hence, for each cycle in the CTOT, the duration and amplitude (that is, the cumulative change in the CTOT) from trough to peak and from peak to trough are computed. Booms (respectively, busts) are then identified as periods of increases (respectively, decreases) in the CTOT with amplitudes that fall into the top (respectively, bottom) 10 percent of all such episodes across the sample. These cutoff amplitudes imply that booms (respectively, busts) are defined as events with net commodity trade gains (respectively, losses) in excess of 7 percent of GDP. This procedure

Figure 6: Commodity Terms of Trade: Other Countries



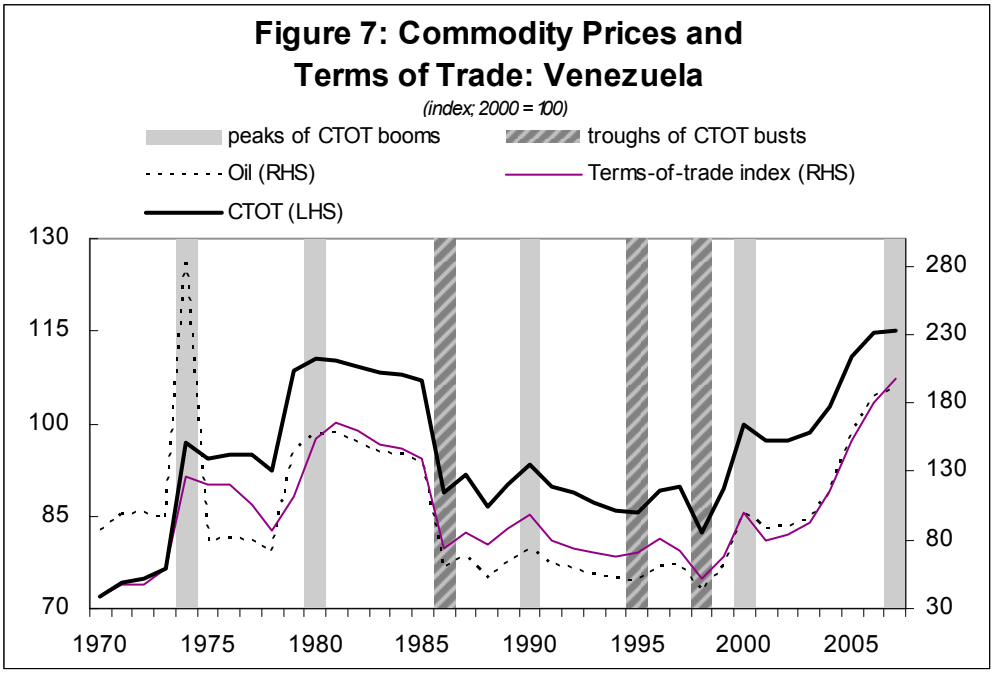
yielded 130 booms and 128 busts that occurred between 1970 and the most recent cycles, which began in the early 2000s.

In order to identify the latest cycles, 2007—the last year in our sample—is taken as the peak or trough year for all countries involved.[10] The beginning of the latest cycle is dated as the most recent country-specific peak (trough) that comes after the most recent trough (peak). Then the associated country-specific amplitudes are computed, and booms (busts) are defined as episodes with cumulative increases (decreases) in the commodity terms of trade

[10]For the purposes of this exercise, several peaks and troughs that occurred in 2006 are considered part of the latest cycle.

exceeding the top (bottom) 10 percent threshold, as described above. This procedure yielded 25 booms and 12 busts. Overall, the sample therefore contains 155 booms and 140 busts.

Figures 7–9 illustrate the standard terms-of-trade index, the CTOT index, and the identified booms and busts, in the context of three different countries: Venezuela, a large fuel exporter; Papua New Guinea, which relies heavily on exports of copper, as well as gold and oil; and Mauritius, whose main commodity export over the period was sugar, whereas oil was a key import. Comparisons among these episodes need to take into account differences in the structure of commodity exports and imports and the associated price dynamics, the importance of commodity exports and imports in overall trade, and the importance of trade for the economy as a whole. In all cases, the CTOT series behaves as expected, given the prices of the key export and import commodities. Further, the algorithm appears to capture well the key commodity booms and busts. Importantly, the CTOT and terms-of-trade indices can diverge, sometimes by significant amounts, when key commodity prices are changing rapidly (see, for instance, Papua New Guinea in 1985–86 and 2006–07, or Mauritius over 1980–86).



