

# IMF Working Paper

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

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**IMF Working Paper**

Western Hemisphere Department

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**Abstract**

We study the history of terms-of-trade booms (during 1970–2012), with a focus on Latin America, through the prisms of a simple metric that quantifies the associated *income windfall*. We also document saving patterns during these episodes and propose a measure of how much of the income windfall was saved. We find that Latin America’s terms-of-trade shocks of the last decade have not differed much in magnitude from those observed during the 1970s, but that the associated windfall have been substantially larger. While aggregate saving increased more than in past episodes, the share of the windfall saved (the marginal saving rate) seems to be lower, suggesting that greater aggregate saving reflects mainly the sheer size of the windfall rather than a greater ‘effort’ to save it. Finally, we find evidence that, while savings during the boom help to increase post-boom income, the composition of such savings matters. Specifically, in past episodes, savings allocated to foreign asset accumulation appear to have contributed more to post-boom income than those devoted to domestic investment.

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## I. INTRODUCTION

Commodity exporting countries across the world have benefited largely from the commodity price boom of the last decade. Together with improved macroeconomic management, the associated terms-of-trade boom allowed many emerging market economies to strengthen their economic fundamentals markedly in many dimensions. Latin America—being an important commodity producing region—has witnessed a particularly stark transformation. These developments have fed a growing sense of complacency in the region that this time the macroeconomic response to the terms-of-trade shock has been different, and more prudent, than in past episodes. Whether this is the case, however, remains an open empirical question, that this paper seeks to shed light on. Specifically, we study the current episode—that started around 2002—from a historical perspective, with a focus on the associated terms-of-trade *income windfall* and the extent to which it has been saved. We focus on Latin America, but draw intra-regional comparisons when relevant.

Some recent studies (IADB, 2008; Izquierdo et al, 2008; Osterholm and Zettelmeyer, 2008; Cespedes and Velasco; 2011; etc.) have looked into the role of external factors—including terms-of-trade shocks—in driving economic activity in Latin America. However, by focusing primarily on the effects of these shocks on *output* rather than *income*, they have overlooked an important dimension of the story that is key to assess whether the macroeconomic response to the shock was indeed different this time.

Against this backdrop, we offer two key innovations *vis-à-vis* these studies. *First*, we develop a simple, but quite telling, metric of the ‘extraordinary’ income (*windfall*) arising from the terms-of-trade shocks (*vis-à-vis* a counterfactual) that allows us to grasp the importance of the recent boom in absolute magnitude as well as in historical perspective. With this measure at hand, we then compute marginal savings rates (i.e., the proportion of the windfall saved) to shed light on whether the ‘effort’ to save the windfall has indeed been different this time. Finally, we use these estimates to study the extent to which saving during the boom, and its different types (i.e., domestic versus foreign), affect post-boom income.

We find that the recent terms-of-trade shocks in Latin America have not been larger than those seen during the 1970s. At the same time, the associated income windfall of the recent boom has been considerably larger than in the past, and quite large in absolute terms—averaging close to 15 percent of domestic income on an annual basis and about 100 percent on a cumulative basis. This windfall is only comparable to that received by Middle-East and North Africa (MENA) oil exporting countries. This is our first contribution.

Second, we find that while aggregate (average) savings increased more than in past episodes, the share of the income windfall saved (i.e., the marginal saving rate) has been lower. Together, these findings challenge the growing perception that the macroeconomic response was different this time. Furthermore, it suggests that the marked improvements in fundamentals largely reflect the sheer size of the windfall, rather than a greater effort to save

it. At the same time, there is evidence indicating that public sectors have contributed more to saving the income windfall than the private sector this time.

Another important difference with respect to past episodes is that, this time, a larger share of saving has been allocated to domestic investment (as opposed to accumulation of foreign assets). Related to the latter, we find econometric evidence suggesting that, in past episodes, boom-time saving resulted in higher post-boom income but saving tilted towards domestic investment—as seen recently—was been less beneficial to post-boom income than saving in foreign assets. This finding raises questions about the ongoing weakening of external current account balances in Latin America.

The rest of the paper is organized as follows: Section II describes our metric of income windfall and compares Latin America’s current episode with those of other regions, as well as its own past episodes. Section III studies the extent to which windfalls were saved. Section IV presents the econometric exercise to assess the importance of saving the windfall, and its composition, for post-boom income. Section V concludes with a discussion of the key takeaways.

## II. THE TERMS-OF-TRADE WINDFALL IN HISTORICAL PERSPECTIVE

We study the history of large terms-of-trade shocks, focusing on the period 1970-2012 on a sample of 180 countries. The main data source is the IMF, *International Financial Statistics (World Economic Outlook)*. Our main exercise entails identifying episodes of terms-of-trade booms over the collected sample, as follows:

**Terms-of-trade Boom.** Define terms of trade as  $TT^i = P^i_X / P^i_M$ , where  $P^i_X$  ( $P^i_M$ ) stands for the price in U.S. dollars of exports (imports) of goods and services in a given year. Let  $S$  ( $P$ ) be the year in which the boom starts (peaks) identified as local min (max). A terms-of-trade boom episode is an event for which the following conditions hold:

- i. The terms of trade increase at least 15 percent from start to peak, (i.e.,  $\left(\frac{TT_P - TT_S}{TT_S}\right) \geq 0.15$ ); and
- ii. The annual average increase in terms of trade is of at least 3 percent (i.e.,  $\left(\frac{TT_P - TT_S}{TT_S * (P - S)}\right) \geq 0.03$ ).

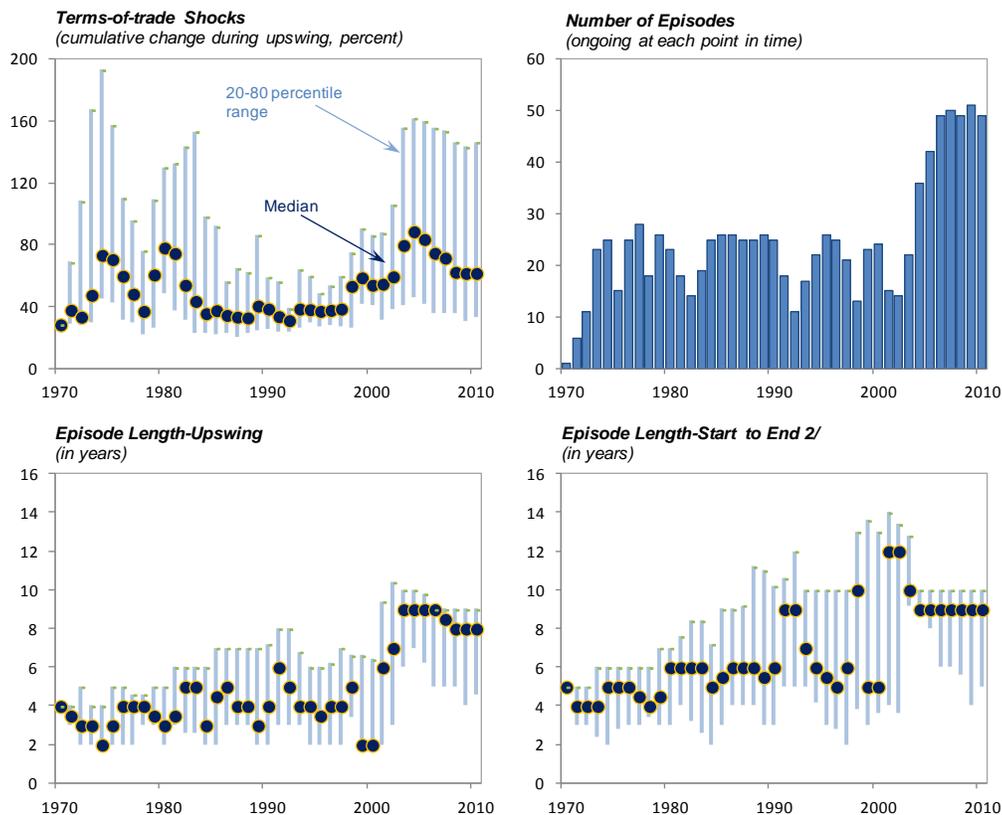
These thresholds identify 270 episodes, encompassing low-income countries, emerging market economies, and advanced economies (see Appendix Table A1 for the full list of episodes).

A first interesting result from exploring the sample of identified episodes is that the magnitude of the terms-of-trade shocks—measured during the upswing—under the recent boom has not been larger than those seen in the 1970s, as shown in Figure 1 (upper left chart). The recent wave of terms-of-trade shocks, however, has been more widespread (upper right chart) with twice as many episodes as in any of the previous decades, including the

1970s. This likely reflects the widespread increase in commodity prices over the past 10 years. Another key difference with past episodes, is that the recent wave of terms-of-trade shocks has been more persistent. Indeed, the average upswing of the latter is 7 years, compared to 3 years in past episodes (lower left chart and annex Table A3).

Looking beyond the upswing, we measure the *end* of the terms-of-trade boom (lower right chart), as the point in time at which at least a 1/3 of the increase during the upswing is reverted (or a new boom starts). We find that, even if the ongoing boom were to find an abrupt end, the full length from start to end of the episode (i.e., *cycle*) would still be much longer than those in the past, reflecting in part the relatively rapid reversal of booms in the 1970s and 1980s (on average, past episodes met their end only 1 year after reaching their peaks).

Figure 1. Key Features of Terms-of-trade Boom Episodes, 1970-2012 1/



Source: Authors' calculations.

1/ Statistics across all ongoing episodes (upswing) at each point in time.

2/ End is reached when at least 1/3 of the increase in terms of trade is reverted (or a new boom takes place). For episodes that did not reach their end, by the end of the sample period, 2012 is taken as the episode end year.

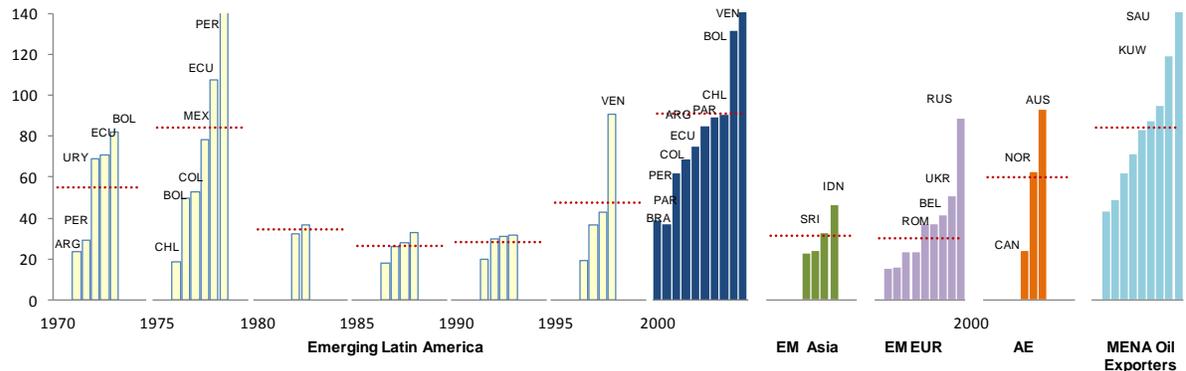
In the case of Emerging Latin America—Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, and Venezuela—the data show that within this group, only 9 countries satisfy the above thresholds, delivering 10 episodes during the 2000s. Interestingly, Uruguay and Mexico do not qualify as cases of recent terms-of-trade booms, reflecting the fact that, while being producers of certain commodities, their *net* commodity

exports are relatively small. At the same time, we identify two episodes for Paraguay since 2000.

Similar to the general result highlighted above, Latin America's current terms-of-trade boom—which started around 2002—is comparable in magnitude and scope (i.e., number of countries experiencing one) to those seen in the 1970s. Identified episodes have a median terms-of-trade cumulative increase of about 80 percent (during the upswing), although there is also significant variation across countries within the group. For example, Venezuela and Bolivia show cumulative terms-of-trade shocks of more than 120 percent while Brazil is on the other extreme, with a shock of only about 35 percent. This compares to 11 episodes in the 1970s, with a median cumulative increase of about 70 percent.

Furthermore, a contemporaneous comparison across regions indicates that Latin America's recent shock is only comparable to those of the oil exporting countries of the Middle East and North Africa region (Figure 2) and, to a lesser extent, to those of commodity exporting advanced economies (Australia, Canada, and Norway). Indeed, for other emerging market regions, we identify a limited number of episodes (e.g., Emerging Asia) and of much lower magnitude (e.g., Emerging Asia and Emerging Europe).<sup>1</sup>

**Figure 2. Emerging Latin America and Selected Regions: Terms-of-Trade Booms, 1970-2012<sup>1</sup>**  
(Cumulative percentage change, during upswing)



Sources: IMF, *International Financial Statistics*; and authors' estimates.

<sup>1</sup> Cumulative percentage change in terms of trade (of goods and services) from start to peak of each identified episode (that meet the criteria of at least 15 percent cumulative and 3 percent average increase). Episodes are grouped in 5-year windows according to the date of their first year. Dotted lines indicate group averages. Country groups as defined in Annex Table A2.

This traditional measure of terms-of-trade shock, however, does not provide information on the magnitude of the associated income shock, as it does not take into account the degree of trade openness of these economies.<sup>2</sup> Next we discuss a metric that takes this dimension into account.

<sup>1</sup> In Europe, only Russia, Ukraine, and Belarus show episodes of magnitudes comparable to those of Latin America. In Emerging Asia, only Indonesia stands out.

<sup>2</sup> The limited information content of the traditional measure of terms-of-trade is discussed in Adler and Sosa (2011).

## A. A Simple Metric of Terms-of-Trade Income Windfall

### Methodology

Our interest lies in quantifying the extent to which *real (gross domestic) income* in these economies was higher than *what it would have been had no terms-of-trade shock occurred* (i.e., in the counterfactual).<sup>3</sup> To this end, we construct a simple metric that focuses on the difference between actual real (gross domestic income and a similar variable but measured at pre-boom terms of trade. To construct the latter, we exploit the different paths of the GDP deflator and the CPI during terms-of-trade booms.

