## BOX 4.1 How does procyclical fiscal policy affect output growth?

*Fiscal responses to commodity price shocks have differed considerably between emerging market and developing economies (EMDEs) and advanced economies. Commodity-exporting EMDEs have tended to react in a procyclical manner, increasing government expenditures when prices of exported commodities rise. Advanced-economy commodity exporters, by contrast, have tended to react countercyclically, reducing spending when prices rise. Fiscal policy procyclicality in the average EMDE commodity exporter has increased the effects of a commodity price shock on the business cycle by more than one-fifth.*

### Introduction

Procyclical fiscal policy amplifies the effect on output of a shock to economic activity—that is, "when it rains, it pours," using the analogy of Kaminsky, Reinhart, and Végh (2004). Such shocks could originate from various sources—from the financial sector or from supply or demand shocks associated with external or domestic developments. Kaminsky, Reinhart, and Végh (2004) focused on net capital inflows, finding that such flows were associated with an increase in government expenditure in emerging market and developing economies (EMDEs), while net capital outflows were associated with a decline in government expenditure. A variety of other drivers could lead to procyclical fiscal behavior.

This box examines how increases in commodity prices have affected the behavior of fiscal policy and, in turn, output growth. The total impact of the changes in commodity prices on output can be decomposed into two components. First, the "rains" component: in response to an increase in commodity prices, production rises in the commodity sector and other related sectors, and the associated increases in income generate further increases in private spending and output. The increases in output and spending, in turn, boost fiscal revenue, reducing the primary fiscal deficit. The second component depends on the response of fiscal policy. If the reduction in the fiscal deficit is conserved, fiscal policy will play a countercyclical role, dampening the increase in demand and activity. But if the reduction in the fiscal deficit leads the government to increase spending or lower taxes, fiscal policy will increase the effect of the shock on output. There will then be a "pours" component, with procyclical fiscal policy amplifying the business cycle.

This box addresses the following questions:

- How does fiscal policy in commodity-exporting countries react to changes in prices of commodity exports?
- How does the impact of this fiscal reaction on output growth differ between commodity-exporting-EMDEs and advanced economies?

### Methodology

To estimate the effect of fiscal policy on output, the analysis proceeds in four steps. First, to quantify the effects of changes in commodity prices on output, panel regressions are used to obtain the response of real GDP to changes in country-specific commodity price indexes.[a] The results show that a 10 percent increase in commodity export prices increases output by 0.63-0.85 percent in EMDE commodity exporters and 0.18-0.26 percent in advanced-economy commodity exporters (table A4.1.3).[b]

Second, panel regressions are used to estimate a fiscal policy reaction function (that is, the response of government spending to changes in commodity prices). Results show that EMDEs increase government spending when commodity export prices rise, indicating a procyclical fiscal policy (table A4.1.4). Specifically, a 10 percent increase in commodity export prices leads to an increase in government spending of about 0.6 percent to 0.8 percent. In contrast, advanced economies respond countercyclically: a 10 percent increase in commodity export prices elicits a reduction in government spending of about 0.7 percent to 1.2 percent. Third, an average fiscal multiplier is estimated for

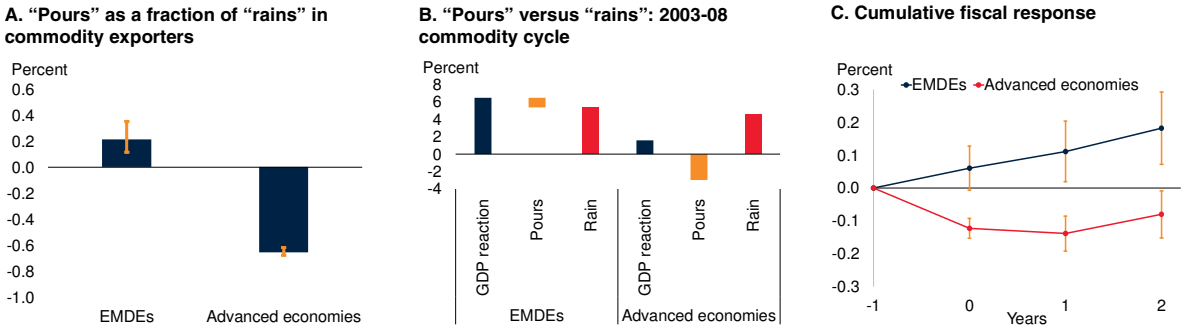
a. Two control variables are used: overall terms of trade (which include terms of trade for all traded goods and services, not just commodities, using data from the IMF) to control for trade effects, and the lagged dependent variable to capture underlying growth unrelated to commodity prices. The country-specific commodity export price index is an index that weights commodities prices by their relevance in a country's exports. This index is a better measure of a commodity price shock for a particular country than global commodity price indexes that might include goods not exported by the particular country.