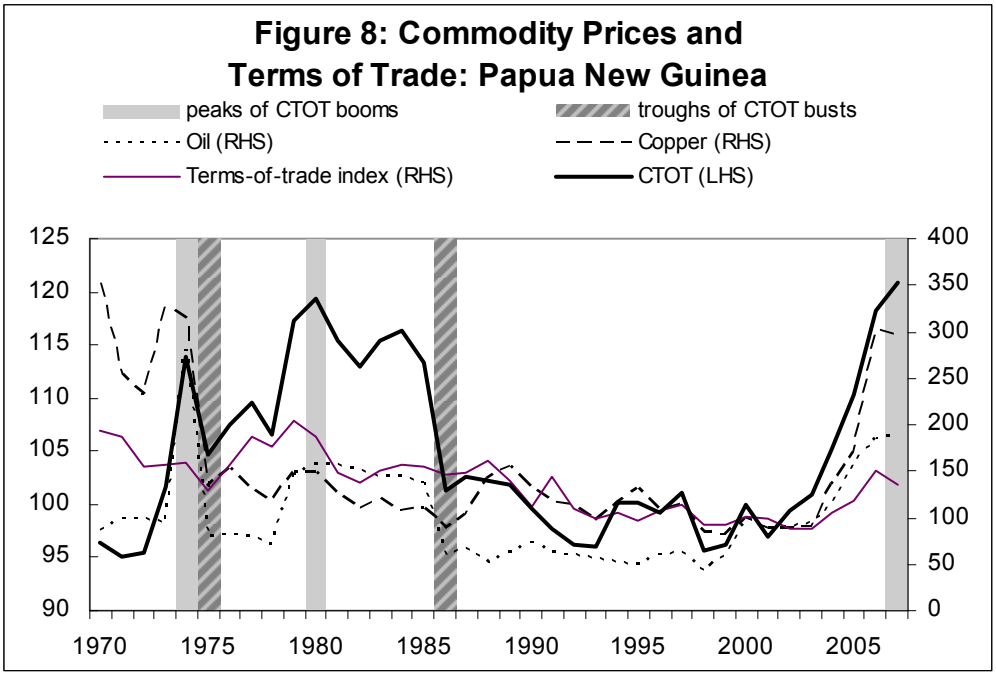


Figure 8: Commodity Prices and
Terms of Trade: Papua New Guinea
peaks of CTOT booms
troughs of CTOT busts
Oil (RHS)
Copper (RHS)
Terms-of-trade index (RHS)
CTOT (LHS)
125
120
115
110
105
100
95
90
400
350
300
250
200
150
100
50
0
1970
1975
1980
1985
1990
1995
2000
2005

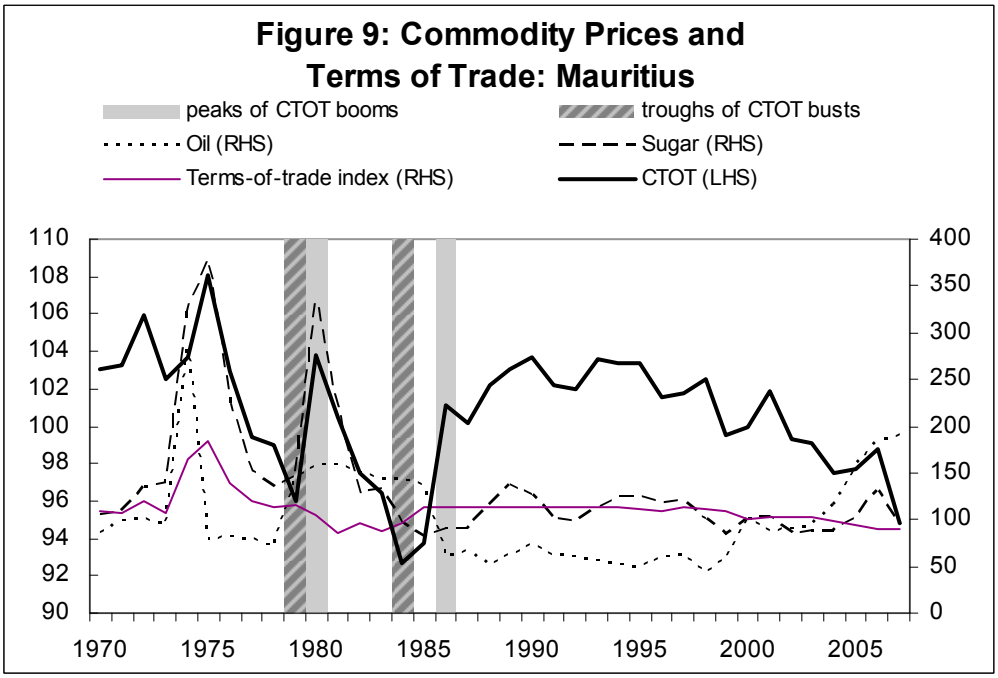
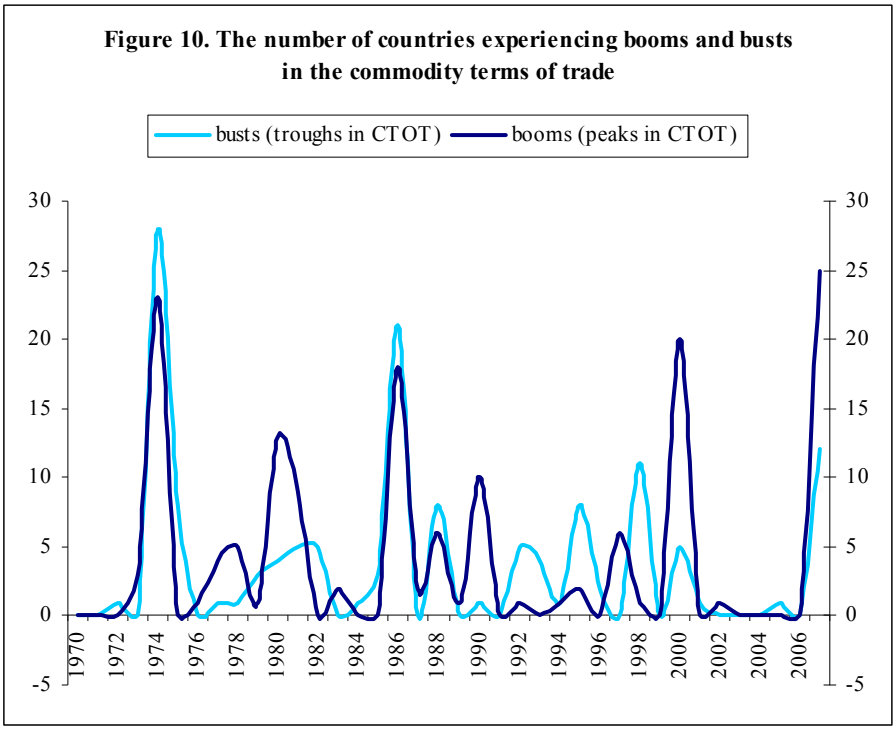