As in Kohli (2004), define country  $i$ 's real (gross domestic) income, at time  $t$ , as follows<sup>4</sup>

$$RI_{i,t} \equiv \frac{GDI_{i,t}}{P_{i,t}^C} = \frac{GDP_{i,t}}{P_{i,t}^C} \quad (1)$$

where  $GDI$  ( $GDP$ ) denotes gross domestic income (product) and  $P_t^C$  denotes the Consumer Price Index (CPI). Key in this definition is the use of the CPI to deflate nominal income, so as to capture its purchasing power in terms of the average consumption basket.<sup>5</sup> As the consumer price index differs from the GDP deflator, equation (1) can also be written as

$RI_{i,t} = RGDP_{i,t} * \left( \frac{P_{i,t}^Y}{P_{i,t}^C} \right)$ , where  $RGDP_t$  denotes real GDP (i.e.,  $GDP_{i,t}/P_{i,t}^Y$ ), and  $P_{i,t}^Y$  is the GDP deflator. This simple equation makes it clear that real income tends to diverge from real GDP when the GDP deflator diverges from the consumer price index, which tends to occur when the economy faces large terms-of-trade shocks, as shown next.

Express the GDP deflator in terms of its demand-side components as:

$$P_{i,t}^Y = P_{i,t}^C w_{i,t-1}^C + P_{i,t}^I w_{i,t-1}^I + P_{i,t}^G w_{i,t-1}^G + P_{i,t}^X w_{i,t-1}^X - P_{i,t}^M w_{i,t-1}^M \quad (2)$$

where  $P_{i,t}^C$  denotes the consumption deflator and  $w_{i,t-1}^C$  its share in GDP in the previous year. Similar terminology applies to investment ( $I$ ), government consumption ( $G$ ), exports of

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<sup>3</sup> This increase in income (windfall) arising from terms-of-trade shocks can be thought of being mostly unexpected as suggested by a comparison of IMF forecasts (and market expectations) with the subsequent realizations of terms-of-trade measures. Taking the increase in income as unexpected, one can interpret contemporaneous changes in aggregate savings patterns as a response to these innovations. Ideally one would derive the unexpected component of these terms-of-trade shocks, but data on expectations about trade prices is not available on a comprehensive basis.

<sup>4</sup> Gross domestic income ( $GDI$ ) is different from the concept of gross national disposable income ( $GNDY$ ), as the latter includes the balance of income from abroad (i.e.  $GNDY=GDI+BI$ ). See IMF (2009) and EC *et al* (2009).

<sup>5</sup> The CPI is used as a proxy for the private consumption deflator.

goods and services ( $X$ ) and imports of goods and services ( $M$ ). Differentiating equations (1) and (2), and combining them, yields:<sup>6</sup>

$$\widehat{RI}_{i,t} \approx R\widehat{GDP}_{i,t} + \left[ \widehat{P}_{i,t}^{X,r} * w_{i,t-1}^X - \widehat{P}_{i,t}^{M,r} * w_{i,t-1}^M \right] + \left[ \widehat{E}_{i,t} + \widehat{P}_t^* - \widehat{P}_{i,t}^C \right] [w_{i,t-1}^X - w_{i,t-1}^M] \quad (3)$$

where  $\widehat{X}$  denotes the annual percentage change of any variable  $X$ ;  $P_{i,t}^{X,r} = P_{i,t}^X/P_t^*$  and  $P_{i,t}^{M,r} = P_{i,t}^M/P_t^*$  are country  $i$ 's export and import prices (expressed relative to the U.S. CPI);<sup>7</sup>  $w_{i,t-1}^X$  and  $w_{i,t-1}^M$  denote the ratios of exports and imports (of goods and services) to GDP, and  $E_{i,t}$  is country  $i$ 's exchange rate *vis-à-vis* the U.S. dollar (local currency units per U.S. dollar). This equation shows that differences between real GDI and real GDP arise primarily from the income impact of terms-of-trade shocks (as captured by the second term on the right-hand-side) and from the effect of real exchange rate movements (last term).

Finally, the first term on the right-hand-side can be decomposed into trend growth and deviations from trend ( $R\widehat{GDP}_{i,t} = R\widehat{GDP}_{i,t}^{trend} + \Delta R\widehat{GDP}_{i,t}$ ) to yield:

$$\begin{aligned} \widehat{RI}_{i,t} \approx R\widehat{GDP}_{i,t}^{trend} + \Delta R\widehat{GDP}_{i,t} + \left[ \widehat{P}_{i,t}^{X,r} * w_{i,t-1}^X - \widehat{P}_{i,t}^{M,r} * w_{i,t-1}^M \right] \\ + \left[ \widehat{E}_{i,t} + \widehat{P}_t^* - \widehat{P}_{i,t}^C \right] [w_{i,t-1}^X - w_{i,t-1}^M] \end{aligned} \quad (4)$$

Stripping out the effect of changes in the real exchange rate (last term), equation (4) forms the basis for our estimates of the income windfall.<sup>8</sup> It provides us with the key components to build a counterfactual level of real income. Specifically, one can construct two variants of such measure, depending on the assumed counterfactual:

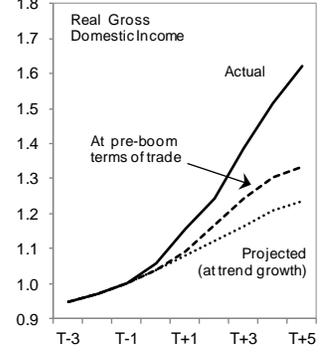
- (i) A purely exogenous metric based on the difference between actual income (stripped out from exchange rate effects) and income at pre-boom trade prices. This measure captured by the third term on the right-hand-side of equation (4) assumes that, in absence of the terms-of-trade shock, the same level of output would have been achieved but with relative prices as those prevailing before the boom.

<sup>6</sup> Equation (3) is an approximation because it requires the assumption that the joint deflator of investment ( $I$ ) and government consumption ( $G$ ) behaves similarly to the private consumption deflator (i.e.,  $\widehat{P}_t^C \approx (\widehat{P}_t^I w^I + \widehat{P}_t^G w^G)/(w^I + w^G)$ ). This assumption allows us to reduce significantly the data requirements for estimating the terms-of-trade income windfall, and thus to cover a large number of episodes, including from the 1970s, for which detailed national accounts data is not readily available. While investment tends to have a relatively large tradable component, the contrary happens to government consumption. Thus, this assumption should be relatively innocuous.

<sup>7</sup> Expressing export and import deflators in relative terms to the U.S. CPI is key to avoid imputing high global inflation (seen in the 1970s and 1980s) as terms-of-trade shocks.

<sup>8</sup> The real appreciation that normally accompanies large terms-of-trade shocks could hide the effect of the latter on real income (by raising the relative value of the domestic consumption basket). It can also reflect macroeconomic policies implemented during the boom or before it. For this reason, we focus on a measure of real income that strips out this effect and therefore is exogenous.

- (ii) A broader measure that tries to capture also the increase in real output arising from the shock, by imputing any deviation of output from its trend also to the terms-of-trade income windfall. This means computing the difference between actual income (stripped out from exchange rate effects) and projected income at trend growth, where the latter would grow at the rate of trend output. This measure encompasses the second and third terms on the right-hand-side of equation (4).



Our interest lies primarily on the first measure, even though it is likely to provide a lower bound estimate of the income windfall (as output also tends to respond positively to favorable terms-of-trade shocks). The focus on this lower bound estimate poses stringent requirements on the data, strengthening the results. Furthermore, the second measure might be contaminated by the effect of domestic factors, which could raise endogeneity issues, while the first is an exogenous measure of the terms-of-trade income shock.<sup>9</sup>

Finally, using equation (4), we compute the annual income windfall as:

$$WI_{i,t} \equiv \frac{[RI_{i,t} - RI_{i,t}^*]}{RI_{i,t}^*} \quad (5)$$

where  $RI_{i,t}$  is an index of actual real income, and  $RI_{i,t}^*$  is the corresponding counterfactual, constructed as:<sup>10</sup>

$$RI_{i,t} = \begin{cases} 1 & \text{if } t = T - 1 \\ RI_{i,t-1} * \left[ 1 + \Delta RGDP_{i,t} + \left[ P_{i,t}^{X,r} * w_{i,t-1}^X - P_{i,t}^{M,r} * w_{i,t-1}^M \right] \right] & \text{if } t > T - 1 \end{cases} \quad (6)$$

and

$$RI_{i,t}^* = \begin{cases} 1 & \text{if } t = T - 1 \\ RI_{i,t-1}^* * \left[ 1 + \Delta RGDP_{i,t} \right] & \text{if } t > T - 1 \end{cases} \quad (7)$$

Thus, the annual income windfall measures the vertical distance between real income and real income at pre-boom terms of trade; and the cumulative windfall the area between the two. Both are expressed as shares of real income at pre-boom terms of trade.

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

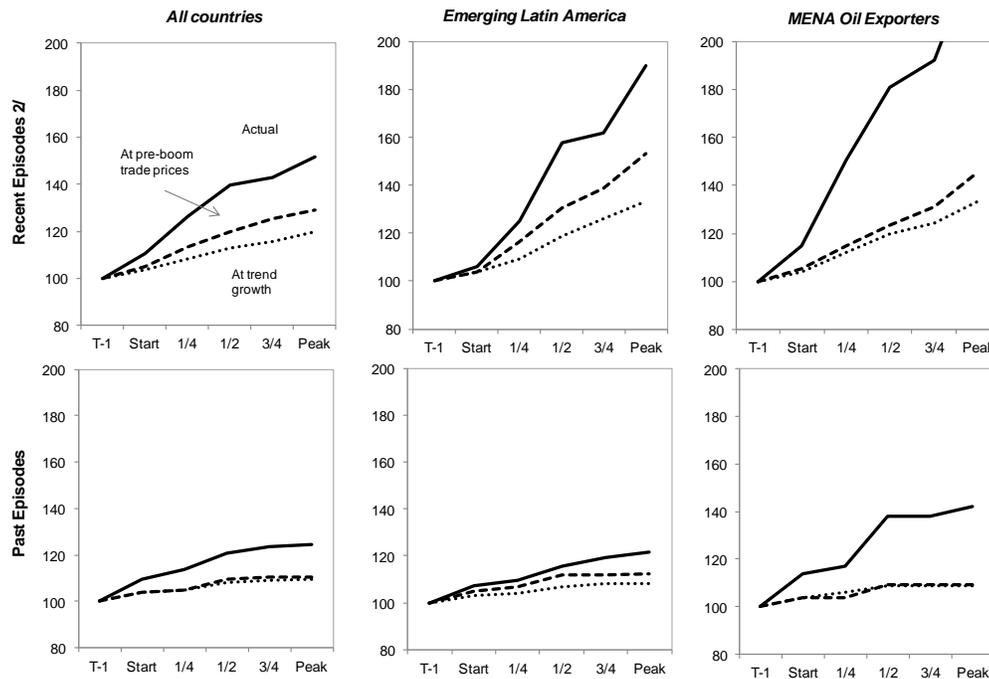
<sup>9</sup> For the interested reader, annex Tables A4–A6 show the results for the broader measure.

<sup>10</sup> This representation is useful for the analysis of marginal savings rates, as discussed in Section III.

## Results

The magnitude of the positive income shocks associated with recent terms-of-trade boom is evident from Figure 3, which presents the key measures of real income for subsamples of the identified booms. As shown, such effect has been especially pronounced in the recent episode and even more so for Emerging Latin American and the MENA oil exporting countries.<sup>11</sup> Furthermore, this income shock is particularly relevant for countries whose output did not grow faster than previously anticipated during the recent terms-of-trade boom, but whose income levels increased markedly on account of the improved trade prices. Within Latin America, Bolivia and Chile are striking cases of this (see Annex Figure A1).

**Figure 3. Real Gross Domestic Income during Terms-of-trade Booms, 1970-2012 1/**  
(medians, normalized lengths of episodes, Index T-1=100)



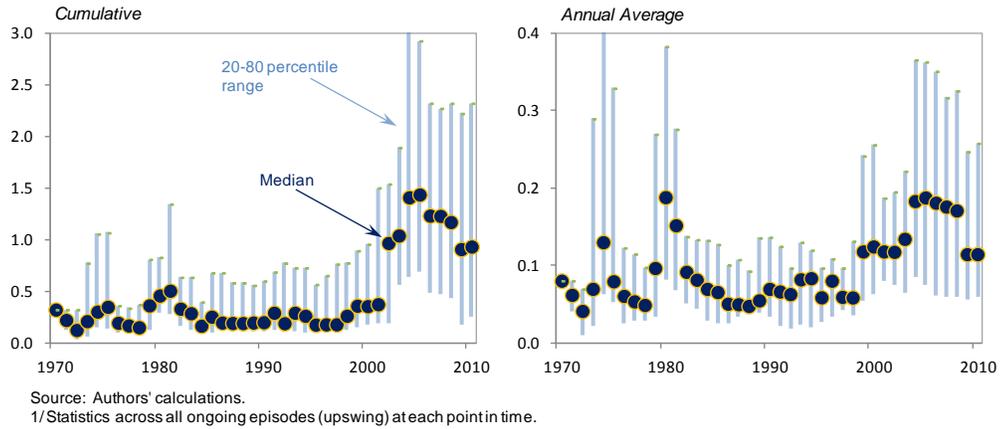
Sources: IMF, *International Financial Statistics*; and authors' estimations.

1/ Episode lengths are normalized in order to allow aggregation, and series are reported at fractions of the lifetime of each event. Real Domestic Income as defined in Section II.A (i.e., excluding real exchange rate effect). Country groupings as defined in Annex Table A2.  
2/ Episodes taken place since 2000.

