THE COMMODITIES ROLLER COASTER: A FISCAL FRAMEWORK FOR UNCERTAIN TIMES

Exporters of nonrenewable commodities such as oil, gas, and metals are a key part of the global economy (Figure 1.1).[1] They are a mix of high-, middle-, and low-income countries that represent close to 20 percent of world GDP and global exports, and are an important destination for foreign direct investment (FDI). They hold a large share of the world's natural resources, accounting for almost 90 percent of crude oil reserves and 75 percent of copper reserves.

Natural resource wealth has enabled some of these countries to accumulate substantial assets. These assets provide a buffer in the event of shocks and allow countries to share the benefits of exhaustible natural resources with future generations. In a growing number of countries, these assets have been placed in sovereign wealth funds and invested abroad (Figure 1.2).

Natural resources would seem to be a blessing for a country. Resource wealth should make it easier to finance investment for sustainable growth while allowing the government to provide fundamental social services. However, quite a number of resource-rich countries have struggled to leverage these resources to raise economic growth and living standards, falling prey to the so-called resource curse.

When governments rely heavily on revenues derived from commodities, they are subject to the unpredictable ebb and flow of commodity prices. If not adequately managed, this volatility can result in disappointing economic performance.[2] For example, economic activity fell on average by 1 percent a year in several countries (Iran, Libya, Peru, Saudi Arabia) during the commodity price bust of the 1980s, as public spending collapsed by a third or more. Conversely, several countries (Angola, Azerbaijan, Equatorial Guinea, Kuwait, Libya) experienced strong growth during the 2000–08 commodity price boom—partly

fueled by a tripling of public spending in real terms—but in some cases did not accumulate enough buffers to protect from falling prices.

The IMF (2012a) examined these issues and developed new macroeconomic policy frameworks for resource-rich developing economies. The analysis there demonstrated that some frontloading of consumption spending to benefit presently poorer generations may be welfare improving and that some scaling up of domestic investment would normally be part of an optimal development strategy. At the same time, the analysis suggested that a high saving rate is necessary if there is to be a lasting impact on development, and that the volatility and uncertainty of resource flows also argues for liquidity buffers.
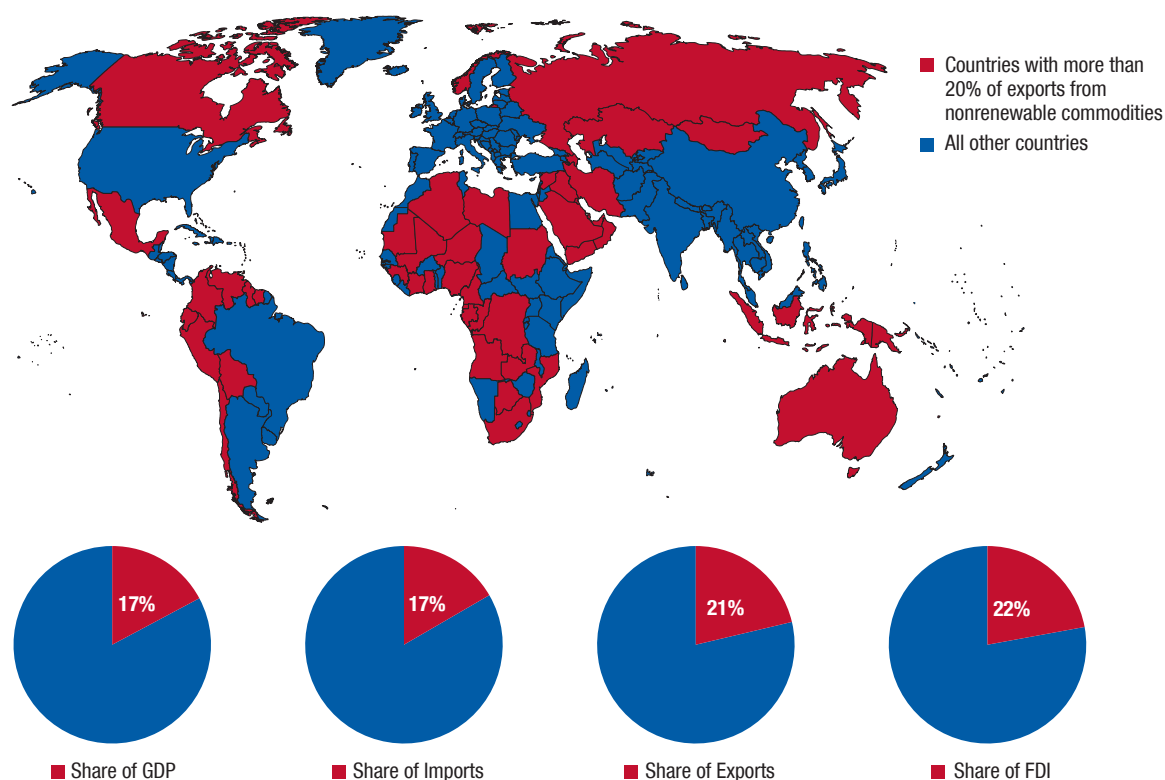
In light of the large and unexpected decline in global commodity prices since 2012, this issue of the *Fiscal Monitor* reviews the recent experience of resource-rich economies and examines their fiscal policy frameworks. In doing so, several interrelated questions arise: Did policies help shield the economy from large and unexpected commodity price movements? How did governments use the latest period of abundant resources? How can policies and fiscal institutions be improved to cope with uncertainty and better support economic growth?