Figure 9: Commodity Prices and
Terms of Trade: Mauritius
peaks of CTOT booms
troughs of CTOT busts
Oil (RHS)
Sugar (RHS)
Terms-of-trade index (RHS)
CTOT (LHS)
110
108
106
104
102
100
98
96
94
92
90
400
350
300
250
200
150
100
50
0
1970
1975
1980
1985
1990
1995
2000
2005

Figure 10 and Tables 1 and 2 show some summary statistics for the distribution of both booms and busts across time periods and geographic regions for all countries between 1970 and 2007.[11] Commodity booms and busts were most common in the 1970s and the 1980s, reflecting in part major oil-price shocks, while the 1990s stand out as a comparatively quiet period. The amplitude of booms was also on average much larger in the 1970s than in the 1980s and 1990s. Overall, booms tend to be somewhat larger yet shorter than busts: the average size of all booms (respectively, busts) is 20 percent (respectively, 13 percent) of GDP, and the average length of all booms is 3.1 years (respectively, 3.5 years). As for the most recent commodity-price cycles, these have been characterized by relatively large booms, as well as relatively small busts, with booms about 2½ times as large as busts. Also, both booms and busts have become substantially longer during the latest cycle, which has lasted more than 4 years on average.

Figure 10. The number of countries experiencing booms and busts in the commodity terms of trade



[11]Commodity booms and busts are identified for the same period, from 1970 to 2007, for all countries in the sample. However, it should be noted that, reflecting data availability, there are differences across countries in the time periods over which the import and export weights used in the CTOT calculation are averaged.

Table 1. The Distribution of Booms Across Periods and Regions: Some Summary Statistics 1/

	Number	Size (amplitude) in percent				Length (duration) in years			
	per country	Mean	StDev	Skewness	Kurtosis	Mean	StDev	Skewness	Kurtosis
By period									
1970 - 1979	0.2	26.5	23.3	1.4	4.2	3.4	0.9	-1.0	2.7
1980 - 1989	0.3	17.1	10.8	1.4	4.4	2.7	1.3	0.9	3.4
1990 - 1999	0.1	11.7	4.0	0.5	2.1	2.0	0.2	4.2	19.1
2000 - 2007	0.3	22.1	11.9	0.7	2.9	4.0	1.9	0.0	1.1
By region									
Advanced Economies	0.2	12.9	3.9	1.1	2.3	3.5	1.9	0.5	1.6
Latin America	2.1	14.8	8.5	1.7	6.2	2.8	1.4	0.7	2.6
Developing Asia	0.7	13.7	6.4	0.6	1.9	4.4	1.6	-0.2	1.5
Middle East and North Africa	2.1	23.4	13.8	1.3	4.4	3.3	1.5	0.8	2.3
Sub-Saharan Africa	2.7	23.9	22.1	1.6	5.1	2.9	1.4	1.0	3.0
Central and Eastern Europe	0.0								
Commonwealth of Independent States	0.9	17.9	10.9	1.1	3.6	3.3	1.5	0.5	2.2
By type									
Fuel commodity exporters	4.7	24.5	17.4	1.6	6.2	3.2	1.6	0.8	2.2
Non-fuel commodity exporters	1.7	17.8	8.2	1.5	5.6	2.9	1.4	0.3	2.2
Other countries	0.3	10.2	3.8	1.6	4.8	3.2	1.4	0.8	2.5
Total									
	1.0	20.1	15.2	2.1	8.5	3.1	1.5	0.7	2.3
All cycles	*9*	*3.6*	*7.9*	*5.2*	*39.5*	*2.1*	*1.3*	*1.4*	*4.7*

1/ Booms are defined as large upturns (top 10% in the sample) and are dated as of the year in which CTOT reached its peak.

Table 2. The Distribution of Busts Across Periods and Regions: Some Summary Statistics 1/

	Number	Size (amplitude) in percent				Length (duration) in years			
	per country	Mean	StDev	Skewness	Kurtosis	Mean	StDev	Skewness	Kurtosis
By period									
1970 - 1979	0.3	11.4	4.1	1.0	2.8	3.2	1.2	-0.2	1.7
1980 - 1989	0.3	15.3	7.7	1.1	3.0	3.3	1.7	0.2	1.6
1990 - 1999	0.2	13.0	6.2	2.4	8.9	3.1	2.0	0.2	2.0
2000 - 2007	0.1	9.1	2.8	2.5	9.6	5.2	2.3	-0.1	2.0
By region									
Advanced Economies	0.0								
Latin America	2.3	12.7	6.3	1.9	6.8	3.5	2.1	1.1	3.5
Developing Asia	1.1	9.9	3.2	1.6	4.8	3.4	1.3	-0.1	2.9
Middle East and North Africa	1.4	13.6	6.4	1.4	3.9	3.3	1.9	-0.2	1.4
Sub-Saharan Africa	2.9	12.7	6.6	2.0	7.0	3.5	1.8	0.4	2.6
Central and Eastern Europe	0.0								
Commonwealth of Independent States	0.7	13.8	6.5	1.3	3.5	3.4	1.9	-0.1	1.5
By type									
Fuel commodity exporters	2.6	14.7	7.3	1.3	3.8	3.0	1.9	0.2	1.3
Non-fuel commodity exporters	1.9	15.2	7.0	1.2	4.3	3.2	1.6	0.4	2.4
Other countries	0.5	9.9	2.8	1.6	5.5	4.0	1.8	0.8	3.5
Total									
	0.9	12.8	6.2	1.8	6.1	3.5	1.8	0.4	2.7
All cycles	*9*	*3.0*	*4.2*	*3.4*	*18.8*	*2.2*	*1.5*	*1.7*	*6.4*

1/ Busts are defined as large downturns (bottom 10% in the sample) and dated as of the year in which CTOT reached its trough.