A historical comparison of our estimates of the cumulative income windfall points to a much larger effect during the recent wave than in past ones, including those of the 1970s (Figure 4 and Tables 1–2). This reflects a higher degree of trade openness in most countries in the sample, and the longer duration of the recent event.

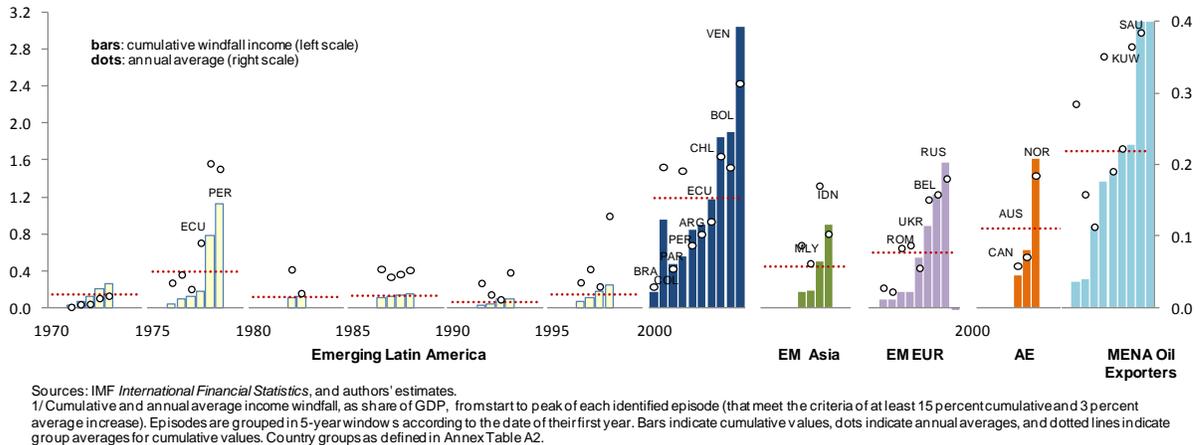
<sup>11</sup> See similar charts for selected countries in Annex Figure A1.

**Figure 4. Income Windfall of Terms-of-trade Booms, 1970-2012<sup>1/</sup>**  
(share of GDP)



This pattern is also visible in the case of Emerging Latin America (Figure 5). Estimates of the income effect of the recent boom for the latter group are quite large in absolute terms, with a median of about 87 percent of a year's GDP cumulative or about 15 percent per year. This means, that only taking into account the price effect of the terms-of-trade shock, real income has been, on average, at least 15 percent per year higher than what it would have been otherwise. Within Latin America, Venezuela, Bolivia, and Chile stand out as having benefited the most, with cumulative (annual average) windfalls of as much as 300 (30) percent of income in the first case, and close to 200 (20) percent in the case of both Bolivia and Chile. Not surprisingly, Brazil is at the other end of the distribution, with significantly lower windfall estimates, reflecting a lower reliance on commodities and its lower degree of trade openness.

**Figure 5. Emerging Latin America and Selected Regions: Income Windfall, 1970-2012<sup>1/</sup>**  
(share of annual GDP)



These effects are quite large also in relative terms to those of other regions. For example, the median cumulative windfall was just over 50 percent in Emerging Asia, 30 percent in Emerging Europe, and close to 65 percent in commodity-exporting advanced countries. Only oil-exporting countries in the MENA region show income windfalls of larger magnitude than

those of Latin America, reaching a median of about 170 percent of GDP. This highlights the order of magnitude of the terms-of-trade windfall received by Latin America, which has been not only larger than its own past experiences, but greater than most other regions. The share of countries that benefited from terms-of-trade booms has also been much higher in Latin America than in other regions.

Table 1. Key Statistics of Income Windfall (medians) 1/

Country Group	Number of Episodes	Episode Length (years)		Terms-of-Trade Shock 4/		Income Windfall (price effect) 5/	
		Up-swing 2/	Cycle 3/	Cum. (%)	Annual Avg. (%)	Cum.	Avg
		<b>Latin America 11</b>	<b>35</b>	<b>3</b>	<b>4</b>	<b>43.1</b>	<b>14.1</b>
Current	10	9	10	80.0	8.6	92.5	15.1
Past	25	2	3	33.2	15.7	11.8	4.5
<b>EM Asia</b>	<b>16</b>	<b>2</b>	<b>4</b>	<b>27.7</b>	<b>9.8</b>	<b>18.1</b>	<b>6.8</b>
Current	3	3	3	32.4	7.9	51.2	10.3
Past	13	2	4	26.8	11.1	14.9	5.6
<b>EM Europe</b>	<b>15</b>	<b>4</b>	<b>5</b>	<b>30.4</b>	<b>8.5</b>	<b>16.7</b>	<b>7.4</b>
Current	6	5	6	29.9	5.5	32.4	4.2
Past	9	3	5	30.4	14.7	16.7	8.0
<b>MENA Oil Exporters</b>	<b>39</b>	<b>3</b>	<b>5</b>	<b>83.4</b>	<b>24.8</b>	<b>80.8</b>	<b>23.7</b>
Current	7	8	8	87.3	10.5	178.3	35.2
Past	32	2	5	81.2	36.0	51.7	20.3
<b>Advanced Ec. (excl. MENA)</b>	<b>21</b>	<b>4</b>	<b>5</b>	<b>28.8</b>	<b>7.2</b>	<b>19.0</b>	<b>5.0</b>
Current	3	9	9	62.7	7.0	64.1	7.1
Past	18	4	5	28.5	7.4	16.2	4.9

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). Subgroups as defined in Annex Table A2.

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

4/ Of goods and services, for upswing period (start to peak).

5/ In percent of income under the counterfactual (i.e., real domestic income at pre-boom terms-of-trade).

Table 2. Emerging Latin America: Key Statistics of Income Windfall 1/

Countries	First Year	Episode Length (years)		Terms-of-Trade Shock 4/		Income Windfall (price effect) 5/	
		Up-swing 2/	Cycle 3/	Cum. (%)	Annual Avg. (%)	Cum.	Avg
		Argentina 6/	2003	9	10	85.1	9.5
Bolivia	2003	10	10	131.1	13.1	190.1	19.0
Brazil	2006	6	7	37.2	6.2	17.1	2.9
Chile	2003	9	10	90.2	10.0	184.7	20.5
Colombia	2004	9	9	68.7	7.6	47.7	5.3
Ecuador	2002	10	11	74.9	7.5	116.8	11.7
Paraguay	2002	3	3	89.2	29.7	55.6	18.5
Paraguay	2008	5	5	38.8	7.8	95.3	19.1
Peru	2003	10	10	61.9	6.2	84.6	8.5
Venezuela, Republica Bolivariana	2003	10	10	233.3	23.3	303.9	30.4

Source: authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak).

2/ From start to peak.

3/ Start to end, with end identified as year when at least 1/3 of the shock is reverted (or 2012 if the latter is not met).

4/ Of goods and services, for upswing period (start to peak).

5/ In percent of income under the counterfactual (i.e., real income at pre-boom terms-of-trade).

6/ Results for Argentina are based on officially reported data. The IMF has, however, issued a declaration of censure and called on Argentina to adopt remedial measures to address the quality of the official GDP and CPI-GBA data.

### III. SAVING PATTERNS DURING THE TERMS-OF-TRADE BOOMS

In this section we study aggregate saving patterns during these episodes of terms-of-trade booms by looking at both *average* as well as *marginal* rates. The goal is to document differences across time and regions in the macroeconomic responses to these shocks, in terms of the extent to which income windfalls were saved. Such responses have an important bearing on economic performance after the boom, as discussed in section IV, especially in cases where booms were followed by busts (i.e., sharp drops in terms of trade).

It is important to highlight however that, in this paper, we do not attempt to assess the optimality of the macroeconomic response to the terms-of-trade shock (i.e., the determinants of saving and investment decisions). The latter entails, among other things, linking such response to the perceived persistence of the shock as well as other contemporaneous external perturbations, which we address in a separate paper.

Marginal saving rates are of particular interest, as they give an indication of the country's aggregate effort to save the additional (marginal) income arising from the terms-of-trade shock. Since the allocation of savings may also play a role, as shown later, we also decompose aggregate savings into domestic (i.e., investment) and foreign saving, relying on the current account identity ( $S = I + CA$ ).

#### A. Average Saving Rates

A comparison of Latin America's average saving rates across episodes points to a visible difference between the recent episode and the previous ones (Figure 5 and Tables 3–4). In particular, we observe that during the recent event, the median saving rate has increased by about 4 percentage points of GDP relative to pre-boom levels, as opposed to only 2 percentage points in past episodes. This has been accompanied by a remarkable increase in the investment rate (of about 5 percentage points of GDP), in clear contrast with the past. As a result, and despite higher saving rates, the recent episodes do not display higher current account balances than those of the past. In addition, a look into the dynamics within the episode shows that current account improved during the first stages of the current episode, but have deteriorated more recently, reflecting the pickup in investment along with the decline of saving rates.<sup>12</sup>

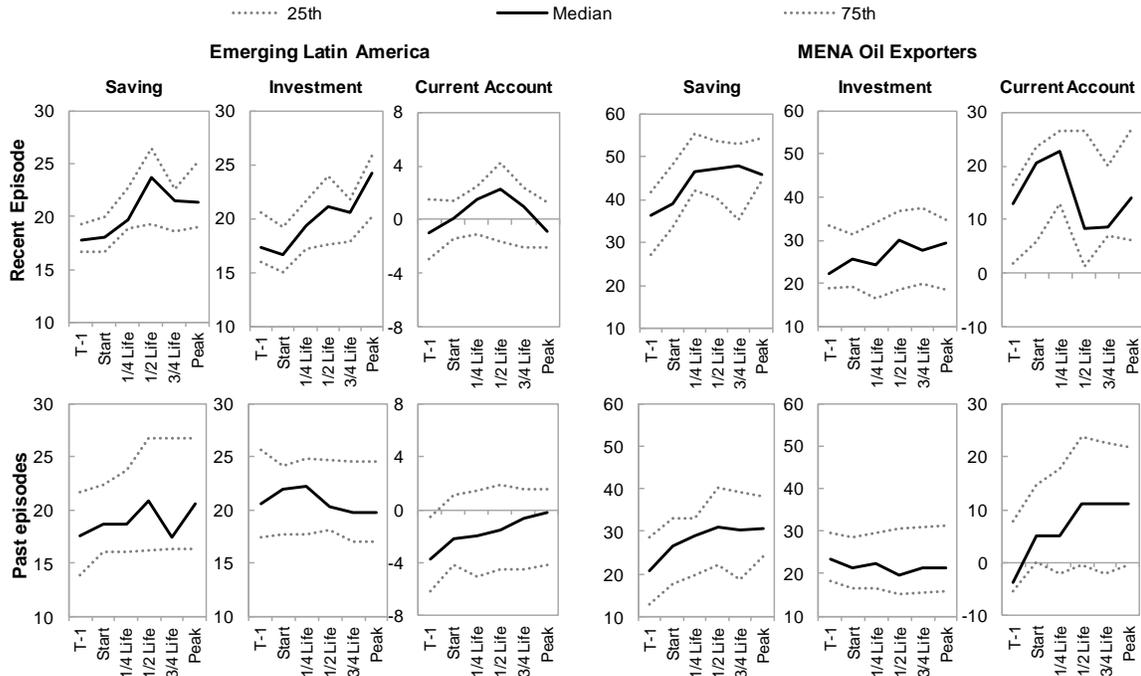
Developments in Latin America, however, are dwarfed by those seen in the MENA oil exporting countries. The latter experienced, during the recent episode, an increase in saving rates of about 11 percentage points of GDP, and starting from levels twice as high as those seen in Latin America. Investment also picked up markedly in these oil exporters, leading to

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<sup>12</sup> These dynamics may reflect, in part, changing perceptions regarding the persistence of the terms-of-trade shock, possibly being increasingly perceived as more permanent.

a sharp weakening of their current account balances towards the ½ life of the episode, although external balances still hovered around 10 percentage points of GDP (as opposed to around zero in Latin America).

**Figure 6. Emerging Latin America and MENA Oil Exporters: Aggregate Savings, Investment, and Current Account during Terms-of-Trade Booms<sup>1</sup>**  
(Percent of GDP; medians, and 25th and 75th percentiles)



Source: IMF *International Financial Statistics*; and authors' calculations.

<sup>1</sup>Episode length is normalized in order to allow aggregation, and series are reported at fractions of the lifetime of each event.

## B. Marginal Saving Rates

Average saving and investment rates, however, do not inform us about the extent to which the *income windfall* is saved, as they are computed over the overall level of income, as opposed to just the extraordinary component. Marginal rates, on the other hand, give a metric of the latter, and thus an indication of the ‘effort’ made to save the additional income. It is, therefore, likely to be more relevant for explaining the dynamics of the economy during the boom as well as their post-boom impact.

We compute marginal saving rates in a way that captures the increase in savings as a proportion of the estimated income windfall.<sup>13</sup> To do this, the economy’s *average* saving rate during the boom ( $s$ ) is decomposed into a ‘*norm*’ saving rate ( $\bar{s}$ )—that we proxy by the

<sup>13</sup> As discussed before, if the increase in income (i.e., windfall) is largely unexpected, one can interpret contemporaneous changes in savings patterns as a response to these innovations.

average saving rate in the three years preceding the boom—and the *marginal* saving rate ( $s^W$ ) or share of the income windfall saved, as follows:

$$s = \bar{s} * \frac{RI^*}{RI} + s^W * \frac{(RI - RI^*)}{RI} \quad (8)$$

The average saving rate can be seen as a weighted average of the norm saving rate and the saving rate on the extra income (windfall). Equation (8) can be re-arranged to derive the marginal saving rate as:

$$s^W \equiv \frac{(s * RI - \bar{s} * RI^*)}{RI - RI^*} \quad (9)$$

And this expression shows that the marginal rate can be computed as the additional saving during the boom with respect to what saving would have been had no terms-of-trade boom occurred, measured as share of the income windfall.