The experience of the past few decades, including the latest boom, has shown that fiscal policy plays a crucial role in managing the effects of commodity price volatility on the domestic economy, but this has been a difficult challenge for many countries. In particular, public expenditure growth has tended to accelerate during price upswings and fall during price downswings, and this procyclical response has intensified the volatility in the economy and could have hampered economic growth. Moreover, although some countries accumulated significant financial buffers during the 2000–08 revenue boom, which have helped them to manage the downturn since 2009, many others will have to endure sharper fiscal contractions due to insufficient buffers.

Against this backdrop, this issue of the *Fiscal Monitor* argues that fiscal policies in commodity-exporting countries need to be sufficiently mindful of uncertainty.

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[1] The chapter looks at exporters of extractive commodities (oil, gas, and metals), where these commodities represent a significant share of exports or fiscal revenues (Annex 1.1).

[2] Other important factors that explain weak growth include real exchange rate appreciations (Sachs and Warner 2001; van der Ploeg 2011), rent seeking, and fragile political institutions (Arezki, Hamilton, and Kazimov 2011).

Figure 1.1. Nonrenewable Commodity Exporters, 2014

Countries with more than 20% of exports from nonrenewable commodities

All other countries

17%	17%	21%	22%
■ Share of GDP	■ Share of Imports	■ Share of Exports	■ Share of FDI

Sources: BP Statistical Review of World Energy, 2015; *Institutional Investor's* Sovereign Wealth Center; national authorities; Sovereign Wealth Fund Institute; and U.S. Geological Survey.
Note: FDI = foreign direct investment.

The discussion below draws heavily on extensive past IMF research, technical assistance to resource-rich countries, and policy analysis (including IMF 2012a). This past work—as well as the recent collapse in commodity prices—has underscored the need for fiscal policies to pay closer attention to the large volatility and uncertainty to which commodity exporters are particularly prone. And consistent with past IMF advice to these countries, this *Fiscal Monitor* concludes that addressing these challenges requires a comprehensive strategy:

- A longer-term anchor is needed to guide fiscal policy. Countries need to set a long-term strategy that ensures an appropriate level of savings to deal with the eventuality of depleted resources and to help stabilize the economy and promote long-term growth under high uncertainty. This calls for long-term stabilization savings to weather the large and persistent shocks.
- Sound fiscal rules, institutional frameworks, and tax policies can further support these goals, along with improvements in public investment management

and reform of fuel subsidies. Strong fiscal institutions and appropriate stabilization buffers will also increase the chances of a successful scaling up of public investment.
- Strong underlying institutions (including good governance) are essential for ensuring that countries are able to leverage their natural wealth to achieve higher long-term growth.

How Commodity Cycles Affect the Economy

Commodity prices are highly volatile and unpredictable, posing significant challenges to policymakers in resource-rich economies (Figure 1.3). Shocks to commodity prices are often large and persistent. Booms and busts can involve prices moving by as much as 40–80 percent for as long as a decade. Hence, forecasting commodity prices has proved exceptionally difficult (Cashin, Liang, and McDermott 2000), and even more so in recent years as commodity prices have been highly volatile (Arezki and others 2013).

Macroeconomic performance of commodity exporters tends to move with commodity price cycles (April 2012 *World Economic Outlook*). The direct impacts of commodity price shocks, whether positive or negative, are felt via exports and the effect that shocks to the country's terms of trade have on the rest of the economy. Typically, economic activity and external and fiscal balances deteriorate (improve) during commodity price downswings (upswings). These price fluctuations can have significant impacts on growth and investment.[3]

The principal transmission channel appears to be through the government budget, especially for oil exporters. In many commodity-exporting countries, a large share of government revenue is provided by the resource sector. As illustrated in Figure 1.4, commodity price shocks tend to cause large fluctuations in fiscal revenues and, correspondingly, very large changes in government spending. Indeed, empirical analysis of oil-exporting countries suggests that oil price shocks affect growth mostly through public expenditure.[4]

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[3] See the October 2015 *World Economic Outlook* for an analysis of economic growth in resource-rich countries over commodity price cycles.