Turning to the shape of the distribution of cycles by size and length, it is interesting to note that skewness and kurtosis, which reflect the presence of especially large or long booms or busts, have over time declined for booms (at least in terms of size) but increased for busts. This suggests that as booms have become more uniform in magnitude, busts have become increasingly prone to large outliers.

Turning to the regional distribution, sub-Saharan Africa accounts for the largest number of booms and busts per country. Together with the Middle East and North Africa, it

is also characterized by the biggest booms, while in terms of busts it is more similar to Latin America. The largest busts tend to occur in the Middle East and North Africa and in the Commonwealth of Independent States. Splitting the sample along analytical lines, the frequency of booms and busts is largest among fuel exporters, which also tend to experience the largest booms yet the shortest busts.

Table 3 presents some simple tests linking the size and the length of booms and busts. As one would expect, the larger events are typically also the longer events. Interestingly, the probabilities that a boom is followed by a bust, or that a bust is followed by a boom, are both around 1/3 (about ½ in the case of non-fuel commodity exporters)—that is, there is a significant chance that a boom will turn to bust, or that a bust will turn to boom. Importantly, the larger the boom, the larger the subsequent bust. That said, longer booms (respectively, busts) are not associated with significantly longer subsequent busts (respectively, booms).

To bring the latest commodity price cycle into focus, Table 4 shows a list of the most recent booms and busts (the full set of booms and busts by country is provided in the Appendix). Most of the episodes started in the early 2000s and as of the end of 2007 were still ongoing. Congo (Brazzaville), Gabon, Nigeria, and Oman—all fuel exporters—have recently seen the largest booms, with CTOT amplitudes in excess of 30 percent of GDP overall and 5 percent of GDP on average per year. The busts have been markedly smaller and limited to small economies, with Panama in particular experiencing a cumulative drop in the CTOT of 12 percent of GDP (2 percent of GDP on average per year).

IV. The Consequences of Commodity Booms and Busts

Having identified commodity booms and busts, we now offer some initial illustrative analyses of these episodes, with more analyses left for further research. We focus on one key indicator of macroeconomic performance, GDP growth, and compare its behavior during booms and busts, with a particular focus on the most recent cycles. The evidence reported in

Table 3. Descriptive Tests of Amplitude and Duration of Booms and Busts 1/

Test	Booms			Busts		
	Observations	Statistic	P-value	Observations	Statistic	P-value
Spearman correlation between size and length of event						
Total	155	0.22	0.01	140	0.15	0.07
Fuel commodity exporters	94	0.32	0.00	51	0.44	0.00
Non-fuel commodity exporters	25	-0.09	0.67	29	0.31	0.10
Other countries	36	0.23	0.17	60	0.02	0.86
All cycles	*1371*	*0.47*	*0.00*	*1374*	*0.48*	*0.00*
Sample probability of alternative event following						
Total	155	0.36		140	0.35	
Fuel commodity exporters	94	0.34		51	0.53	
Non-fuel commodity exporters	25	0.56		29	0.45	
Other countries	36	0.28		60	0.15	
Spearman correlation between sizes of consecutive, alternative events 1/						
Total	56	0.51	0.00	49	-0.04	0.80
Fuel commodity exporters	32	0.60	0.00	27	-0.11	0.60
Non-fuel commodity exporters	14	0.45	0.10	13	-0.08	0.80
Other countries	10	0.18	0.63	9	0.32	0.41
All cycles	*1219*	*0.48*	*0.00*	*1222*	*0.46*	*0.00*
Spearman correlation between lengths of consecutive, alternative events 1/						
Total	56	0.17	0.20	49	0.23	0.12
Fuel commodity exporters	32	0.23	0.21	27	-0.32	0.11
Non-fuel commodity exporters	14	0.42	0.14	13	0.30	0.33
Other countries	10	-0.31	0.38	9	-0.24	0.54
All cycles	*1219*	*-0.03*	*0.24*	*1222*	*0.10*	*0.00*

1/ Tests for consecutive events refer to booms that are followed by busts and to busts that are followed by booms.

Table 4. The Most Recent Episodes of Booms and Busts

Booms				Busts			
Country	Starting year	Amplitude (percent)	Amplitude per year (percent)	Country	Starting year	Amplitude (percent)	Amplitude per year (percent)
Algeria	2001	11.3	1.9	Armenia; Republic of	2001	9.5	1.6
Azerbaijan; Republic of	2001	24.9	4.2	Gambia, The	2003	7.7	1.9
Bahrain	2002	24.2	4.8	Honduras	1998	10.7	1.2
Chile	2002	11.1	2.2	Jordan	2001	6.9	1.1
Congo (Brazzaville)	2001	46.5	7.7	Kiribati	2001	8.0	1.3
Ecuador	2003	7.4	1.8	Lebanon	2001	8.6	1.4
Gabon	2001	36.4	6.1	Lesotho	2001	7.1	1.2
Iran, Islamic Republic of	2001	12.4	2.1	Nicaragua	1998	9.7	1.1
Kazakhstan	2001	29.9	5.0	Panama	2001	11.7	2.0
Kuwait	2001	28.1	4.7	Sierra Leone	2001	8.2	1.4
Mauritania	2003	9.1	2.3	Swaziland	2001	7.2	1.2
Nigeria	2001	35.5	5.9	Togo	2003	7.8	2.0
Norway	2001	10.5	1.8				
Oman	2001	32.5	5.4				
Papua New Guinea	2001	24.6	4.1				
Qatar	2001	26.0	4.3				
Russia	2001	10.9	1.8				
Saudi Arabia	2001	28.1	4.7				
Suriname	2003	21.5	5.4				
Syrian Arab Republic	2001	13.0	2.2				
Trinidad and Tobago	2001	9.2	1.5				
Turkmenistan	2002	8.6	1.7				
United Arab Emirates	2001	14.7	2.4				
Venezuela	2001	18.6	3.1				
Zambia	2002	24.7	4.9				

the preceding section suggests that the latest booms have been relatively large and strikingly long, when compared to past booms. Has this translated into unusual performance also at the macro-economic level? To answer this question, we use a simple event analysis based on difference-in-difference regressions.