We also compute the marginal rates for domestic and foreign savings in the same way that the average saving rates ( $S$ ) can be decomposed into domestic investment ( $I$ ) and foreign asset accumulation ( $CA$ ) using the current account identity ( $CA = S - I$ ). In this case, the measures are interpreted as the marginal saving either channeled to increase the stock of domestic capital (investment) or to improve the country's net foreign asset position (through a strengthening of the external current account). Specifically, we compute the marginal investment rate ( $s^{WD}$ ) as follows:

$$s^{WD} \equiv \frac{(ir * RI - \bar{ir} * RI^*)}{RI - RI^*} \quad (10)$$

where  $ir$  stands for the investment rate and  $\bar{ir}$  is the corresponding norm (again, measured as the pre-boom 3-year average). As before, this estimate has an intuitive interpretation: how much of the extra income (relative to the counterfactual) is allocated to gross capital formation, relative to the corresponding allocation in the counterfactual. Finally, using the current account identity we derive the foreign saving component, as

$$s^{WF} = s^W - s^{WD} \quad (11)$$

For the latter, the same interpretation applies, although referring to the share of income windfall allocated to the accumulation of net foreign assets.

These metrics reveal that Latin America's marginal saving rates in the recent episode were actually lower than those from past episodes (Table 3). Indeed, the last episode has a median saving rate of 45 percent of the income windfall, compared a median of 80 percent during past events, although marginal rates for previous episodes depict a relatively high dispersion. These figures suggest, therefore, that Latin America's macroeconomic response to the recent terms-of-trade boom, in terms of its effort to save the windfall has not been greater than during past episodes. There is, however, significant variance across countries within Latin America (Table 4). Bolivia, Colombia, and Peru appear to have saved a larger proportion of their income shocks than the rest, while Paraguay, Chile, and Brazil stand on the other

extreme. In the case of Chile, however, a relatively low marginal saving rate reflects a relatively high starting average rate.<sup>14</sup>

Interestingly, MENA oil-exporting countries—the other group with similar or larger income windfall—appear to have saved a much larger share of the windfall than Latin America, with a median marginal saving rate of about 80 percent. Furthermore, this is about the same as during this region’s past episodes, suggesting that common global shocks (other than terms of trade) cannot fully explain the drop in marginal savings rates in Latin America. Another important difference between these two regions is in the split between domestic and foreign saving, with MENA countries displaying a balanced allocation in the recent boom, as opposed to Latin America, whose allocation has been heavily biased towards domestic investment. The breakdown between domestic and foreign saving suggest that, other than Paraguay in 2002 and Bolivia in 2003, all other episodes show a larger share of their marginal savings being allocated to domestic investment, as opposed to improving their net foreign asset position (through the current account). In some cases, there is even a (marginal) deterioration in the country’s net international asset position.

Table 3. Average and Marginal Saving Rates during Terms-of-trade Booms (medians) 1/

Country Group	Number of Episodes	Episode Length (years)		Saving rates								
		2/	3/	Pre-boom 4/			Boom (Upswing)			Marginal (percent of IW) 6/		
				Average 5/			Average 5/			Marginal (percent of IW) 6/		
		Upswing	Cycle	Total	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign
<b>Latin America 11</b>	<b>35</b>	<b>3</b>	<b>4</b>	<b>17.2</b>	<b>18.9</b>	<b>-2.5</b>	<b>20.7</b>	<b>21.8</b>	<b>-0.9</b>	<b>66.7</b>	<b>46.6</b>	<b>20.1</b>
Current	10	9	10	17.2	17.0	-0.1	21.4	22.0	0.7	45.2	41.2	4.0
Past	25	2	3	17.2	20.2	-3.4	19.1	21.3	-2.2	80.6	46.6	34.0
<b>EM Asia</b>	<b>16</b>	<b>2</b>	<b>4</b>	<b>22.0</b>	<b>26.8</b>	<b>-4.4</b>	<b>23.1</b>	<b>25.9</b>	<b>-0.9</b>	<b>50.5</b>	<b>11.7</b>	<b>38.7</b>
Current	3	3	3	27.1	23.2	3.9	29.5	25.8	0.7	52.9	21.0	31.9
Past	13	2	4	21.4	27.1	-5.2	21.2	26.0	-1.0	41.1	-8.3	49.4
<b>EM Europe</b>	<b>15</b>	<b>4</b>	<b>5</b>	<b>19.4</b>	<b>20.9</b>	<b>-2.6</b>	<b>22.7</b>	<b>24.5</b>	<b>-0.9</b>	<b>30.5</b>	<b>41.1</b>	<b>-10.6</b>
Current	6	5	6	17.6	20.6	-3.6	19.3	25.2	-7.5	28.6	51.3	-22.7
Past	9	3	5	20.5	25.3	-2.3	23.0	23.1	-0.5	32.5	34.9	-2.4
<b>MENA Oil Exporters</b>	<b>39</b>	<b>3</b>	<b>5</b>	<b>24.4</b>	<b>23.0</b>	<b>-1.3</b>	<b>33.2</b>	<b>21.3</b>	<b>6.8</b>	<b>79.0</b>	<b>7.3</b>	<b>71.7</b>
Current	7	8	8	34.3	19.6	8.2	45.1	28.4	14.2	77.2	29.7	47.6
Past	32	2	5	22.6	23.8	-2.4	31.2	21.1	4.2	80.7	1.7	79.1
<b>Advanced Ec. (exc. MENA)</b>	<b>21</b>	<b>4</b>	<b>5</b>	<b>22.4</b>	<b>25.0</b>	<b>-3.2</b>	<b>24.8</b>	<b>24.0</b>	<b>-0.2</b>	<b>46.5</b>	<b>10.6</b>	<b>35.8</b>
Current	3	9	9	22.3	20.2	2.1	24.0	23.0	1.3	52.5	66.9	-14.5
Past	18	4	5	23.0	26.4	-3.9	26.0	24.1	-0.6	43.6	3.1	40.5

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). Subgroups as defined in Annex Table A2.

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

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

5/ Aggregate average rates (percent of GDP).

6/ Aggregate marginal rates, in percent of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).

<sup>14</sup> Argentina also is among the countries with the highest marginal saving rates, in part for two reasons: (i) increased savings relative to pre-boom levels reflect to a large extent the rebound from the 2001–02 crisis; and (ii) the income windfall could be underestimated if real GDP data is overestimated, as suggested by private sector analysts. See corresponding footnote in Table 4. The relevance of the latter issue can be gauged by looking at the marginal saving rates computed over the broader measure of windfall income (see Annex Table A6).

Table 4. Emerging Latin America: Average and Marginal Saving Rates during Terms-of-trade Booms 1/

Country Group	First Year	Episode Length (years)		Saving rates								
				Pre-boom 4/			Boom (Upswing)					
		Upswing	Cycle	Average 5/			Average 5/			Marginal (percent of WI) 6/		
				Total	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign
Argentina 7/	2003	9	10	16.1	14.6	1.5	24.3	21.9	2.4	105.9	96.4	9.5
Bolivia	2003	10	10	12.0	16.2	-4.3	21.7	15.9	5.8	74.6	15.1	59.5
Brazil	2006	6	7	17.7	16.4	1.4	18.0	19.1	-1.0	29.8	114.3	-84.5
Chile	2003	9	10	22.7	23.9	-1.2	23.4	22.2	1.2	27.1	14.0	13.2
Colombia	2004	9	9	16.2	17.3	-1.2	19.9	22.3	-2.3	91.5	116.3	-24.8
Ecuador	2002	10	11	20.1	18.0	2.1	22.4	22.2	0.2	42.8	58.6	-15.8
Paraguay	2002	3	3	14.2	16.7	-2.5	17.9	16.2	1.7	36.9	13.8	23.1
Paraguay	2008	5	5	17.6	16.7	0.9	13.6	14.9	-1.3	-10.2	5.8	-16.0
Peru	2003	10	10	16.8	19.1	-2.4	21.2	22.0	-0.8	74.6	57.8	16.8
Venezuela, Republica Bolivariana	2003	10	10	29.2	24.3	4.9	33.6	24.1	9.4	47.5	24.6	23.0

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). Subgroups as defined in Annex Table A2.

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

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

5/ Aggregate average rates (percent of GDP).

6/ Aggregate marginal rates, in percent of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).

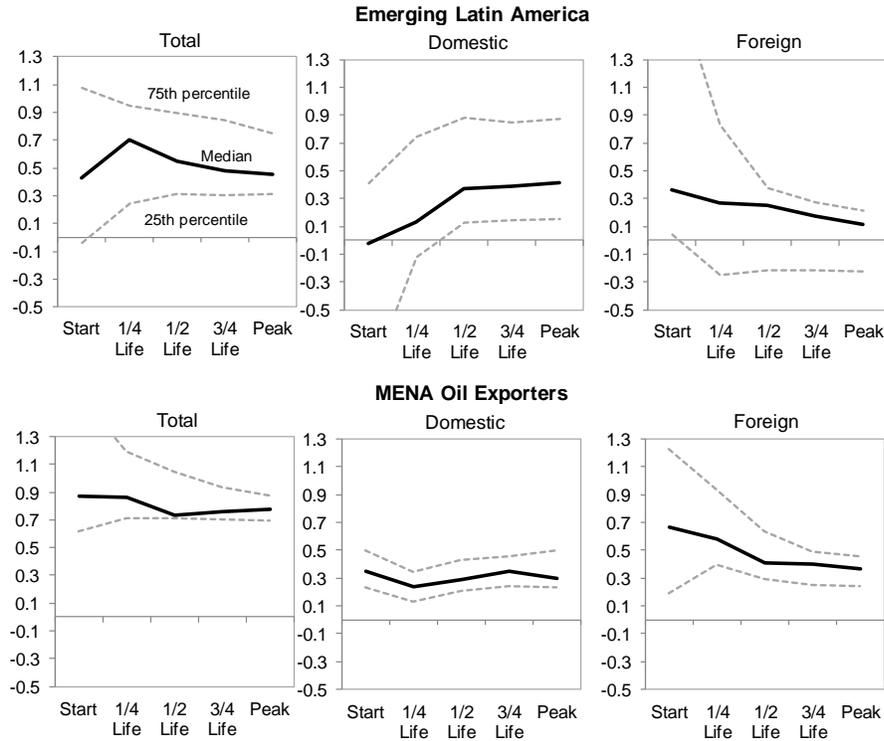
7/ Results for Argentina are based on officially reported data. The IMF has, however, issued a declaration of censure and called on Argentina to adopt remedial measures to address the quality of the official GDP and CPI-GBA data.

A glance at the cross-time dynamics of Latin America's marginal saving rates during the recent episode points to a gradual decline after a short-lived initial increase (Figure 6). These dynamics, as discussed above, could reflect changing perceptions of the persistence of the terms-of-trade shock, if being increasingly perceived as more protracted, as the boom evolved.<sup>15</sup> At the same time, different dynamics in the MENA region do not lend support to the latter hypothesis. Furthermore, the breakdown of marginal savings rate into domestic and foreign savings shows, as average rates do, a growing share of the windfall being allocated to domestic capital formation rather than to improving countries' net foreign asset position. This pattern is also consistent with the notion that the perceived persistence of the shock may have increased over time, leading to further domestic investment (including in commodity related sectors). While such behavior can be reconciled with a need to accumulate physical capital, especially because these are developing economies, it remains an empirical issue whether domestic investment or foreign asset accumulation is preferable, in terms of increasing post-boom income, during periods of terms-of-trade booms. This is studied in Section IV.

<sup>15</sup> The effects of the global financial crisis of 2008–09 may have also played a role, leading to lower aggregate savings, at least temporarily.

**Figure 7. Emerging Latin America and MENA Oil Exporters:  
Windfall Saving Rates<sup>1</sup>**

(Cumulative, share of income windfall ; medians, and 25th and 75th percentiles)



Source: IMF, *International Financial Statistics*; and authors' estimations.