[4] The empirical analysis draws on Husain, Tazhibayeva, and Ter-Martirosyan (2008). See also background notes http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.
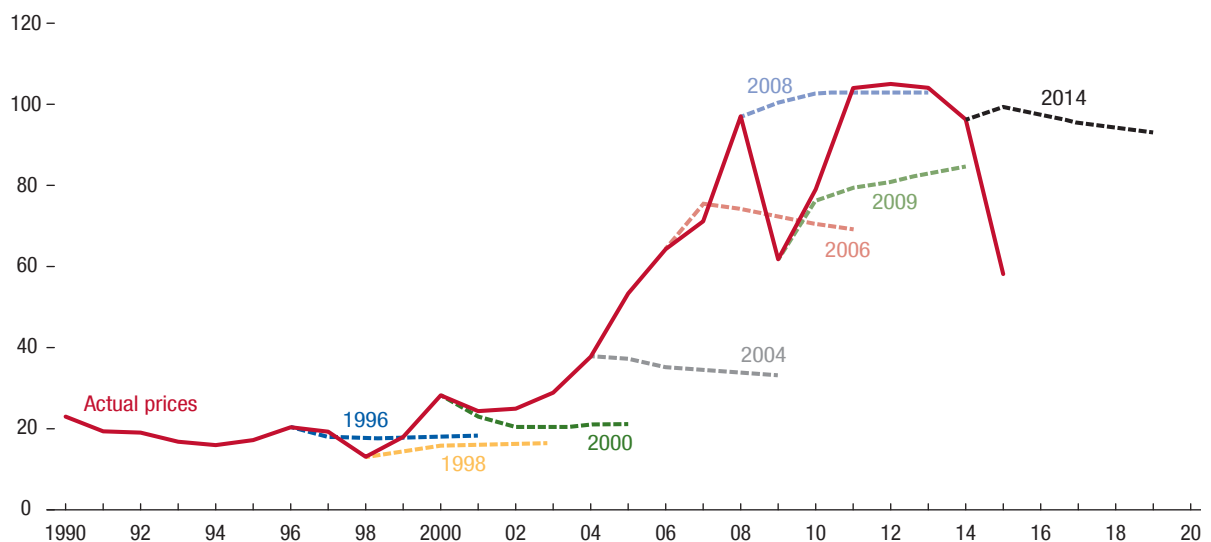
Figure 1.2. Sovereign Wealth Funds, 2014

Many commodity exporters have established sovereign wealth funds, which now hold more than $3.6 trillion.

Sources: *Institutional Investor's* Sovereign Wealth Center; national authorities; Sovereign Wealth Fund Institute; and IMF staff reports.
Note: The total amount for each country takes into account available data for all sovereign wealth funds. Saudi Arabia's Monetary Authority, although not a wealth fund, holds significant reserves at the central bank ($0.8 trillion).

Figure 1.3. A Poor Record of Forecasting Oil Prices
(Crude oil, U.S. dollars a barrel)

Sources: IMF staff estimates and market projections. 2015 represents an estimate based on actual data for part of the year and future contracts.
Note: The solid line represents actual crude oil average prices for the year. The dashed lines are based on market projections for prices (futures contracts).

Moreover, commodity price shocks appear to have had damaging effects on long-term growth. Although some countries have been able to sail successfully through the turbulence of commodity price cycles and achieve sustainable growth (including Botswana, Chile, and Norway), many have not. For example, after the boom-bust in the late 1970s, many resource-rich countries endured a long period of low or negative growth, and in some cases, per capita GDP in the late 1990s was at or below 1970 levels (Figure 1.5). Economic growth accelerated in many resource-rich countries during the 2000s, boosted by the large commodity boom, but it is expected to slow down significantly in the years ahead (October 2015 *World Economic Outlook*). Analysis of the experience of 64 resource-rich countries during commodity boom-bust periods suggests that although countries that maintained a pegged exchange rate and did not accumulate fiscal buffers grew the fastest during boom periods, they also suffered the most after the price bust (Adler and Sosa 2011).

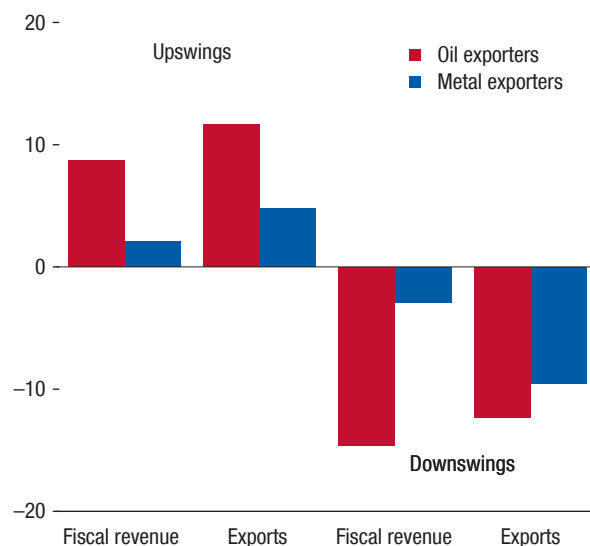## Fiscal Policy during Booms and Busts: A Difficult Balancing Act

Fiscal policymakers in resource-rich countries have often tried to meet two challenging, and at times conflicting, objectives. One is to reduce the dependence of public expenditures on unpredictable fluctuations in commodity prices, so as to avoid overheating the economy during price upswings or making large cuts in expenditures during downswings. The other is to leverage resource revenue to support long-term growth, including by scaling up public investment. This section examines how resource-rich countries have fared with respect to these two objectives.

Procyclical Fiscal Policy during Revenue Windfalls

Stabilization of economic activity is particularly challenging in resource-rich countries given the high uncertainty around commodity price shocks. As discussed in the April 2015 *Fiscal Monitor*, fiscal policies that reduce output volatility could have the added benefit of increasing long-term growth. The high volatility of fiscal revenues in resource-rich economies implies that the role of fiscal policy in achieving these objectives is even more critical, but also more difficult.