b. In table A4.1.3, the coefficient for EMDEs (0.085) in column (1) is about 3.5 times as much as the coefficient for advanced economies (0.024) in column (4).

## BOX 4.1 How does procyclical fiscal policy affect output growth? (*continued*)

### FIGURE B4.1.1 The amplification effect of procyclical fiscal policy on output

*Fiscal policy in commodity-exporting EMDEs has tended to amplify the effects of commodity price shocks on output, while in advanced economies it has tended to dampen the effects. More than three-fourths of the difference in growth between major commodity-exporting EMDEs and advanced economies during the 2003–08 commodity price boom can be explained by the difference in the cyclicality of fiscal policy between the two groups of countries.*




*Sources*: Arroyo Marioli and Végh (2023); International Monetary Fund; World Bank.

*Note*: EMDEs = emerging market and developing economies.

A.B. The sample has 4 advanced economies (Australia, Canada, New Zealand, and Norway) and 11 EMDEs (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Indonesia, Russian Federation, South Africa, and Ukraine).

A. Panel shows the change in GDP (in response to a commodity price shock) explained by the reaction of fiscal policy (the "pours" component) as a share of the direct effect of the commodity price shock on output (the "rain" component). The average of these shares for commodity-exporting EMDEs and advanced economies is shown by the blue bars. Whiskers shows the minimum and maximum range.

B. The orange bars represent the fraction of the change in GDP, in response to a commodity price shock, explained by the reaction of fiscal policy to the shock, averaged at the aggregate level. The red bars show the direct effect of a commodity price shock on GDP.

C. Panel shows the cumulative reaction of fiscal expenditure to a 1 percent increase in commodity exports prices in $t$=0, using panel regressions. The regression includes two leads and lags of commodity export prices.

commodity exporters using a panel structural vector autoregression (SVAR) model. [c]

Finally, the "amplification" effect (the "pours" component) of fiscal policy on output is obtained by combining the fiscal response in the second step with the fiscal multiplier obtained from the third step. The pours component represents changes in output growth that are due solely to changes in government expenditure in response to the initial shock. The "pours component" is then formally measured by:

$$Pours = \Delta CEP * Fiscal\ reaction\ elasticity * fiscal\ multiplier * \frac{g}{y} \quad \text{(B4.1.1)}$$

where $CEP$ is the commodity export price, *fiscal reaction elasticity* is the estimated coefficient in the fiscal regression and $\frac{g}{y}$ is the ratio of government spending to GDP (computed as the average over the sample period for each country). Intuitively, changes in commodity export price ($CEP$) trigger a fiscal reaction (elasticity), which in turn affect GDP via the fiscal multiplier. The fiscal reaction is adjusted by the size of the government to measure the final impact in percentage points of GDP.[d]

c. The model is based on the Blanchard-Perotti (2002) identification method, employing quarterly data for GDP and government expenditure from the IMF's International Financial Statistics database for the period 1990-2019. In computing the "pours" component, the value of the multiplier after four quarters is used (given by 0.88).

d. The fiscal reaction elasticity is estimated using a panel of 15 commodity exporters (4 advanced economies and 11 EMDEs). The fiscal multiplier is estimated for the same panel following Blanchard and Perotti (2002). Government size is represented by the average government expenditure as a share of GDP for each country. The availability of quarterly data is critical for the Blanchard and Perotti (2002) identification method. This method assumes that output responds to government spending within the period, but that government spending does not respond to GDP. In other words, all contemporaneous correlation is attributed to fiscal policy affecting GDP. See Ilzetzki, Mendoza, and Végh (2013) for a detailed discussion.