<sup>1</sup> Episode length is normalized in order to allow aggregation, and series are reported at fractions of the lifetime

### Public and Private Sectors' Saving Patterns

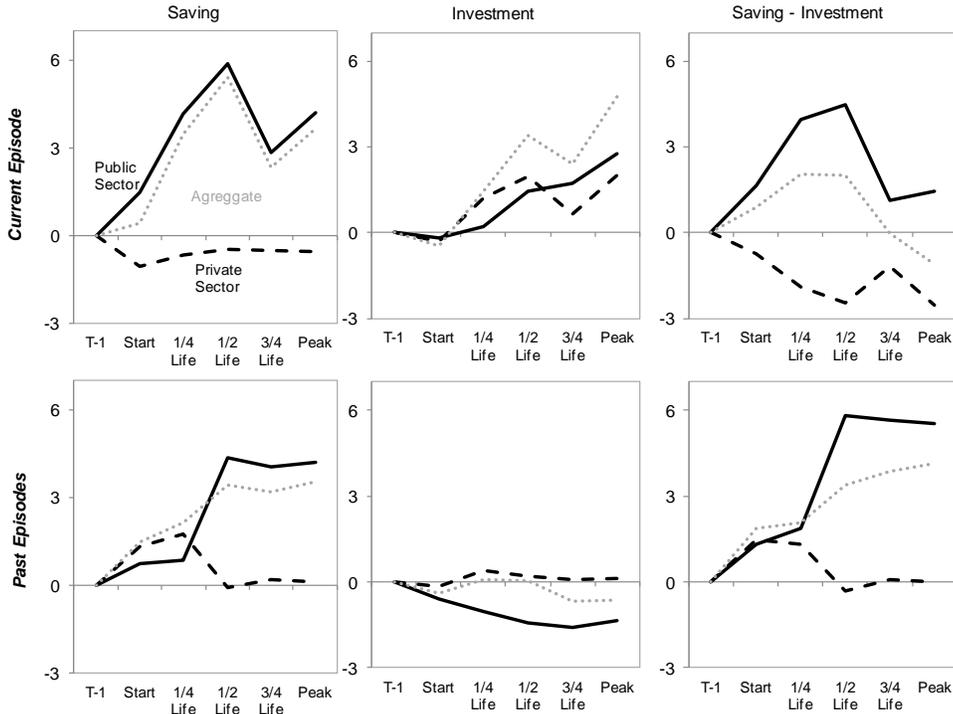
So far, we have discussed patterns of savings and investment at the aggregate level (i.e., for the economy as a whole). An interesting and important issue, however, is whether there are differences in behavior between the public and the private sectors. To study this issue, we compute the corresponding average saving and investment rates for each of them.<sup>16</sup>

We find that the public sector appears to have responded more prudently than the private sector to the recent terms-of-trade shock (Figure 7). This is evidenced by the sharp increase in average savings rates of the former, while private sector saving rates have remained broadly stable. At the same time, the dynamics suggests a more recent 'relaxation' in the public sector efforts to save the windfall. The latter, together with a sharp increase in investment rates has largely contributed to weakening current account balances in the region. Interestingly, for past episodes we find broadly similar results regarding public and private sector savings. A main difference, however, is the sharp response of investment rates this time, as opposed to the past. It is important, however, to highlight that the comparison with past episodes is subject to significant data limitations, and thus results should be interpreted

<sup>16</sup> Statistics reported here are based on a sub-sample of countries, as fiscal data for past episodes is limited.

with caution. Furthermore, this analysis is based on averages rather than marginal rates, and therefore not the best indication of the effort made by these two sectors of the economy. Computing their marginal savings rate is left for future research as it entails estimating private disposable income, thus requiring further data gathering.

**Figure 8. Emerging Latin America. Saving, Investment and Balance 1/**  
(in percent of GDP, change from T-1, group simple averages)



Sources: IMF *International Financial Statistics*, and authors' estimations.

1/ Breakdown public/private for past episodes is based on a subsample of episodes, due to limited data availability.

#### IV. SAVING DURING THE BOOM AND POST-BOOM INCOME

In this section we study how saving patterns *during the boom* (and their different allocations) affect *post-boom* income, by way of a simple cross-section econometric exercise. The goal is to gauge the extent to which saving during the boom delivers higher income afterwards, as one would expect, and more interestingly, whether it matters if the saving is channeled to domestic purposes (investment) or to improving the external position of the country (through the current account). Thus, the following specification is estimated using OLS:

$$RGNDY_i^{Post} = \alpha_0 + \beta'ws_i + \theta'X_i + \Omega'Z_i + \varepsilon_i \quad (12)$$

where  $RGNDY_i^{Post}$  denotes post-boom real gross national disposable income for episode  $i$ , which is measured as the level at 5 years after the boom; and  $ws_i$  stands for the corresponding windfall saving. We use gross national disposable income—rather than gross domestic income as in the first part of the paper—to take into account the net financial income from abroad (the income balance of the external current account), which incorporates

the return on marginal changes in the country's net foreign asset position. This let us study whether returns on domestic or foreign savings have been higher.

Regressions include a number of country-specific controls,  $\mathbf{X}$ , and global controls,  $\mathbf{Z}$ . Among the former we include:

- A measure of the (contemporaneous) post-boom terms-of-trade shock. Terms of trade are corrected for the degree of trade openness of the economy to account for the effective impact of variations in the terms-of-trade on the real economy.<sup>17</sup>
- A measure of the country's *de facto* exchange rate regime, based on the coarse classification of Ilzetki et al. (2011).
- A measure of the degree of financial integration, from Chinn and Ito (2008).
- We also control for the pre-boom growth rate of real GDP to account for trend growth (during normal times).
- Given that our interest lies on the impact of the marginal windfall saving on post-boom real income, we also control for real income at the peak, precisely to measure only the marginal effect.

We also control for external factors that could affect post-boom income, including the U.S. real interest rate (U.S. Fed funds rate deflated by the U.S. CPI) and the growth rate of world GDP.<sup>18</sup>

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<sup>17</sup> For details, see Adler and Sosa (2011).

<sup>18</sup> For consistency, both types of controls are measured contemporaneously with the dependent variable. In particular, we use the average (from the peak of the boom to 5 years after it) U.S. real interest rate and rate of growth of world GDP. The terms of trade is computed as the average between the peak of the boom and its value 5 years after peaking, while financial integration and exchange rate flexibility are taken at their values at the peak of the boom.

Table 5. Effects of Windfall Saving on Post-Boom Income<sup>1</sup>

	Dependent variable: Real Gross National Disposable Income							
	5 years after Boom				Average of 5 years after Boom			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Windfall saving	<b>0.12</b> *** (3.03)		<b>0.14</b> *** (3.36)		<b>0.06</b> * (1.69)		<b>0.08</b> ** (2.00)	
Domestic windfall saving		<b>0.06</b> (0.63)		<b>0.16</b> (1.41)		<b>-0.02</b> (-0.26)		<b>0.01</b> (0.06)
Foreign windfall saving		<b>0.13</b> *** (3.17)		<b>0.14</b> *** (3.33)		<b>0.08</b> ** (2.02)		<b>0.08</b> ** (2.06)
Dummy Latin America			-2.67 (-0.39)	-1.46 (-0.21)			9.08 (1.47)	7.40 (1.16)
Windfall saving * dummy LA			<b>-0.24</b> * (-1.63)				<b>-0.16</b> (-1.23)	
Domestic saving * dummy LA				<b>-0.43</b> * (-1.77)				<b>-0.16</b> (-0.71)
Foreign saving * dummy LA				<b>0.00</b> (0.01)				<b>0.04</b> (0.22)
<b>Controls</b>								
Real income at peak ( <i>end of boom</i> )	1.14 *** (13.39)	1.13 *** (13.18)	1.12 *** (13.19)	1.11 *** (12.83)	0.77 *** (10.19)	0.77 *** (10.09)	0.78 *** (10.28)	0.78 *** (9.97)
Pre-boom RGDP trend growth	0.01 (0.01)	0.04 (0.05)	-0.09 (-0.12)	-0.11 (-0.14)	-0.43 (-0.62)	-0.41 (-0.59)	-0.57 (-0.81)	-0.51 (-0.72)
Terms of trade ( <i>openness adjusted</i> )	3.33 *** (3.63)	3.47 *** (3.68)	3.24 *** (3.54)	3.26 *** (3.46)	0.52 (0.62)	0.69 (0.81)	0.72 *** (0.61)	0.67 (0.78)
Financial integration	-0.49 (-0.24)	-0.12 (-0.06)	0.17 (0.08)	0.09 (0.04)	-0.91 (-0.49)	-0.46 (-0.24)	-1.22 (-0.65)	-0.96 (-0.50)
Exchange rate regime	-5.15 *** (-2.55)	-5.14 *** (-2.45)	-4.39 ** (-2.14)	-4.89 ** (-2.29)	-3.05 * (-1.67)	-2.92 + (-1.52)	-3.19 * (-1.71)	-3.38 * (-1.71)
World RGDP growth	6.04 (1.19)	6.38 (1.26)	6.10 (1.21)	6.36 (1.26)	-3.34 (-0.73)	-3.62 (-0.79)	-3.19 (-0.70)	-3.55 (-0.77)
US real interest rate	-3.12 ** (-2.10)	-3.23 ** (-2.17)	-3.26 ** (-2.19)	-3.14 ** (-2.09)	-3.76 *** (-2.79)	-4.07 *** (-3.00)	-4.03 *** (-2.98)	-4.15 *** (-3.01)
Constant	8.17 (0.38)	8.22 (0.38)	9.98 (0.46)	11.26 (0.52)	66.38 *** (3.42)	67.28 *** (3.44)	63.23 *** (3.24)	65.49 *** (3.31)
Obs.	156	155	156	155	157	157	156	156
Adjusted R <sup>2</sup>	0.63	0.64	0.64	0.64	0.47	0.48	0.48	0.48
F-prob	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' estimations.

Confidence level: (\*) 10 percent, (\*\*) 5 percent, and (\*\*\*) 1 percent; t-statistics are reported in parenthesis.

<sup>1</sup> OLS estimation based on cross-section of terms-of-trade boom episodes. Dependent variable is Gross National Disposable Income as defined in IMF (2009).

To assess the effects of domestic versus foreign saving, the specification is subsequently modified by decomposing the contribution of each of them as follows:

$$RGNDY_i^{Post} = \alpha_0 + \beta' ws_i^D + \gamma ws_i^F + \theta' X_i + \Omega' Z_i + \varepsilon_i \quad (13)$$

where  $ws_i^D$  and  $ws_i^F$  denote windfall saving allocated to domestic investment and foreign assets, respectively. It is important to note that these variables are not expressed as shares of the windfall but rather as total savings in percent of GDP. In this way, the coefficients  $\beta$  and  $\gamma$  can be interpreted as the returns of an increase in savings of 1 percent of GDP.

These models are estimated using OLS over a cross section of 216 episodes. The sample excludes the recent episodes with less than 5 years of post-boom data. Furthermore, the sample is restricted by data limitations on some of the controls, thus resulting in samples of around 150-160 episodes per regression.

Results reveal that, as expected, higher windfall savings (during the boom) increase post-boom real income (Table 5, column 1). We observe that an increase in windfall saving of 1 percent of GDP yields, all else equal, a 0.12 percent higher real income five years after the boom. These results are economically as well as statistically significant (at the 1 percent level).

Very importantly, the composition of the windfall saving appears to have a mayor role. Results in column 2 show a substantially higher *return* from allocating the windfall saving to foreign assets than to domestic investment, despite the fact that the sample is mostly composed of developing economies (where the return on capital is expected to be larger). Furthermore, the estimated coefficient for domestic savings—i.e., the return of domestic investment—is not statistically significant from zero. While somewhat surprising at first, this result is consistent with previous findings in the literature that show that abundance (in this case arising from terms-of-trade booms) often lead to misallocation of resources, as well as a weakening of underlying current account positions that end up being a drag on growth as terms-of-trade booms revert.

We also explore whether effects are different in Latin America (columns 3 and 4). The results suggest that, on average, the return of boom savings may have been negative in past episodes in Latin America. However, the decomposition between domestic and foreign savings suggests that the problem of low returns lies in the type of saving, with (boom time) domestic savings delivering very low (negative marginal) returns, while foreign savings still positive returns.<sup>19</sup> Furthermore, we find that the reduction in the rate of return is

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<sup>19</sup> Observe also that after allowing for a Latin America-specific effect, the returns to foreign and domestic saving do not differ much for other economies (being about the same order of magnitude). This suggests that the overall result of lower return on domestic capital, vis-à-vis foreign capital, is driven by the experience of Latin America in past episodes.

economically large and statistically significant for domestic investment, whereas it is close to zero and not statistically significant for foreign saving for Latin American countries. As an additional robustness check, we use *average* real income—over the 5 years after the boom—as dependent variable. Columns 5–8 report these results, showing no substantial differences. In the current context, these results suggest that the deteriorating external current account balances in Latin America could be a source of concern worth monitoring, particularly going forward.

## V. CONCLUDING REMARKS

We propose two simple metrics of the (exogenous component of) income windfall and the associated savings that allow us to compare terms-of-trade episodes across regions and time on a consistent manner (for 180 countries during 1970–2012).

Focusing on Latin America, our analysis provides some interesting insights. While Latin America’s recent terms-of-trade boom is of similar magnitude to those of the 1970s, the associated income windfall has been much larger, reflecting higher trade openness and longer duration of the recent shock.

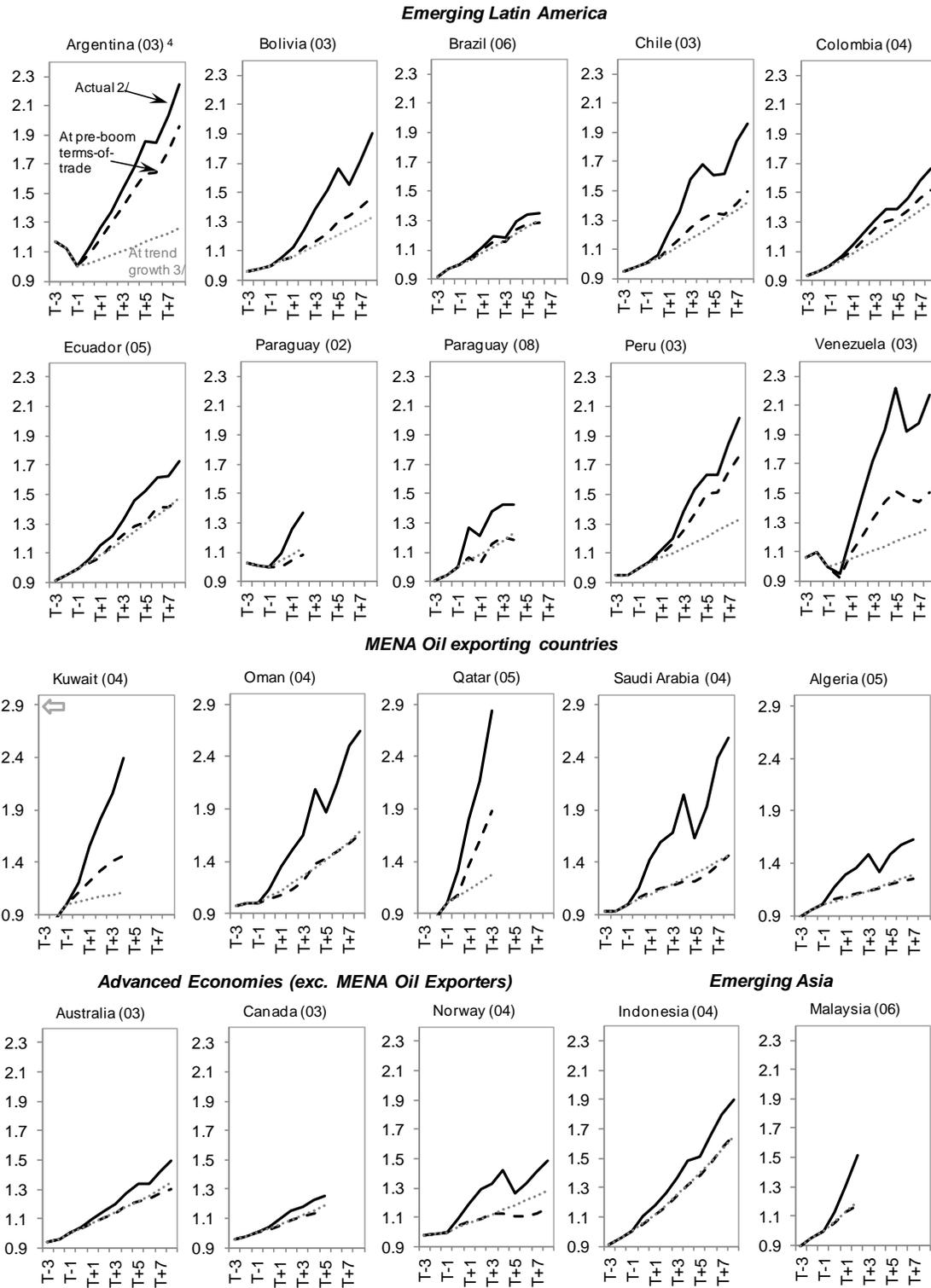
Sizable increases in aggregate saving rates in the last episodes, as opposed to the past, suggest a more prudent response this time around. However, estimates of the marginal saving rate (i.e., windfall saving) do not point to a visibly stronger effort compared to the past, thus implying that the observed improvements in fundamentals are mostly driven by the sheer size of the income windfall. Yet, Latin America’s public sectors seem to have been more prudent than the private sector during the recent event.