There are two approaches to gauging the success of fiscal policymakers in acting in a manner that dampens the effects of cyclical shocks. One looks at the extent to which fiscal policy is reacting to the business cycle

Figure 1.4. Impact of Commodity Price Swings on Fiscal Revenues and Exports
(Percent of GDP, average)

Source: IMF staff estimates.
Note: For upswings (downswings), the impact is estimated by multiplying fiscal revenue and exports as a share of GDP during the most recent trough (peak) by the average percentage change of commodity prices from trough to peak (peak to trough). Based on Cashin, McDermott, and Scott (2002), the following parameters are used to date commodity cycles for the period 1957–2015: minimum duration of each phase = 12 months; minimum duration of a complete cycle = 24 months.

in the nonresource sector. The other approach measures the responsiveness of the rate of growth of public expenditures to year-to-year changes in commodity prices (Céspedes and Velasco 2014). A key policy challenge is to limit the expenditure response to the year-to-year commodity prices to protect macroeconomic stability (Arezki, Hamilton, and Kazimov 2011).
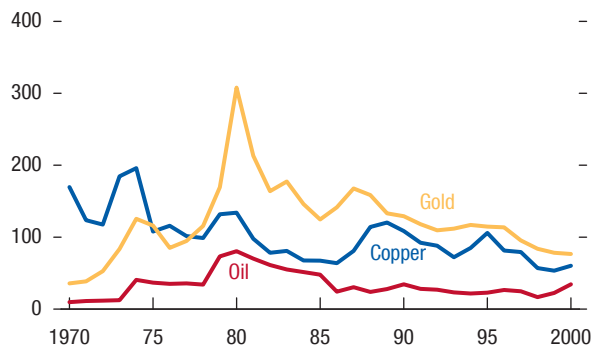
The evidence suggests that, on average, fiscal policies have not been stabilizing. In particular, government spending growth has been positively correlated with commodity prices; that is, it has been procyclical—increasing when commodity prices rise and decreasing when prices fall.[5] To some extent this is not surprising given the large shocks that have occurred to commodity prices, the uncertainty regarding their persistence, and the impact on the balance sheet of the govern-

[5] By focusing on government spending growth and commodity price changes, the analysis abstracts from positive long-run comovement in the level of both variables and focuses on their cyclical association. The results are robust to using an error-correction model that accounts for a long-term comovement between commodity prices and government spending.
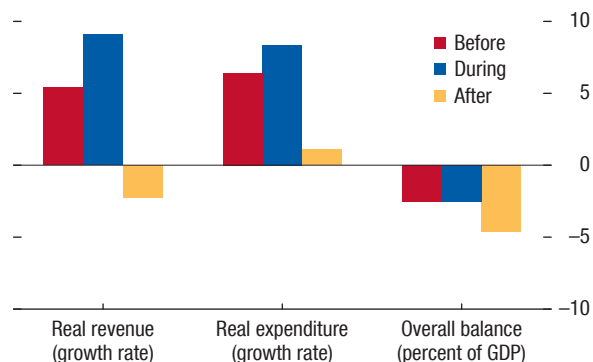
Figure 1.5. Impact of the 1970s–80s Boom-Bust on Growth

The 1970s–80s boom-bust had a long-lasting negative impact on growth for commodity-exporting countries. Oil producers and metal exporters struggled to grow after the 1970s boom.
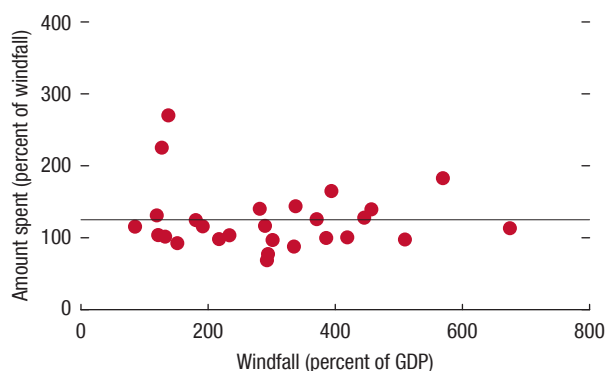
1. Commodity Prices
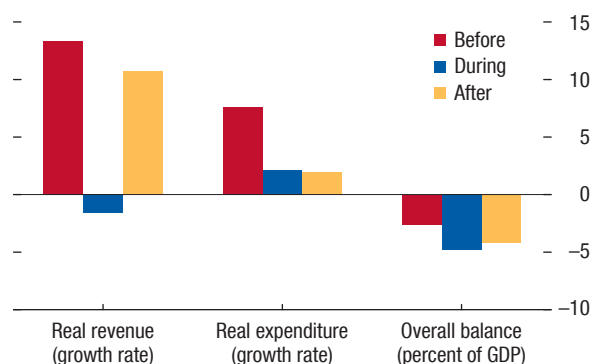   **(U.S. dollars, deflated by U.S. GDP deflator)**