**BOX 4.1 How does procyclical fiscal policy affect output growth? (*continued*)**

### Impact of procyclical fiscal policy on output

The results indicate that, if an increase in the price of the exported commodity boosts output by 1.0 percentage point (the "rains" effect), procyclical fiscal policy in commodity-exporting EMDEs increases GDP by another 0.21 percentage point (the "pours" effect), boosting the total change in GDP to 1.21 percent (figure B4.1.A). In contrast, fiscal policy in commodity-exporting advanced economies compensates for the cyclical effect by reacting in the opposite direction, reducing GDP by 0.65 percentage point. This leaves the net increase in GDP of 0.35 percentage point for advanced economies. These estimates suggest that, when faced with a commodity price shock of the same magnitude, the overall change in GDP can be more than three times bigger in EMDEs than in advanced economies solely because of the fiscal policy reaction.

The above approach is applied to the commodity price boom of 2003-08 to illustrate the role of fiscal policy. During this period, commodity export prices increased about 76 percent for the EMDEs and 66 percent for the advanced economies in the sample. The analysis estimates the direct effect of the commodity price shock on output (the "rain" component) by applying the 2003-08 cumulative price shock to the estimated parameters. The results indicate the effect on output to be 5.4 percent for EMDEs and 4.6 percent for advanced economies—that is, a difference of 0.8 percentage point (figure B4.1.1.B). The procyclical response of fiscal policy in EMDEs ("pours" component) added another 1.1 percentage points to growth, bringing EMDE growth to 6.5 percent over this period.

In contrast, fiscal policy in advanced economies reacted in a countercyclical fashion, subtracting about 3 percentage points from growth, bringing advanced-economy growth to 1.6 percent. In other words, of the 4.9 percentage points difference between total EMDE and advanced-economy growth in the sample, 4.1 percentage points (or 84 percent) can be explained by the responses of fiscal policy—procyclical in EMDEs and countercyclical in advanced economies. Alternative estimates also indicate that fiscal expenditure in EMDEs reacts in a procyclical manner while that in advanced economies reacts in a countercyclical one (figure B4.1.1.C).

### Conclusion

Fiscal procyclicality amplifies the effect of commodity price shocks on the business cycle in EMDEs. In the sample period examined, fiscal policy in the average EMDE commodity exporter is estimated to have increased the effect of a commodity price shock on output by more than one-fifth. The results indicate that in EMDE commodity exporters fiscal policy has tended to amplify the business cycle, whereas in advanced-economy commodity exporters fiscal policy has tended to dampen it.

cyclically adjusted targets and well-defined escape clauses, combined with strong legal and enforcement arrangements—have been associated with reduced procyclicality (Bova, Carcenac, and Guerguil 2014). The country cases examined in box 4.2 suggest that fiscal rules or SWFs are most effective in achieving their stated objectives when they are well-designed, closely linked to broader policy objectives, and supported by strong institutions and political commitment.

Armed with the insights from the correlates of fiscal procyclicality established above, the analysis uses cross-country regressions to identify the main drivers of fiscal procyclicality in commodity exporters.[10] The dependent variable here is the correlation between the annual percentage changes of real government spending and real GDP. The explanatory variables are intended to capture the four explanations for the existence of procyclical fiscal policy described in the previous section: capital account openness (measured by an index of

[10] For an empirical analysis of the drivers of fiscal procyclicality in OECD countries, see Lane (2003). For an analysis of the role of financial and institutional variables, see Calderón and Schmidt-Hebbel (2008) and Calderón, Duncan, and Schmidt-Hebbel (2010). Ilzetzki (2011) provides a novel political economy explanation based on successive governments disagreeing on the desired distribution of public spending and examines different theories of procyclicality by running numerical simulations in calibrated models.