Finally, while larger savings pay off by increasing post-boom income, we find evidence that, at least in past booms, its allocation mattered enormously, as foreign savings delivered higher post-boom income than domestic savings. The latter is particularly relevant at this juncture in Latin America, as it points to the possible adverse effects of weakening external current account balances—even if driven by higher domestic investment. As a consequence, it underscores the need to monitor closely external sector developments in the region.

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**Figure A1. Selected Economies-Recent Episodes. Real Domestic Income 1/**  
(Index T-1=1)



Source: Authors' estimates.  
 1/ First year of the episode is reported in parenthesis.  
 2/ Real gross domestic income, as defined in Section II.A.  
 3/ Projected at 'long-term' GDP growth rate (average of 1970-2012).  
 4/ Based on official data.

Table A1. Identified Episodes of Terms-of-Trade Booms 1/

Country	Episode					Terms-of-trade shock (upswing) 2/		Country	Episode					Terms-of-trade shock (upswing) 2/	
	Start	Peak	End	Length (years)		Cum. (%)	Annual Avg. (%)		Start	Peak	End	Length (years)		Cum. (%)	Annual Avg. (%)
				Up-swing	Cycle							Up-swing	Cycle		
Germany	1986	1987	1989	2	4	16.6	8.3	Peru	1979	1984	1989	6	11	197.5	32.9
Italy	1986	1991	1994	6	9	23.2	3.9	Peru	1990	1990	1992	1	3	31.4	31.4
Norway	1999	2000	2003	2	5	42.4	21.2	Peru	1994	1995	1998	2	5	20.2	10.1
Norway	2004	2012	2012	9	9	62.7	7.0	Peru	2003	2012	2012	10	10	61.9	6.2
Canada	2003	2008	2008	6	6	23.9	4.0	Uruguay	1971	1973	1973	3	3	68.9	23.0
Japan	1986	1988	1990	3	5	28.8	9.6	Uruguay	1986	1988	1989	3	4	33.2	11.1
Japan	1991	1994	1996	4	6	24.7	6.2	Venezuela, Republica Bolivariana de	1989	1990	1990	2	2	28.3	14.1
Greece	1982	1983	1983	2	2	22.5	11.2	Venezuela, Republica Bolivariana de	1995	1996	1996	2	2	19.5	9.8
Greece	1986	1991	1991	6	6	33.7	5.6	Venezuela, Republica Bolivariana de	1999	2000	2000	2	2	90.4	45.2
Greece	1998	2003	2010	6	13	60.5	10.1	Venezuela, Republica Bolivariana de	2003	2012	2012	10	10	233.3	23.3
Iceland	1970	1973	1974	4	5	28.8	7.2	Bahamas, The	1982	1986	1989	5	8	22.1	4.4
Iceland	1976	1978	1978	3	3	15.1	5.0	Bahamas, The	1991	1993	1994	3	4	16.6	5.5
Portugal	1985	1995	2005	11	21	39.0	3.5	Barbados	1981	1991	1991	11	11	56.4	5.1
Spain	1985	1992	2004	8	20	56.4	7.1	Jamaica	1978	1979	1980	2	3	26.8	13.4
Turkey	1985	1988	1989	4	5	21.4	5.3	Trinidad and Tobago	1973	1975	1978	3	6	73.6	24.5
Australia	1972	1973	1974	2	3	28.2	14.1	Trinidad and Tobago	1979	1981	1981	3	3	58.6	19.5
Australia	2003	2011	2012	9	10	92.7	10.3	Trinidad and Tobago	1999	2001	2012	3	14	33.0	11.0
New Zealand	1971	1974	1974	4	4	42.5	10.6	Iran, Islamic Republic of	1973	1974	1978	2	6	220.3	110.2
New Zealand	1977	1979	1979	3	3	37.3	12.4	Iran, Islamic Republic of	1979	1981	1981	3	3	133.2	44.4
New Zealand	1987	1989	1990	3	4	15.5	5.2	Iran, Islamic Republic of	1995	1996	1997	2	3	54.0	27.0
South Africa	1980	1980	1983	1	4	208.4	208.4	Iran, Islamic Republic of	1999	2000	2004	2	6	93.7	46.8
South Africa	1984	1987	1988	4	5	15.3	3.8	Iran, Islamic Republic of	2005	2012	2012	8	8	82.7	10.3
South Africa	2003	2011	2012	9	10	34.5	3.8	Jordan	1976	1979	1979	4	4	15.6	3.9
Argentina	1971	1973	1974	3	4	23.7	7.9	Jordan	1985	1988	1988	4	4	99.1	24.8
Argentina	1990	1997	1998	8	9	31.4	3.9	Kuwait	1973	1974	1978	2	6	257.7	128.9
Argentina	2003	2011	2012	9	10	85.1	9.5	Kuwait	1979	1981	1985	3	7	109.3	36.4
Bolivia	1973	1974	1974	2	2	82.3	41.2	Kuwait	1989	1991	1991	3	3	328.8	109.6
Bolivia	1979	1980	1980	2	2	49.7	24.9	Kuwait	1994	1996	1997	3	4	32.5	10.8
Bolivia	1984	1985	1985	2	2	36.8	18.4	Kuwait	1999	2000	2003	2	5	79.0	39.5
Bolivia	2003	2012	2012	10	10	131.1	13.1	Kuwait	2004	2008	2008	5	5	118.7	23.7
Brazil	2006	2011	2012	6	7	37.2	6.2	Lebanon	1971	1973	1973	3	3	33.7	11.2
Chile	1979	1979	1980	1	2	18.6	18.6	Lebanon	1983	1985	1985	3	3	18.3	6.1
Chile	1987	1989	1991	3	5	18.0	6.0	Lebanon	1993	1994	2008	2	16	416.2	208.1
Chile	1994	1995	1995	2	2	29.8	14.9	Lebanon	2009	2009	2010	1	2	19.0	19.0
Chile	2003	2011	2012	9	10	90.2	10.0	Oman	1974	1975	1978	2	5	170.5	85.3
Colombia	1976	1977	1977	2	2	52.8	26.4	Oman	1979	1981	1985	3	7	132.5	44.2
Colombia	1981	1986	1986	6	6	32.3	5.4	Oman	1989	1991	1993	3	5	67.3	22.4
Colombia	1995	2000	2003	6	9	43.1	7.2	Oman	1999	2000	2003	2	5	83.4	41.7
Colombia	2004	2012	2012	9	9	68.7	7.6	Oman	2004	2012	2012	9	9	94.5	10.5
Costa Rica	1975	1977	1977	3	3	33.4	11.1	Qatar	1973	1974	1978	2	6	254.9	127.5
Costa Rica	1984	1986	1986	3	3	36.0	12.0	Qatar	1979	1981	1982	3	4	127.0	42.3
Costa Rica	2009	2012	2012	4	4	16.0	4.0	Qatar	1996	1997	1997	2	2	28.0	14.0
Dominican Republic	1974	1975	1975	2	2	57.6	28.8	Qatar	2000	2000	2004	1	5	43.0	43.0
Dominican Republic	1980	1983	1983	4	4	29.9	7.5	Qatar	2005	2008	2008	4	4	87.3	21.8
Dominican Republic	1994	1995	2007	2	14	40.1	20.1	Saudi Arabia	1973	1976	1978	4	6	196.5	49.1
Ecuador	1973	1974	1976	2	4	71.1	35.6	Saudi Arabia	1979	1981	1982	3	4	72.2	24.1
Ecuador	1977	1980	1985	4	9	107.7	26.9	Saudi Arabia	1989	1990	1990	2	2	42.7	21.4
Ecuador	2002	2011	2012	10	11	74.9	7.5	Saudi Arabia	1996	1997	1997	2	2	29.1	14.6
El Salvador	1976	1980	1981	5	6	73.7	14.7	Saudi Arabia	1999	2000	2003	2	5	124.0	62.0
El Salvador	1990	1997	1999	8	10	38.9	4.9	Saudi Arabia	2004	2012	2012	9	9	151.4	16.8
Guatemala	1976	1977	1978	2	3	69.2	34.6	Syrian Arab Republic	1985	1990	2006	6	22	199.7	33.3
Guatemala	1983	1986	1986	4	4	26.5	6.6	Yemen, Republic of	1999	2000	2003	2	5	41.6	20.8
Guatemala	1993	1997	1998	5	6	40.0	8.0	Yemen, Republic of	2004	2011	2012	8	9	62.0	7.7
Honduras	1976	1977	1992	2	17	70.2	35.1	Bangladesh	1976	1979	1980	4	5	63.4	15.8
Honduras	1994	1995	2002	2	9	34.8	17.4	Bangladesh	1984	1985	1985	2	2	20.4	10.2
Mexico	1976	1980	1982	5	7	78.4	15.7	Bangladesh	1988	1992	1999	5	12	23.9	4.8
Mexico	1995	1996	1997	2	3	36.8	18.4	Brunei Darussalam	1990	1991	1991	2	2	15.0	7.5
Nicaragua	1976	1977	1978	2	3	60.1	30.1	Brunei Darussalam	1999	2000	2002	2	4	48.7	24.3
Nicaragua	1983	1984	1984	2	2	23.5	11.7	Brunei Darussalam	2003	2012	2012	10	10	162.1	16.2
Nicaragua	1987	1988	1989	2	3	19.0	9.5	Myanmar	2001	2011	2012	11	12	163.9	14.9
Nicaragua	1993	1995	1998	3	6	40.2	13.4	Cambodia	1996	1999	2005	4	10	91.0	22.7
Panama	1980	1981	1985	2	6	33.6	16.8	Sri Lanka	1976	1977	1981	2	6	135.3	67.7
Panama	1986	1988	1989	3	4	31.0	10.3	Sri Lanka	1983	1984	1984	2	2	53.2	26.6
Panama	1996	2004	2008	9	13	43.3	4.8	Sri Lanka	1992	1993	1996	2	5	17.3	8.6
Panama	2009	2010	2012	2	4	23.8	11.9	Sri Lanka	1997	1998	1998	2	2	22.1	11.1
Paraguay	1988	1990	1990	3	3	26.0	8.7	Sri Lanka	2001	2003	2004	3	4	22.7	7.6
Paraguay	2002	2004	2004	3	3	89.2	29.7	Sri Lanka	2009	2010	2010	2	2	32.4	16.2
Paraguay	2008	2008	2012	1	5	37.1	37.1	Indonesia	1974	1975	1977	2	4	48.4	24.2
Peru	1973	1974	1974	2	2	29.5	14.8	Indonesia	1978	1982	1985	5	8	107.6	21.5

Source: IMF, *International Financial Statistics* and authors' calculations.

1/ Based on threshold of 15 percent cumulative (start-to-peak) and 3 percent annual average.

2/ Of goods and services.