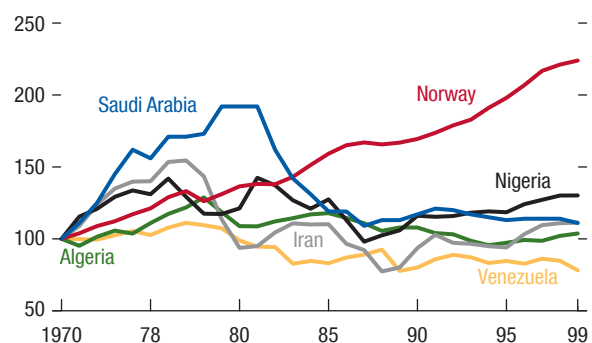**2. Before, during, and after the 1973–80 Boom**
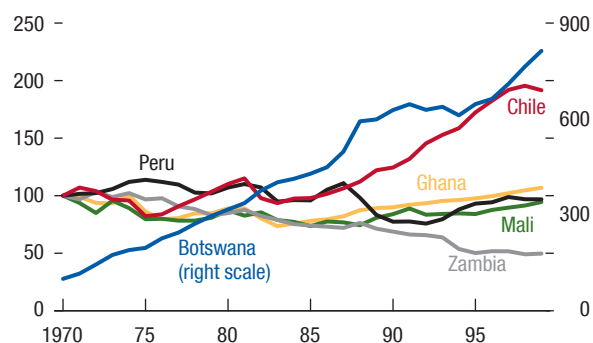   **(Percent)**

3. Windfall Spent, 1973–80 Boom

4. Before, during, and after the 1982–88 Bust
   (Percent)

5. Oil Producers: GDP, 1970–99
   (Real GDP per capita, 1970 = 100)

6. Metal Exporters: GDP, 1970–99
   (Real GDP per capita, 1970 = 100)

Source: IMF staff estimates.
Note: For panel 2, before = 1971–72, during = 1973–80, after = 1982–83; for panel 4, before = 1980–81, during = 1982–88, after = 1989–90.

ment.[6] However, a strong response of expenditures to prices implies that fiscal policy has exacerbated rather than mitigated the effect of commodity price volatility on the economy. On average, a 10 percent increase in commodity prices has led to a 1.2 percentage point increase in the growth of real expenditures (the increase is even higher for public investment) among resource-rich economies.[7] Moreover, the response of government spending has been asymmetric. Procyclicality has been significant in commodity price upturns but less so in downturns (Figure 1.6), which suggests that there has been a strong tendency for countries to spend the revenue windfalls during good times.[8] Procyclicality has tended to be higher among countries with larger commodity sectors, whereas advanced economies (Australia, Canada, Norway) have been successful in delinking expenditures from commodity prices.
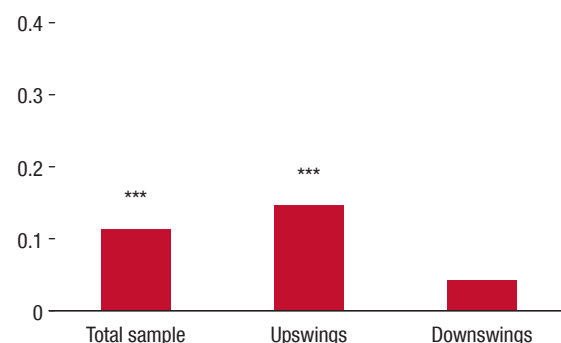
The tendency toward procyclicality is also confirmed when the relationship between the nonresource fiscal balance (NRB) and the domestic (nonresource) economy is examined (Figure 1.7). In particular, the cyclically adjusted NRB (that is, the overall fiscal balance excluding revenues from the resource sector, adjusted for the business cycle) provides a measure of the underlying fiscal position. The analysis finds that governments tended to loosen the fiscal stance when the domestic nonresource economy strengthened, and tighten the fiscal stance when the economy weakened. Specifically, a 1 percentage point improvement in the output gap of the nonresource sector (that is, the difference between actual output and output at full employment) led to a 1 percentage point deterioration of the cyclically adjusted NRB as a share of potential nonresource GDP.[9] Moreover, commodity exporters tend to be more procyclical than other emerging economies. Notably, the April 2015 *Fiscal Monitor* found that emerging market and developing economies also tend to act procyclically in expansions (albeit with a coefficient of about 0.5, half the size of the figure found here for commodity exporters).

As shown in the literature, by exacerbating output volatility, procyclical fiscal policy could dampen
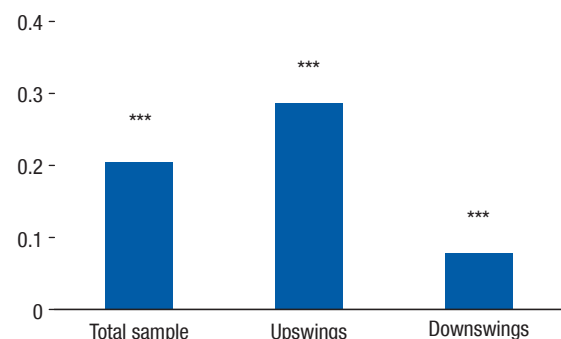
[6] A positive and persistent shock to prices will allow countries to sustain increases in public spending. Likewise, during persistent price downswings, most countries will adjust downward spending.

[7] See background notes for methodology http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.

[8] This difference is statistically significant.

[9] Given the high uncertainty with respect to measuring the output gap in resource-rich countries, we also run regressions using output growth rates as a robustness check. The results are qualitatively similar (as shown in Figure 1.7).