As a first step, the average annual growth rate is computed during each boom and each bust, subject to data availability (Table 5). Overall, median growth was close to 2 percentage points higher during commodity booms than during busts. The difference is especially large in the case of fuel exporters, which have experienced on average larger booms, as discussed above. That said, annual growth rates during booms were about twice their values during busts for both fuel and non-fuel commodity exporters.

Next, we analyze how growth outcomes during booms and busts depend on the prevailing values of various policy variables, as well as on the size and length of the episodes (Table 6). For this purpose, we split the sample into groups defined by threshold values of the chosen conditioning variables,[12] and carry out tests for differences in mean growth rates between these groups. We test the following hypotheses: first, that growth is higher (lower) during large and long booms (busts), second, that real appreciations during booms or busts are associated with lower growth, and third, that higher growth is linked with higher public spending and lower initial fiscal deficits.

These simple tests yield two particularly interesting results. First, during both booms and busts, large real appreciations are associated with significantly lower growth. Second, large pre-boom government deficits can be linked with significantly weaker growth during the subsequent boom. One interpretation is that larger initial deficits increase the potential for crowding out of private spending; alternatively, larger initial deficits may reduce the

[12]The thresholds are set to broadly correspond to the 75th percentile for each conditioning variable in both booms and busts.

Table 5. Macroeconomic Performance During Booms and Busts 1/

GDP growth, percent per year	Booms				Busts			
	Observations	Median	25th percentile	75th percentile	Observations	Median	25th percentile	75th percentile
Full sample	**140**	**4.69**	**1.77**	**7.77**	**128**	**3.04**	**0.66**	**4.85**
By period								
1970 - 1979	31	6.52	2.33	10.59	37	3.81	2.36	6.09
1980 - 1989	45	2.79	0.07	6.76	40	1.60	-1.56	4.32
1990 - 1999	18	3.88	1.81	5.81	32	2.63	1.12	4.27
2000 - 2007	46	5.27	2.63	7.77	19	3.67	2.12	7.43
By region								
Advanced Economies	4	3.67	2.49	4.94	1	3.49	3.49	3.49
Latin America	31	4.34	-0.90	7.05	35	3.27	0.63	4.84
Developing Asia	8	2.64	-0.09	5.45	12	2.83	0.54	4.65
Middle East and North Africa	45	4.91	2.74	9.03	29	3.16	0.47	6.60
Sub-Saharan Africa	40	3.92	1.67	7.21	43	2.62	1.13	4.23
Central and Eastern Europe	0				0			
Commonwealth of Independent States	12	8.12	4.02	13.67	8	-5.09	-10.69	7.76
By type								
Fuel commodity exporters	84	5.17	2.12	9.10	45	2.61	0.05	4.70
Non-fuel commodity exporters	23	2.19	-0.26	5.63	26	1.30	-1.37	3.74
Other countries	33	4.75	2.33	7.14	57	3.97	2.34	7.28

1/ GDP growth is measured as average percentage changes over durations of booms and busts.

Table 6. Comparative Tests of Macroeconomic Performance During Booms and Busts 1/

GDP growth, percent per year	Booms				Busts			
	Observations	Mean	Statistic	P-value	Observations	Mean	Statistic	P-value
By event amplitude								
more than 20 percent	49	6.8	2.16	0.02	13	-0.4	-2.20	0.01
less than 20 percent	91	4.2			115	3.3		
By event duration								
more than 4 years	29	7.0	1.67	0.05	38	3.1	0.30	0.62
less than 4 years	111	4.6			90	2.8		
By changes in real exchange rate relative to trend								
more than 5 p.p. per year	19	2.3	-1.50	0.07	20	0.5	-2.43	0.01
less than 5 p.p. per year	70	4.6			56	3.7		
By changes in government spending over initial GDP								
more than 10 p.p. per year	25	6.2	1.04	0.15	14	1.2	-1.56	0.94
less than 10 p.p. per year	61	4.7			58	3.5		
By initial government deficit relative to initial GDP								
more than 8 percent of GDP	22	3.5	-1.40	0.08	22	2.5	-0.68	0.25
less than 8 percent of GDP	64	5.7			50	3.3		

1/ One-tailed tests of group means (assuming equal variances). GDP growth is measured as average percentage changes over booms and busts.

scope for subsequent increases in public spending. That said, although higher spending is associated with higher growth during booms, the difference is not statistically significant, while in the case of busts the relationship changes sign. In addition, as expected, growth is significantly higher during large and long booms and lower during large busts.

We now turn to a comparison of macroeconomic performance during the most recent commodity price booms with that during previous booms (in this section, we ignore busts, owing to their relative rarity during the most recent cycle). The simplest starting point would be a comparison within the group of countries that experienced a boom both during the latest cycle and in past cycles. However, the findings of this comparison may reflect either factors specific to the countries in question, or more global factors that affect other countries in the same way.

To distinguish between country-specific and global factors, it is useful to extend the comparison within this "treatment group" by including a "control group" of countries. For the purposes of this exercise, we define the treatment group as those countries that have experienced a boom in the most recent cycle, and that also had booms in the past ("boom now and before"). We contrast this group with a control group which includes all countries that have not experienced booms in the latest cycle ("no boom now").