Table A1. Identified Episodes of Terms-of-Trade Booms (continued) 1/

Country	Episode					Terms-of-trade shock (upswing) 2/		Country	Episode					Terms-of-trade shock (upswing) 2/	
	Start	Peak	End	Length (years)		Cum. (%)	Annual Avg. (%)		Start	Peak	End	Length (years)		Cum. (%)	Annual Avg. (%)
				Up-swing	Cycle							Up-swing	Cycle		
Indonesia	2004	2012	2012	9	9	46.2	5.1	Mauritius	1984	1985	1990	2	7	29.4	14.7
Korea, Republic of	1976	1978	1979	3	4	22.9	7.6	Mauritius	1991	1993	1999	3	9	34.4	11.5
Korea, Republic of	1986	1989	1995	4	10	20.9	5.2	Morocco	1974	1975	1975	2	2	32.2	16.1
Lao, P.D.R.	1976	1979	1979	4	4	37.6	9.4	Mozambique	1983	1987	1988	5	6	124.1	24.8
Lao, P.D.R.	2001	2007	2012	7	12	131.2	18.7	Mozambique	2004	2006	2009	3	6	27.8	9.3
Malaysia	1976	1979	1980	4	5	28.5	7.1	Mozambique	2010	2012	2012	3	3	55.3	18.4
Malaysia	2006	2008	2008	3	3	23.8	7.9	Niger	1972	1977	1980	6	9	108.3	18.0
Pakistan	1972	1973	1973	2	2	29.6	14.8	Niger	1982	1983	1983	2	2	37.0	18.5
Pakistan	1976	1979	1979	4	4	42.6	10.6	Niger	2007	2012	2012	6	6	55.1	9.2
Pakistan	1994	1996	1996	3	3	16.4	5.5	Nigeria	1974	1974	1978	1	5	192.5	192.5
Pakistan	2009	2011	2011	3	3	24.9	8.3	Nigeria	1979	1979	1983	1	5	96.2	96.2
Philippines	1978	1979	1979	2	2	16.1	8.0	Nigeria	1984	1984	1985	1	2	32.6	32.6
Philippines	1985	1991	1993	7	9	26.8	3.8	Nigeria	1989	1990	1990	2	2	53.1	26.5
Vietnam	1989	1989	1990	1	2	211.0	211.0	Nigeria	1996	2000	2003	5	8	53.6	10.7
Algeria	1974	1977	1979	4	6	154.2	38.6	Nigeria	2004	2012	2012	9	9	57.3	6.4
Algeria	1980	1982	1985	3	6	55.7	18.6	Rwanda	1997	1997	2002	1	6	77.5	77.5
Algeria	1989	1990	1991	2	3	30.3	15.2	Rwanda	2007	2009	2009	3	3	30.1	10.0
Algeria	1996	1997	1997	2	2	25.1	12.5	Senegal	1984	1985	1987	2	4	31.8	15.9
Algeria	2000	2001	2004	2	5	71.1	35.6	Senegal	2008	2012	2012	5	5	22.3	4.5
Algeria	2005	2012	2012	8	8	48.7	6.1	Namibia	1996	2002	2012	7	17	76.8	11.0
Angola	1999	2000	2001	2	3	135.3	67.6	Sudan	1986	1988	1989	3	4	47.7	15.9
Angola	2004	2012	2012	9	9	143.3	15.9	Sudan	2004	2012	2012	9	9	223.1	24.8
Botswana	1976	1979	1979	4	4	25.4	6.3	Swaziland	1971	1975	1975	5	5	123.9	24.8
Botswana	1983	1989	1991	7	9	213.0	30.4	Swaziland	1980	1981	1985	2	6	18.5	9.2
Cameroon	1973	1974	1974	2	2	45.7	22.8	Tanzania	1986	1988	1991	3	6	49.5	16.5
Cameroon	1977	1979	1981	3	5	22.3	7.4	Tanzania	1998	1999	2000	2	3	72.2	36.1
Cameroon	1982	1982	1982	1	1	53.0	53.0	Tanzania	2006	2011	2012	6	7	23.9	4.0
Cameroon	2005	2006	2008	2	4	34.6	17.3	Togo	1974	1974	1975	1	2	81.3	81.3
Chad	1976	1980	1981	5	6	119.0	23.8	Togo	1980	1980	1981	1	2	47.3	47.3
Chad	1993	1994	1994	2	2	65.3	32.6	Tunisia	1973	1974	1975	2	3	47.8	23.9
Chad	2005	2012	2012	8	8	166.8	20.8	Tunisia	1979	1983	1985	5	7	43.9	8.8
Congo, Republic of	1980	1980	1982	1	3	99.1	99.1	Uganda	1972	1977	1977	6	6	429.9	71.6
Congo, Republic of	1990	1990	1992	1	3	86.1	86.1	Uganda	1984	1985	1985	2	2	91.9	46.0
Congo, Republic of	1996	1997	1997	2	2	39.2	19.6	Uganda	1995	1996	1999	2	5	49.1	24.5
Congo, Republic of	2000	2011	2012	12	13	182.2	15.2	Uganda	2008	2012	2012	5	5	59.4	11.9
Congo, Democratic Ri	1999	2000	2000	2	2	31.4	15.7	Zambia	2004	2011	2012	8	9	138.3	17.3
Congo, Democratic Ri	2003	2007	2011	5	9	209.3	41.9	Papua New Guinea	1993	1996	1997	4	5	38.1	9.5
Benin	1987	1990	1992	4	6	127.5	31.9	Papua New Guinea	2004	2012	2012	9	9	188.5	20.9
Benin	2006	2011	2012	6	7	304.3	50.7	Belarus	2005	2012	2012	8	8	41.0	5.1
Ethiopia	1973	1977	1978	5	6	44.3	8.9	Albania	1983	1987	1987	5	5	50.2	10.0
Ethiopia	1980	1985	1985	6	6	223.1	37.2	Albania	1993	1999	2007	7	15	218.8	31.3
Ethiopia	2009	2012	2012	4	4	99.1	24.8	Georgia	1997	1999	1999	3	3	15.5	5.2
Gabon	1973	1975	1979	3	7	46.7	15.6	Georgia	2004	2010	2012	7	9	31.0	4.4
Gabon	1980	1980	1981	1	2	60.4	60.4	Kazakhstan	1999	2012	2012	14	14	55.0	3.9
Gabon	1985	1991	1993	7	9	51.5	7.4	Kyrgyz Republic	1999	2007	2012	9	14	40.0	4.4
Gabon	1999	2000	2001	2	3	59.1	29.5	Bulgaria	1988	1989	1989	2	2	86.5	43.2
Gabon	2005	2008	2008	4	4	60.3	15.1	Bulgaria	1992	1995	1996	4	5	60.1	15.0
Ghana	1977	1978	1980	2	4	39.3	19.6	Moldova	1993	1998	2002	6	10	33.3	5.6
Ghana	1981	1984	1986	4	6	199.5	49.9	Russian Federation	1994	1997	1997	4	4	30.4	7.6
Ghana	2000	2002	2002	3	3	24.9	8.3	Russian Federation	2000	2001	2003	2	4	23.2	11.6
Cote d'Ivoire	1976	1977	1980	2	5	68.4	34.2	Russian Federation	2004	2012	2012	9	9	88.5	9.8
Cote d'Ivoire	1984	1985	1986	2	3	41.0	20.5	China, P.R.: Mainland	1972	1973	1973	2	2	22.9	11.5
Cote d'Ivoire	1993	1995	1999	3	7	67.6	22.5	China, P.R.: Mainland	1990	1995	1997	6	8	23.9	4.0
Cote d'Ivoire	2006	2010	2011	5	6	32.0	6.4	Ukraine	2003	2008	2008	6	6	50.7	8.5
Kenya	1976	1977	1977	2	2	32.3	16.2	Serbia, Republic of	2001	2002	2004	2	4	36.7	18.4
Kenya	2009	2010	2011	2	3	24.1	12.1	Serbia, Republic of	2006	2009	2009	4	4	15.2	3.8
Libya	2004	2012	2012	9	9	167.3	18.6	Montenegro, Republic of	2007	2010	2012	4	6	23.1	5.8
Madagascar	1974	1977	1977	4	4	35.2	8.8	Hungary	1995	1998	2007	4	13	15.1	3.8
Madagascar	1981	1986	1989	6	9	77.5	12.9	Macedonia, FYR	2005	2007	2008	3	4	15.6	5.2
Madagascar	2007	2008	2008	2	2	97.8	48.9	Poland	1989	1991	1993	3	5	57.4	19.1
Malawi	1989	1990	1991	2	3	24.7	12.4	Romania	1988	1989	2002	2	15	29.4	14.7
Malawi	1995	1997	1997	3	3	27.1	9.0	Romania	2003	2012	2012	10	10	36.6	3.7
Malawi	2009	2011	2011	3	3	37.2	12.4								
Mali	1983	1985	1987	3	5	20.7	6.9								
Mali	2001	2002	2002	2	2	59.0	29.5								
Mauritania	1984	1984	1986	1	3	26.9	26.9								
Mauritania	1994	1998	1998	5	5	59.9	12.0								
Mauritania	2006	2006	2008	1	3	84.5	84.5								
Mauritania	2009	2010	2012	2	4	64.4	32.2								
Mauritius	1974	1975	1975	2	2	70.9	35.4								

Source: IMF *International Financial Statistics* and authors' calculations.

1/ Based on threshold of 15 percent cumulative (start-to-peak) and 3 percent annual average.

2/ Of goods and services.

**Table A2. Subgroups of countries (with identified terms-of-trade booms) 1/****Latin America 11**

Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela.

**Pier Emerging Asia**

China (P.R. Mainland), Indonesia, Malaysia, Philippines, Sri Lanka.

**Pier Emerging Europe**

Bulgaria, Russia Federation, Ukraine, Republic of Serbia, Republic of Montenegro, Hungary, FYR Macedonia, Poland, Romania, Turkey.

**Advanced Economies**

Australia, Canada, Germany, Greece, Iceland, Italy, Japan, New Zealand, Norway, Portugal, Republic of Korea, Spain.

**MENA Oil Exporters**

Algeria, Islamic Republic of Iran, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Republic of Yemen.

1/ Booms identified on the basis of increase in terms of trade of at least 15 percent cumulative (start to peak), and 3 percent annual average.

**Table A3. Key Statistics of Income Windfall-Price Effect and Saving Rates (medians) 1/**

Country Group	Number of Episodes	Episode Length (years)		Terms-of-Trade Shock 4/		Income Windfall (IW) 5/		Saving Rates								
		Up-swing 2/	Cycle 3/	Cum. (%)	Annual Avg. (%)	Cum.	Avg	Pre-boom			Boom (Upswing)			Marginal (percent of IW) 7/		
								Total	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign
<b>All</b>	<b>270</b>	<b>3</b>	<b>5</b>	<b>46.4</b>	<b>14.8</b>	<b>25.6</b>	<b>8.4</b>	<b>18.4</b>	<b>22.7</b>	<b>-3.8</b>	<b>21.1</b>	<b>22.0</b>	<b>-1.8</b>	<b>46.7</b>	<b>22.5</b>	<b>24.2</b>
Current	62	6	7	59.9	10.2	59.9	11.6	19.3	22.1	-3.0	21.1	22.8	-1.3	49.4	31.6	17.7
Past	208	3	4	42.9	15.8	19.2	8.0	18.3	23.2	-4.2	21.1	21.5	-1.9	44.2	18.1	26.1
<b>Advanced Economies</b>	<b>46</b>	<b>3</b>	<b>5</b>	<b>42.9</b>	<b>11.8</b>	<b>35.1</b>	<b>8.8</b>	<b>22.4</b>	<b>23.3</b>	<b>-1.5</b>	<b>27.2</b>	<b>22.6</b>	<b>2.7</b>	<b>65.1</b>	<b>10.1</b>	<b>55.0</b>
Current	7	9	9	92.7	10.5	166.5	35.2	25.9	19.5	8.2	38.3	23.0	14.0	67.4	46.7	20.7
Past	39	3	5	42.4	12.4	29.1	8.4	21.5	23.8	-3.0	25.8	22.5	1.2	55.8	-0.1	55.9
<b>Emerging Economies</b>	<b>159</b>	<b>3</b>	<b>5</b>	<b>41.0</b>	<b>13.4</b>	<b>23.8</b>	<b>8.8</b>	<b>18.9</b>	<b>23.2</b>	<b>-3.6</b>	<b>21.9</b>	<b>22.6</b>	<b>-1.3</b>	<b>52.0</b>	<b>28.8</b>	<b>23.3</b>
Current	36	8	8	47.5	8.1	87.2	11.6	19.5	22.2	-1.2	21.7	22.2	-0.8	49.7	30.1	19.6
Past	123	3	4	40.2	15.0	18.6	8.0	18.9	24.1	-4.0	22.1	23.0	-2.0	52.8	26.5	26.3
LA	60	3	4	38.9	13.3	18.3	6.0	17.0	20.2	-3.6	19.8	21.8	-2.4	49.5	29.6	20.0
Current	12	9	10	71.8	8.6	87.2	10.8	17.2	17.6	-1.2	20.6	22.0	-0.3	45.2	41.2	4.0
Past	48	3	4	36.4	14.8	16.5	5.4	16.9	22.3	-4.8	19.5	21.7	-3.1	53.6	29.6	24.0
Asia	17	3	5	28.5	9.5	19.2	7.7	22.8	26.0	-3.5	23.5	25.8	-0.8	50.5	3.7	46.8
Current	4	6	6	39.3	12.1	72.2	13.7	26.5	23.1	3.4	27.0	24.2	-0.3	51.3	12.9	38.3
Past	13	2	5	26.8	9.5	18.7	6.2	22.0	26.8	-4.4	22.7	26.0	-0.8	46.2	-6.6	52.8
Europe	19	4	5	36.6	8.5	16.7	7.4	20.5	22.5	-3.0	22.7	24.5	-2.1	30.5	51.3	-20.8
Current	7	6	6	36.6	5.2	55.8	5.6	20.2	20.9	-3.4	22.5	26.0	-7.4	40.9	73.6	-32.7
Past	12	4	5	35.0	13.2	15.8	7.7	20.5	25.9	-2.3	22.7	23.8	-1.0	22.0	47.3	-25.4
Other EMs	63	3	5	53.0	16.1	36.7	11.8	20.6	24.2	-3.9	24.4	23.7	-0.3	58.1	20.8	37.3
Current	13	8	8	48.7	10.3	102.9	13.5	19.6	26.6	-3.4	23.5	22.2	2.4	53.8	17.0	36.8
Past	50	3	4	53.0	21.5	31.5	11.4	20.6	24.1	-4.1	24.8	23.9	-0.3	60.5	23.4	37.1
<b>LICs</b>	<b>59</b>	<b>3</b>	<b>5</b>	<b>59.0</b>	<b>18.0</b>	<b>19.3</b>	<b>6.8</b>	<b>12.0</b>	<b>19.7</b>	<b>-6.5</b>	<b>13.4</b>	<b>18.8</b>	<b>-4.8</b>	<b>22.2</b>	<b>21.6</b>	<b>0.6</b>
Current	18	5	5	60.7	14.3	35.4	9.2	15.6	22.4	-7.9	17.6	23.6	-7.0	31.4	28.3	3.0
Past	41	3	5	49.5	18.7	17.7	6.4	11.3	16.2	-5.6	12.2	16.3	-4.2	15.8	17.3	-1.5

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). Groups based on IMF World Economic Outlook country classification.