Figure 1.6. Public Expenditure Procyclicality across Countries
(Procyclicality coefficient)

Total government expenditure growth is positively correlated with changes in commodity prices (procyclical), with capital expenditure even more procyclical. The procyclicality of public spending increases with commodity dependence.
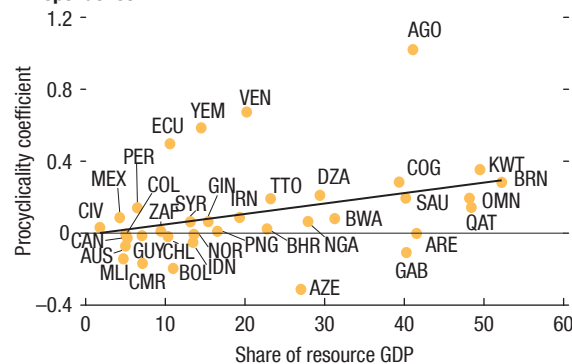
1. Procyclicality of Total Spending

2. Procyclicality of Capital Spending

3. Procyclicality of Total Spending in Relation to Commodity Dependence

Sources: United Nations; and IMF staff estimates.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes. Sample period is 1972–2014, but length varies across countries; minimum sample length is set to 10 observations for each country. Panels 1 and 2 show coefficients from panel regressions of real expenditure growth on commodity price changes. Panel 3 shows coefficients from country-specific regressions of real expenditure growth rates on commodity price changes. Positive numbers indicate procyclicality (see background notes for details http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf). Share of resource GDP is calculated using annual averages for the whole sample period.
*** $p < 0.01$.

Figure 1.7. Cyclically Adjusted Nonresource Balance and Procyclicality
(Procyclicality coefficient)

The tendency toward fiscal procyclicality is confirmed by the relationship between the cyclically adjusted nonresource fiscal balance and the output gap.

Source: IMF staff estimates.
Note: The sample period is 1990–2014. The bars show the estimated impact of a 1 percent increase in the nonresource output gap and nonresource GDP on the cyclically adjusted nonresource balance. Estimations are performed using panel time and country fixed effects, and robust error estimator.
*** $p < 0.01$.

Figure 1.8. Procyclicality and Growth

1. Procyclicality and Output Volatility

2. Procyclicality and Output Growth

Source: IMF staff estimates.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes. Countries with at least 30 real GDP per capita observations are reported. Procyclicality is measured using country-specific regressions of real expenditure growth rates on commodity price changes. Predicted real GDP per capita growth volatilit is obtained from a linear regression on procyclicality. The sample period is 1972–2014, but length varies across countries.

economic growth. The April 2015 *Fiscal Monitor* finds that an increase in fiscal stabilization (equivalent to 1 standard deviation of the sample) would boost long-run annual growth rates of developing economies by 0.1 percentage points.[10] Van der Ploeg and Poel-hekke (2008) also show that volatility hurts growth among commodity exporters, with the former partially explained by volatile government expenditures.[11] These findings suggest that the higher fiscal procyclicality in resource-rich economies could partially explain the disappointing long-term growth performance of these countries. Figure 1.8 illustrates the relationship between procyclicality and economic growth for a sample of commodity exporters.
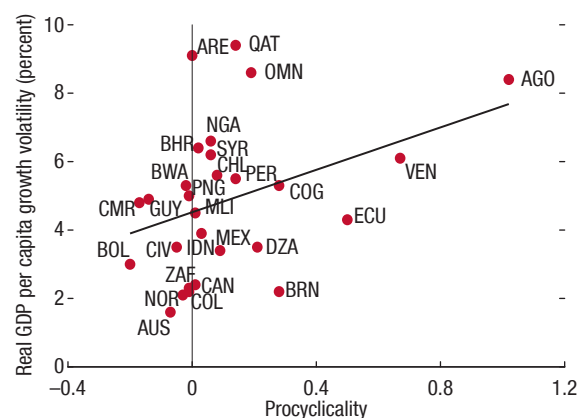
There are several reasons why fiscal policies have been procyclical in the face of unexpected commod-

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[10] Fatas and Mihov (2003) show that the volatility in expenditures (a proxy for discretionary policy) hurts economic growth. McManus and Gulcin Ozkan (2012) also find a negative impact of procyclical policies on volatility and economic growth.
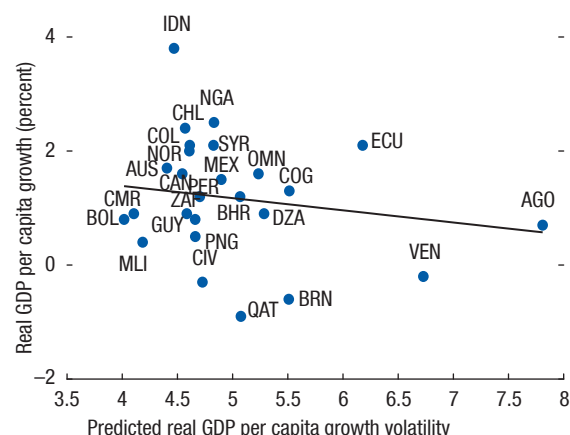
[11] The procyclical indicator relative to commodity prices has a high correlation with expenditure volatility.