In order to compare the most recent commodity price cycle with previous cycles, we focus on selected measures of macroeconomic outcomes, policies, initial conditions, and the underlying characteristics of the cycles. To measure performance of countries in both the treatment and the control group, changes (or, in some cases, values, as appropriate) of each variable of interest during each boom are computed, subject to data availability.[13] For countries that did not experience booms, similar changes (or values) are computed over the reference periods when booms were especially common elsewhere.[14] To contrast past episodes with the latest event, past episodes are aggregated using medians, so that each country is characterized by only two observations. For each performance measure, differences are then computed between these two observations—in the most recent boom and

[13]More specifically, for outcome variables (real GDP and components) average annual percentage changes are computed. For policy variables (real exchange rate relative to trend, and government spending over initial GDP) average annual changes are used instead. For initial conditions (initial fiscal deficit over GDP) values in percent are taken. Sizes (amplitudes) of booms are measured in percentage points, and lengths (durations) are measured in years.

[14]Specifically, 1974, 1980, 1990, 2000, and 2007 were identified as artificial peak years for booms. The durations of these comparator episodes were set equal to most common durations of actual episodes in corresponding periods. For the latest episode, 2001 was set as the first year for all comparator countries.

in past booms. For those countries in the control group that did not have booms the respective reference periods are used to calculate these differences.

The differences in performance measures, ΔX_i, are used as dependent variables in the following regressions:

$\Delta X_i = \alpha + \varepsilon_i$, *where i denotes countries in the treatment group only;*

$\Delta X_i = \delta + \beta D_i + \varepsilon_i$, *where i denotes countries in either the treatment or the control groups.*

In the first regression, ΔX_i is regressed on a constant using as sample only the treatment group of countries, with α being the coefficient of interest. In the second regression, ΔX_i is regressed on a constant and on the indicator for the treatment group D_i, using as sample both the treatment group and the control group, with β being the coefficient of interest. In order to make our results robust to the presence of outliers, these models were estimated using median regressions, except in the cases of boom size and length, for which OLS estimates were used.

Table 7 shows the results of this exercise. During the most recent booms, in the treatment group of countries, growth was approximately 3 percentage points per year higher than during past booms. Growth was also higher recently in the control group. Nevertheless, there remains an economically and statistically significant difference, amounting to about 2 percentage points per year, between the treatment and control groups. Put differently, higher growth during the latest commodity-price cycle (as compared to previous cycles) was likely driven not just by global factors, but also by factors specific to those countries that experienced a commodity terms-of-trade boom. Interestingly, this higher growth was driven not by export volumes, which in fact grew more slowly than in comparator countries (although the difference was not statistically significant), but rather by strong domestic demand, with both real consumption and real investment rising significantly more than elsewhere. It also appears that demand was unusually buoyant in the private sector, while the dynamics of public consumption (and government spending) was similar to that in previous commodity-price cycles.

Table 7. Macroeconomic Performance in the Latest Boom Relative to the Past 1/

Dependent variables	**Treatment Group**			**Treatment & Control Groups**		
(in percentage points)	*Regression coefficient on the constant*			*Regression coefficient on treatment dummy*		
	Regression coefficient	Standard error	Observations	Regression coefficient	Standard error	Observations
GDP growth	3.07*	1.57	23	2.02**	0.92	127
Export growth	0.82	2.13	23	-2.63	2.56	122
Import growth	9.09*	4.50	23	3.13	4.31	122
Private consumption growth	4.75**	1.88	22	3.13**	1.56	113
Public consumption growth	0.03	2.78	22	0.41	1.14	113
Investment growth	12.78**	5.61	22	8.33*	4.28	113
Changes in RER relative to trend	-2.79**	1.14	21	-1.79	1.18	114
Changes in spending over initial GDP	-0.27	3.46	18	-0.22	1.49	105
Initial fiscal deficit over initial GDP	-6.67**	2.31	18	-7.44***	1.55	105
Size of boom	0.73	1.06	23	-	-	-
Length of boom (years)	3.35***	0.17	23	-	-	-

1/ Based on difference-in-difference regressions. ***, **, * denote statistical significance at, respectively, the 1, 5, 10 percent level.

Treatment group includes countries with booms both in the latest cycle and in previous cycles ("boom now and before").

Control group includes countries that have not experienced booms in the latest cycle ("no boom now").

What explains the relatively high growth, compared to past events, in those countries that experienced a commodity terms-of-trade boom during the latest commodity-price cycle? A full answer to this question remains outside the scope of this paper, but we can tentatively point to three factors. First, the latest booms were significantly longer than previous ones,

lasting over 3 years more than in the past, although they were not significantly larger. Second, the latest booms were characterized by smaller real appreciations than previous booms, with the difference amounting to almost 3 percentage points, (even though less appreciation was not unique to the countries experiencing booms). Third, countries entered the most recent booms with stronger fiscal positions than in previous booms: initial government deficits relative to GDP were 6.7 percentage points lower than before. The lower fiscal burden likely contributed to investment and consumption buoyancy, by reducing crowding-out effects, and therefore to higher growth. In sum, higher growth compared to the past in those countries that recently experienced a commodity terms-of-trade boom can probably be attributed to a combination of longer booms, smaller real appreciations, and better initial conditions (in particular, stronger initial fiscal positions).

V. CONCLUSIONS

The key contribution of this paper lies in dating and characterizing commodity booms and busts for a sample of more than 150 countries over nearly 40 years starting in the early 1970s. To identify these commodity price episodes, we use the first (to our knowledge) comprehensive dataset on country-specific commodity terms of trade (see Prati et al., forthcoming). We expect this dataset to become a crucial resource for researchers interested in the macroeconomic impact of commodity-price fluctuations. As an illustration, preliminary analyses using this new dataset yield several interesting conclusions, suggesting several fruitful avenues for future research.