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

4/ Of goods and services, for upswing period (start to peak).

5/ In percent of income under the counterfactual (i.e., income at pre-boom terms-of-trade).

6/ Aggregate average rates (percent of GDP).

7/ Aggregate marginal rates, in percent of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).

Table A4. Key Statistics of Income Windfall-Broad Measure and Saving Rates (medians) 1/

Country Group	Number of Episodes	Episode Length (years)		Terms-of-Trade Shock 4/		Income Windfall (IW) 5/		Saving Rates								
		Up-swing 2/	Cycle 3/	Cum. (%)	Annual Avg. (%)	Cum.	Avg	Pre-boom			Boom (Upswing)			Marginal (percent of IW) 7/		
								Average 6/			Average 6/			Total	Domestic	Foreign
<b>All</b>	<b>270</b>	<b>3</b>	<b>5</b>	<b>46.4</b>	<b>14.8</b>	<b>32.4</b>	<b>10.6</b>	<b>18.4</b>	<b>22.7</b>	<b>-3.8</b>	<b>21.1</b>	<b>22.0</b>	<b>-1.8</b>	<b>43.5</b>	<b>25.4</b>	<b>18.2</b>
Current	62	6	7	59.9	10.2	87.8	17.0	19.3	22.1	-3.0	21.1	22.8	-1.3	41.7	30.7	11.0
Past	208	3	4	42.9	15.8	20.1	9.0	18.3	23.2	-4.2	21.1	21.5	-1.9	45.2	23.3	21.8
<b>Advanced Economies</b>	<b>46</b>	<b>3</b>	<b>5</b>	<b>42.9</b>	<b>11.8</b>	<b>50.2</b>	<b>14.7</b>	<b>22.4</b>	<b>23.3</b>	<b>-1.5</b>	<b>27.2</b>	<b>22.6</b>	<b>2.7</b>	<b>58.9</b>	<b>18.7</b>	<b>40.2</b>
Current	7	9	9	92.7	10.5	288.1	36.5	25.9	19.5	8.2	38.3	23.0	14.0	72.0	53.5	18.5
Past	39	3	5	42.4	12.4	46.3	14.6	21.5	23.8	-3.0	25.8	22.5	1.2	50.3	5.1	45.2
<b>Emerging Economies</b>	<b>159</b>	<b>3</b>	<b>5</b>	<b>41.0</b>	<b>13.4</b>	<b>28.3</b>	<b>9.8</b>	<b>18.9</b>	<b>23.2</b>	<b>-3.6</b>	<b>21.9</b>	<b>22.6</b>	<b>-1.3</b>	<b>47.2</b>	<b>31.4</b>	<b>15.7</b>
Current	36	8	8	47.5	8.1	105.2	17.0	19.5	22.2	-1.2	21.7	22.2	-0.8	41.7	32.3	9.4
Past	123	3	4	40.2	15.0	19.8	8.7	18.9	24.1	-4.0	22.1	23.0	-2.0	57.6	31.3	26.3
LA	60	3	4	38.9	13.3	26.3	9.8	17.0	20.2	-3.6	19.8	21.8	-2.4	42.6	34.3	8.3
Current	12	9	10	71.8	8.6	110.8	16.0	17.2	17.6	-1.2	20.6	22.0	-0.3	41.7	29.7	12.0
Past	48	3	4	36.4	14.8	19.5	8.6	16.9	22.3	-4.8	19.5	21.7	-3.1	43.4	35.7	7.7
Asia	17	3	5	28.5	9.5	18.0	8.4	22.8	26.0	-3.5	23.5	25.8	-0.8	59.8	27.9	31.9
Current	4	6	6	39.3	12.1	68.2	12.8	26.5	23.1	3.4	27.0	24.2	-0.3	57.0	13.5	43.5
Past	13	2	5	26.8	9.5	16.3	6.6	22.0	26.8	-4.4	22.7	26.0	-0.8	64.6	35.3	29.3
Europe	19	4	5	36.6	8.5	26.0	7.3	20.5	22.5	-3.0	22.7	24.5	-2.1	40.6	39.4	1.2
Current	7	6	6	36.6	5.2	214.9	21.5	20.2	20.9	-3.4	22.5	26.0	-7.4	26.0	56.0	-30.0
Past	12	4	5	35.0	13.2	10.2	3.8	20.5	25.9	-2.3	22.7	23.8	-1.0	90.5	35.3	55.2
Other EMs	63	3	5	53.0	16.1	36.0	13.6	20.6	24.2	-3.9	24.4	23.7	-0.3	60.2	23.3	36.9
Current	13	8	8	48.7	10.3	118.8	22.0	19.6	26.6	-3.4	23.5	22.2	2.4	48.4	19.9	28.5
Past	50	3	4	53.0	21.5	33.1	13.3	20.6	24.1	-4.1	24.8	23.9	-0.3	61.5	23.8	37.8
<b>LICs</b>	<b>59</b>	<b>3</b>	<b>5</b>	<b>59.0</b>	<b>18.0</b>	<b>22.8</b>	<b>9.0</b>	<b>12.0</b>	<b>19.7</b>	<b>-6.5</b>	<b>13.4</b>	<b>18.8</b>	<b>-4.8</b>	<b>24.7</b>	<b>21.7</b>	<b>3.0</b>
Current	18	5	5	60.7	14.3	63.1	14.3	15.6	22.4	-7.9	17.6	23.6	-7.0	30.7	26.9	3.8
Past	41	3	5	49.5	18.7	10.8	5.8	11.3	16.2	-5.6	12.2	16.3	-4.2	18.5	20.6	-2.1

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). Groups based on IMF World Economic Outlook country classification.

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

4/ Of goods and services, for upswing period (start to peak).

5/ In percent of income under the counterfactual (i.e. income at pre-boom terms-of-trade).

6/ Aggregate average rates (percent of GDP).

7/ Aggregate marginal rates, in percent of broad measure of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).

Table A5. Key Statistics of Income Windfall-Broad Measure and Saving Rates (medians) 1/

Country Group	Number of Episodes	Episode Length (years)		Terms-of-Trade Shock 4/		Income Windfall (IW) 5/		Saving Rates								
		Up-swing 2/	Cycle 3/	Cum. (%)	Annual Avg. (%)	Cum.	Avg	Pre-boom			Boom (Upswing)			Marginal (percent of IW) 7/		
								Average 6/			Average 6/			Total	Domestic	Foreign
<b>Latin America 11</b>	<b>35</b>	<b>3</b>	<b>4</b>	<b>43.1</b>	<b>14.1</b>	<b>28.3</b>	<b>10.1</b>	<b>17.2</b>	<b>18.9</b>	<b>-2.5</b>	<b>20.7</b>	<b>21.8</b>	<b>-0.9</b>	<b>43.4</b>	<b>36.9</b>	<b>6.5</b>
Current	10	9	10	80.0	8.6	179.6	21.9	17.2	17.0	-0.1	21.4	22.0	0.7	41.7	29.7	12.0
Past	25	2	3	33.2	15.7	19.4	7.6	17.2	20.2	-3.4	19.1	21.3	-2.2	48.3	43.2	5.1
<b>EM Asia</b>	<b>16</b>	<b>2</b>	<b>4</b>	<b>27.7</b>	<b>9.8</b>	<b>16.5</b>	<b>7.3</b>	<b>22.0</b>	<b>26.8</b>	<b>-4.4</b>	<b>23.1</b>	<b>25.9</b>	<b>-0.9</b>	<b>59.8</b>	<b>35.3</b>	<b>24.4</b>
Current	3	3	3	32.4	7.9	47.1	9.9	27.1	23.2	3.9	29.5	25.8	0.7	59.1	20.9	38.2
Past	13	2	4	26.8	11.1	13.1	6.0	21.4	27.1	-5.2	21.2	26.0	-1.0	62.5	35.7	26.8
<b>EM Europe</b>	<b>15</b>	<b>4</b>	<b>5</b>	<b>30.4</b>	<b>8.5</b>	<b>26.0</b>	<b>7.3</b>	<b>19.4</b>	<b>20.9</b>	<b>-2.6</b>	<b>22.7</b>	<b>24.5</b>	<b>-0.9</b>	<b>39.6</b>	<b>46.7</b>	<b>-7.0</b>
Current	6	5	6	29.9	5.5	122.1	15.5	17.6	20.6	-3.6	19.3	25.2	-7.5	24.2	53.9	-29.8
Past	9	3	5	30.4	14.7	12.2	5.5	20.5	25.3	-2.3	23.0	23.1	-0.5	92.1	39.4	52.7
<b>MENA Oil Exporters</b>	<b>39</b>	<b>3</b>	<b>5</b>	<b>83.4</b>	<b>24.8</b>	<b>51.5</b>	<b>22.0</b>	<b>24.4</b>	<b>23.0</b>	<b>-1.3</b>	<b>33.2</b>	<b>21.3</b>	<b>6.8</b>	<b>74.5</b>	<b>7.9</b>	<b>66.5</b>
Current	7	8	8	87.3	10.5	288.1	36.5	34.3	19.6	8.2	45.1	28.4	14.2	79.0	30.7	48.3
Past	32	2	5	81.2	36.0	43.6	17.6	22.6	23.8	-2.4	31.2	21.1	4.2	72.6	4.3	68.3
<b>Advanced Ec. (exc. MENA)</b>	<b>21</b>	<b>4</b>	<b>5</b>	<b>28.8</b>	<b>7.2</b>	<b>36.5</b>	<b>8.3</b>	<b>22.4</b>	<b>25.0</b>	<b>-3.2</b>	<b>24.8</b>	<b>24.0</b>	<b>-0.2</b>	<b>41.5</b>	<b>41.2</b>	<b>0.3</b>
Current	3	9	9	62.7	7.0	58.0	6.4	22.3	20.2	2.1	24.0	23.0	1.3	61.3	78.3	-17.0
Past	18	4	5	28.5	7.4	27.4	9.0	23.0	26.4	-3.9	26.0	24.1	-0.6	34.2	33.9	0.3

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak). Groups based Annex Table A2.

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

4/ Of goods and services, for upswing period (start to peak).

5/ In percent of income under the counterfactual (i.e. income at pre-boom terms-of-trade).

6/ Aggregate average rates (percent of GDP).

7/ Aggregate marginal rates, in percent of broad measure of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).

Table A6. Emerging Latin America: Key Statistics of Income Windfall-Broad Measure and Saving Rates (medians) 1/

Country Group	Number of Episodes	Episode Length (years)		Terms-of-Trade Shock 4/		Income Windfall (IW) 5/		Saving Rates								
		Up-swing 2/	Cycle 3/	Cum. (%)	Annual Avg. (%)	Cum.	Avg.	Pre-boom			Boom (Upswing)			Marginal (percent of IW) 7/		
								Average 6/			Average 6/					
							Total	Domestic	Foreign	Total	Domestic	Foreign	Total	Domestic	Foreign	
Argentina 8/	2003	9	10	85.1	9.5	400.8	44.5	16.1	14.6	1.5	24.3	21.9	2.4	43.6	39.8	3.8
Bolivia	2003	10	10	131.1	13.1	260.8	26.1	12.0	16.2	-4.3	21.7	15.9	5.8	60.7	15.9	44.8
Brazil	2006	6	7	37.2	6.2	26.9	4.5	17.7	16.4	1.4	18.0	19.1	-1.0	25.3	80.2	-54.9
Chile	2003	9	10	90.2	10.0	229.2	25.5	22.7	23.9	-1.2	23.4	22.2	1.2	26.4	15.6	10.8
Colombia	2004	9	9	68.7	7.6	90.5	10.1	16.2	17.3	-1.2	19.9	22.3	-2.3	57.8	72.1	-14.3
Ecuador	2002	10	11	74.9	7.5	129.9	13.0	20.1	18.0	2.1	22.4	22.2	0.2	41.7	55.1	-13.4
Paraguay	2002	3	3	89.2	29.7	41.3	13.8	14.2	16.7	-2.5	17.9	16.2	1.7	45.5	12.9	32.6
Paraguay	2008	5	5	38.8	7.8	91.6	18.3	17.6	16.7	0.9	13.6	14.9	-1.3	-8.0	5.6	-13.6
Peru	2003	10	10	61.9	6.2	283.2	28.3	16.8	19.1	-2.4	21.2	22.0	-0.8	37.8	34.1	3.8
Venezuela, Republica Bolivariana	2003	10	10	233.3	23.3	528.7	52.9	29.2	24.3	4.9	33.6	24.1	9.4	41.8	25.4	16.5

Source: Authors' estimations.

1/ For episodes with at least 15 percent cumulative and 3 percent annual average terms-of-trade shock (from start to peak).

2/ From start to peak.

3/ Cycle is defined as start to end. End is identified when at least 1/3 of the shock is reverted.

4/ Of goods and services, for upswing period (start to peak).

5/ In percent of income under the counterfactual (i.e., income at pre-boom terms-of-trade).

6/ Aggregate average rates (percent of GDP).

7/ Aggregate marginal rates, in percent of broad measure of income windfall (computed on the basis of average saving and investment rates of 3 years prior to the terms-of-trade boom).

8/ Results for Argentina are based on officially reported data. The IMF has, however, issued a declaration of censure and called on Argentina to adopt remedial measures to address the quality of the official GDP data.