ity price swings. In part this reflects the persistence of shocks exacerbated by procyclical amplification by financial markets (Gavin and Perotti 1997; Riascos and Vegh 2003). If there is overoptimism, countries may react to price windfalls by excessively increasing expenditures, requiring large adjustments once price dynamics disappoint, resulting in procyclical policies. Moreover, countries with weak political institutions are more prone to rent-seeking in the face of large commodity-related windfalls, which in turn can result in rapid and wasteful spending (Alesina, Campante, and Tabellini 2008; Tornell and Lane 1999).
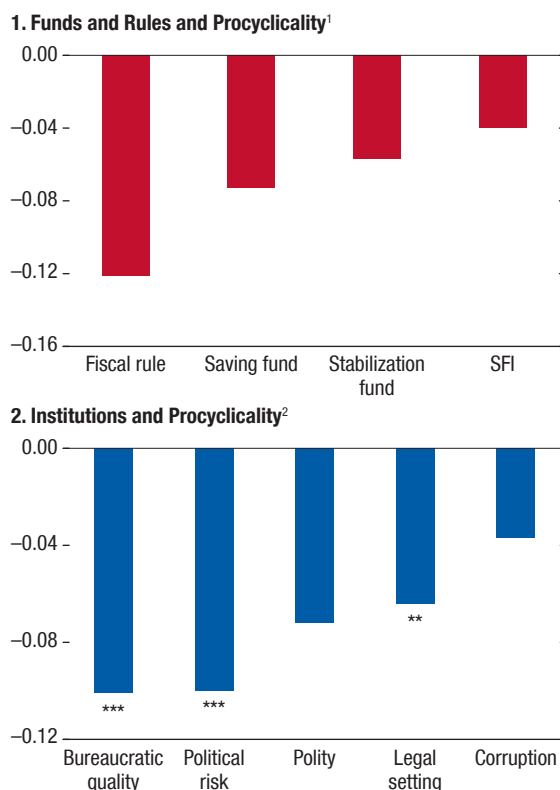
One way to shield the budget from this procyclical tendency is through the use of resource funds and fiscal rules. Resource funds are typically used to save for future generations, but can also serve a stabilization objective, with an allowance to release funds when the economy (or the budget) is faced with an adverse shock. Fiscal rules are often established in resource-rich economies to act as a constraint on expenditures, debt, or deficits (see Annex 1.2 for country examples) or to regulate the flows of revenues to and from resource funds (for example, Equatorial Guinea, Iran, and Venezuela).

The experience with resource funds and fiscal rules has been mixed. There have been notable successes (Botswana, Chile, Norway),[12] but the cross-country evidence suggests that these approaches have not reduced procyclicality in a statistically significant way (Figure 1.9, panel 1). The reasons for this lack of success are varied—for example, it may reflect weak design, but it could also reflect the fact that rules were not followed—but specific country experiences can be instructive. In Timor-Leste, the fiscal rule was breached because policymakers preferred to place a greater priority on scaling up public investment. Mongolia's efficacy of the fiscal rule was undermined by off-budget spending and overly optimistic revenue forecasts. Nigeria's oil-price-based fiscal rule was undermined by weak enforcement. In a number of cases (Chad, Ecuador, Papua New Guinea) resource funds were abandoned partly because they were deemed to be incompatible with budget needs.[13] In some cases (Azerbaijan, Kazakhstan, Libya) the ability to use these funds to finance extra-budgetary spending risks leading to a loss of control over expenditures and a weakening of the budget process. Some countries (Ghana, Trinidad and Tobago) accumulate financial assets in funds while having to borrow extensively to finance deficits.

There is empirical support, however, that "institutional quality" helps limit the procyclical bias in spending (Figure 1.9, panel 2). These results are similar to those found in earlier studies (Fasano 2000; Ossowski and others 2008).[14] This evidence suggests that the lack of success of rules and funds in some countries may owe more to the underlying weaknesses of their institutional frameworks than to the rules themselves. This body of evidence underscores the importance of improving the quality of institutions, which tends

[12] See Annex 1.2 and Ossowski and others (2008).
[13] Papua New Guinea is in the process of creating a new fund.
[14] See background notes for details http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.

Figure 1.9. Positive Impact of Good Institutions on Fiscal Policy
(Procyclicality coefficient)

The use of resource funds and fiscal rules has had varying levels of success in reducing the procyclicality of government expenditures to commodity prices, but there is stronger empirical evidence that better institutions do help limit procyclicality.

1. Funds and Rules and Procyclicality[1]

2. Institutions and Procyclicality[2]

Source: IMF staff estimates.
Note: Sample period is 1972–2014. Procyclicality is measured using regressions of real expenditure growth rates on commodity price changes
[1] Reported numbers show the change in procyclicality following the introduction of a fiscal rule, saving fund, or stabilization fund. SFI = Special fiscal institutions (includes both fiscal rules and resource funds).
[2] Reported numbers show the impact of a 1 standard deviation increase in the institutional quality index on procyclicality.
*** $p < 0.01$; ** $p < 0.05$.

to be weaker in resource-rich countries than in other countries (Figure 1.10).

How Have Commodity Price Windfalls Been Used?