First, we find that commodity-price booms tend to be larger than commodity-price busts. Second, around 1/3 of all booms (busts) are followed by busts (booms) and the larger the boom, the larger the subsequent bust. Third, median annual growth is nearly 2 percentage points higher during commodity-price booms than during busts. Fourth, during both booms and busts, large real appreciations are associated with significantly lower growth. Fifth, the larger the pre-boom government deficit, the smaller the growth during the subsequent boom, possibly because larger initial deficits increase the potential for crowding out of private spending. Finally, it appears that higher growth during the latest commodity-price cycle was at least in part due not to global factors, but rather to factors specific to those countries that

experienced a commodity terms-of-trade boom. Such factors may have included longer booms, smaller real appreciations than in the past, and better initial conditions—in particular, stronger initial fiscal positions.

Appendix. The History of Commodity Booms and Busts from the Early 1970s to the Early 2000s

	Booms				Busts			
Country	Number	Average Amplitude (percent)	Average Duration (years)	Average Amplitude per year (percent)	Number	Average Amplitude (percent)	Average Duration (years)	Average Amplitude per year (percent)
Albania	0				0			
Algeria	3	15.7	3.0	5.4	1	12.3	5.0	2.5
Argentina	0				0			
Armenia; Republic of	2	10.8	3.5	3.0	1	13.3	5.0	2.7
Australia	0				0			
Austria	0				0			
Azerbaijan; Republic of	4	29.2	2.8	10.5	4	13.8	3.0	6.6
Bahrain	3	24.7	2.0	12.4	3	13.5	2.3	6.6
Bangladesh	0				0			
Barbados	0				0			
Belarus	0				0			
Belgium	0				0			
Belize	0				1	8.7	4.0	2.2
Benin	0				1	7.2	2.0	3.6
Bhutan	0				0			
Bolivia	0				0			
Botswana	0				0			
Brazil	0				0			
Bulgaria	0				0			
Burkina Faso	0				0			
Burundi	0				0			
Cambodia	0				0			
Cameroon	0				0			
Canada	0				0			
Cape Verde	0				0			
Central African Republic	0				0			
Chile	0				1	9.1	2.0	4.6
China; Peoples Republic of	0				0			
Colombia	0				0			
Comoros	0				0			
Congo (Brazzaville)	6	41.2	2.2	17.2	5	18.2	2.2	11.3
Costa Rica	0				0			
Cote d'Ivoire	3	10.7	2.3	4.9	2	15.1	6.5	2.4

Appendix. The History of Commodity Booms and Busts from the Early 1970s to the Early 2000s (continued)

Croatia	0				0			
Cyprus	0				0			
Czech Republic	0				0			
Denmark	0				0			
Dominica	0				1	8.4	2.0	4.2
Dominican Republic	1	8.9	2.0	4.4	2	8.6	2.0	4.3
Ecuador	3	8.4	2.3	4.5	1	8.7	3.0	2.9
Egypt	0				0			
El Salvador	0				0			
Estonia	0				0			
Ethiopia	0				0			
Fiji	0				1	9.0	4.0	2.2
Finland	0				0			
France	0				0			
Gabon	6	31.3	2.2	13.2	4	16.0	1.5	11.2
Gambia, The	2	18.5	5.0	3.7	2	14.6	3.0	4.8
Georgia; Republic of	1	8.0	5.0	1.6	1	10.3	4.0	2.6
Germany	0				0			
Ghana	1	7.2	2.0	3.6	1	7.2	4.0	1.8
Greece	0				0			
Grenada	0				0			
Guatemala	0				0			
Guinea	1	10.9	3.0	3.6	2	9.6	4.0	2.4
Guyana	5	17.2	1.6	13.5	5	19.4	3.6	6.7
Honduras	2	7.5	4.0	2.0	2	8.4	3.0	3.2
Hungary	0				0			
Iceland	0				0			
India	0				0			
Indonesia	0				0			
Iran, Islamic Republic of	3	17.6	3.0	6.0	1	13.9	5.0	2.8
Ireland	0				0			
Israel	0				0			
Italy	0				0			
Jamaica	1	13.8	3.0	4.6	2	10.6	4.0	2.6
Japan	0				0			
Jordan	1	9.6	3.0	3.2	1	12.1	4.0	3.0
Kazakhstan	4	22.7	2.5	8.9	4	12.3	3.0	5.9
Kenya	0				0			
Kiribati	2	13.8	4.5	3.0	2	13.5	3.5	3.7

Appendix. The History of Commodity Booms and Busts from the Early 1970s to the Early 2000s (continued)

Korea	0				0			
Kuwait	5	27.8	2.6	10.1	4	14.9	3.0	7.0
Kyrgyz Republic	1	7.1	2.0	3.6	0			
Latvia	0				0			
Lebanon	1	10.2	3.0	3.4	3	10.1	2.7	3.9
Lesotho	1	10.3	2.0	5.1	1	12.0	2.0	6.0
Lithuania	0				0			
Macedonia, Former Yugoslav Republic of	0				1	7.6	5.0	1.5
Madagascar	0				0			
Malawi	0				0			
Malaysia	0				0			
Maldives	1	10.4	6.0	1.7	1	12.2	4.0	3.0
Mali	1	8.1	3.0	2.7	1	7.1	7.0	1.0
Mauritania	1	12.4	2.0	6.2	2	13.1	4.5	2.9
Mauritius	2	8.6	1.5	6.3	2	10.9	4.0	2.7
Mexico	0				0			
Moldova	1	7.1	4.0	1.8	1	9.0	4.0	2.3
Morocco	0				0			
Mozambique	0				0			
Namibia	0				0			
Nepal	0				1	7.4	4.0	1.9
Netherlands	0				0			
New Zealand	0				0			
Nicaragua	0				1	8.2	2.0	4.1
Niger	0				0			
Nigeria	5	35.2	2.6	12.8	4	17.8	3.0	8.5
Norway	3	13.7	2.7	5.3	1	12.0	6.0	2.0
Oman	5	32.4	2.6	11.7	4	16.7	3.0	7.9
Pakistan	0				0			
Panama	2	9.7	2.0	4.8	3	12.0	2.0	6.0
Papua New Guinea	2	15.9	2.5	6.3	2	10.5	1.5	7.3
Paraguay	1	6.9	2.0	3.5	2	10.2	3.5	3.9
Peru	0				0			
Philippines	0				0			
Poland	0				0			
Portugal	0				0			
Qatar	4	30.6	2.8	10.8	4	14.0	3.0	6.6
Romania	0				0			
Russia	3	12.1	2.7	4.7	1	10.9	6.0	1.8
Rwanda	0				0			

Appendix. The History of Commodity Booms and Busts from the Early 1970s to the Early 2000s (concluded)

Samoa	1	6.9	6.0	1.2	1	8.1	4.0	2.0
Saudi Arabia	5	28.0	2.6	10.2	4	15.0	3.0	7.1
Senegal	1	7.3	2.0	3.7	1	10.4	4.0	2.6
Seychelles	1	7.7	2.0	3.8	1	10.5	4.0	2.6
Sierra Leone	2	12.0	4.0	2.9	3	13.0	3.3	4.1
Slovak Republic	0				0			
Slovenia	0				0			
South Africa	0				0			
Spain	0				0			
Sri Lanka	0				1	7.4	4.0	1.8
St. Kitts and Nevis	0				0			
St. Lucia	0				1	8.9	2.0	4.4
St. Vincent and the Grenadines	0				1	7.0	2.0	3.5
Sudan	0				0			
Suriname	4	23.0	2.5	11.5	5	19.6	3.0	7.3
Swaziland	1	8.8	2.0	4.4	0			
Sweden	0				0			
Switzerland	0				0			
Syrian Arab Republic	3	17.8	3.0	6.1	1	14.3	5.0	2.9
São Tomé and Príncipe	0				0			
Taiwan	0				0			
Tajikistan	4	21.1	2.5	10.8	5	18.4	2.8	7.3
Tanzania; United Republic of	0				0			
Thailand	0				0			
Togo	0				3	9.5	2.7	4.0
Trinidad and Tobago	3	13.7	2.7	5.3	1	11.4	6.0	1.9
Tunisia	0				0			
Turkey	0				0			
Turkmenistan	3	12.4	2.7	4.8	1	12.4	2.0	6.2
Uganda	0				0			
Ukraine	0				0			
United Arab Emirates	3	17.7	2.0	8.8	1	14.8	3.0	4.9
United Kingdom	0				0			
United States	0				0			
Uruguay	0				0			
Vanuatu	1	8.0	3.0	2.7	2	9.3	2.5	4.0
Venezuela	4	20.8	2.5	8.2	3	12.0	4.0	4.3
Vietnam	0				0			
Zambia	1	11.8	3.0	3.9	3	10.8	3.0	4.2
Zimbabwe	0				0			

VI. REFERENCES

Blattman, Christopher, Jason Hwang, and Jeffrey G. Williamson, 2007, "Winners and Losers in the Commodity Lottery: The Impact of Terms of Trade Growth and Volatility in the Periphery 1870–1939," *Journal of Development Economics*, Vol. 82, pp. 156–79.

Cashin, Paul, Luis F. Cespedes, and Ratna Sahay, 2004, "Commodity Currencies and the Real Exchange Rate," *Journal of Development Economics*, Vol. 75, pp. 239–268.

Cashin, Paul, C. John McDermott, 2002, "The Long-Run Behavior of Commodity Prices: Small Trends and Big Variability," *Staff Papers*, International Monetary Fund, Vol. 49, No. 2, pp. 175–199.

Cashin, Paul, C. John McDermott, and Alasdair Scott, 2002, "Booms and Slumps in World Commodity Prices," *Journal of Development Economics*, Vol. 69, pp. 277–96.

Collier, Paul, and Benedikt Goderis, 2007, "Commodity Prices, Growth, and the Natural Resource Curse: Reconciling a Conundrum," The Center for the Study of African Economies Working Paper 15 (University of Oxford).

Deaton, Angus, 1999, "Commodity Prices and Growth in Africa," *Journal of Economic Perspectives* Vol. 13, No. 3, pp. 23–40.

Deaton, Angus, and Ronald Miller, 1996, "International Commodity Prices, Macroeconomic Performance, and Politics in Sub-Saharan Africa," *Journal of African Economies*, Vol. 5, pp. 99–191.

International Monetary Fund, 2006, "Methodology for CGER Exchange Rate Assessments", November (Washington).

International Monetary Fund, 2007, *Regional Economic Outlook: Sub-Saharan Africa,* April (Washington).

Prati, Alessandro, Luca Ricci, Lone Christiansen, Stephen Tokarick, and Thierry Tressel, forthcoming, *External Performance in Low Income Countries*, IMF Occasional Paper (Washington).

Prebisch, Raul, 1950, *The Economic Development of Latin America and its Principal Problems* (New York: United Nations).

Singer, Hans W., 1950, "The Distribution of Gains between Investing and Borrowing Countries," *American Economic Review, Papers and Proceedings,* Vol. 40 (May), pp. 473–85.

Van der Ploeg, Frederick, 2006, "Challenges and Opportunities for Resource Rich Economies," CEPR Discussion Paper No. 5688.