Commodity exporters benefited from a very large revenue windfall from 2000 to 2008, when many countries experienced cumulative windfalls of about 230 percent of 2000 GDP (Figure 1.11). On average, resource-rich countries spent about two-thirds of this windfall—a smaller share than during the large boom in the 1970s (see Figure 1.5, Panel 3),
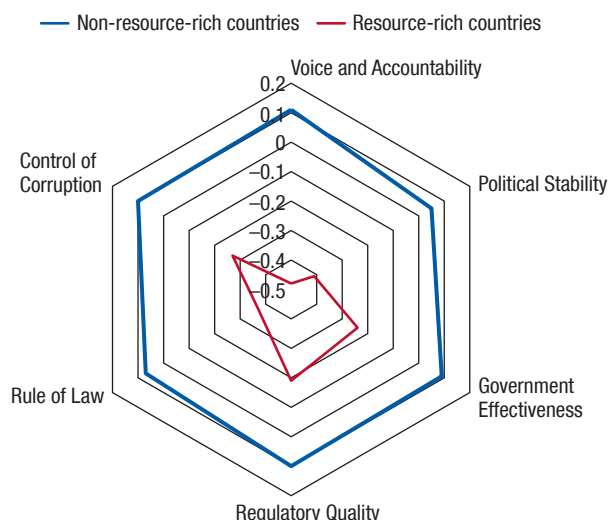
Figure 1.10. Institutional Quality in Resource-Rich Countries

Resource-rich countries tend to have lower institutional quality relative to other countries.

Sources: Worldwide Governance Indicators (World Bank) for 1996–2014; and IMF staff calculations.
Note: The figure shows the average levels of institutional quality for resource-rich and non-resource-rich countries with the same level of GDP per capita (sample average for resource-rich countries).

Figure 1.11. Spending during the 2000–08 Boom

Commodity exporters spent a significant share of the 2000–08 large resource windfall.

Source: IMF staff estimates.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes. Windfall is the cumulative increase in commodity revenues between 2000 and 2008; amount spent is the share of the windfall that was spent.

but amounting to a boost to expenditures equivalent to 150 percent of 2000 GDP in just eight years. This posed the difficult challenge of ensuring the quality of spending, and of managing the procyclical consequences for the economy as a whole (such as avoiding high inflation).
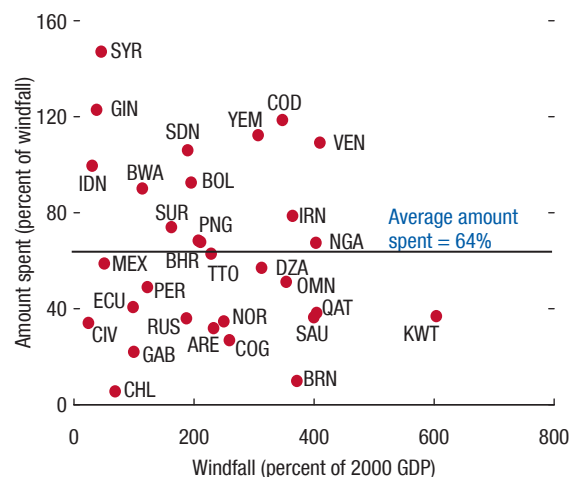
A significant proportion of the spending during the most recent commodity price boom was on capital outlays. Public investment grew at an average of more than 15 percent a year (in real terms) during the 2000–08 period. This increase was especially pronounced among low-income countries, where public capital is relatively scarce (Figure 1.12).

What effect has the scaling up of public investment had on growth among low- and middle-income commodity-exporting countries? To provide an illustration, 12 episodes of significant booms in public investment during the 1970–2009 period were identified, that is, cases in which public investment rose by at least 5 percent of GDP. In only a few cases was economic growth in the subsequent five years higher than in the period before the public investment boom (Figure 1.13).[15]

[15] The analysis compares the post–scaling up period with the previous period to assess whether the investment had a sustained impact on growth (during scaling up growth will tend to be higher due to

This suggests that although public investment can have significant growth dividends, a successful scaling up requires attention to several factors:
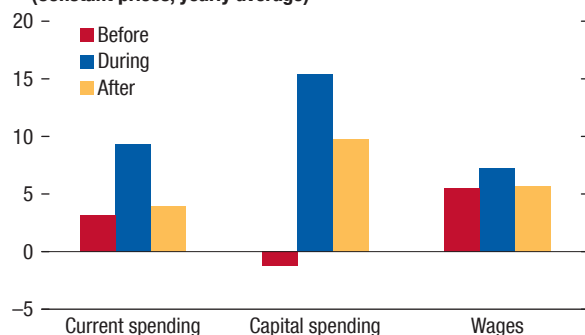
- *Macroeconomic constraints and volatility.* Scaling up of public investment needs to be implemented at a pace that does not crowd out private investment, takes into account supply bottlenecks, and avoids undermining the impact on growth (Sturm, Gurtner, and Alegre 2009). It is also important to build up financial buffers that can help insulate spending plans from the volatility of resource revenues and avoid costly "stop-go" cycles in public investment.

- *Microeconomic constraints.* The pace of public investment also needs to be consistent with institutional capacity to ensure that it does not lead to poor project selection or inefficient implementation. Indeed, Gupta and others (2014) show that the increase in spending during the 2000–08 boom resulted in a much smaller increase in the "efficiency-adjusted" capital stock (see also Annexes 1.3 and 1.4 for country examples). IMF (2015) discusses

the boost to aggregate demand). The growth impact may be affected by other factors not considered in the analysis. Gelb and Associates (1988) and Sachs and Warner (1999) find similar results.
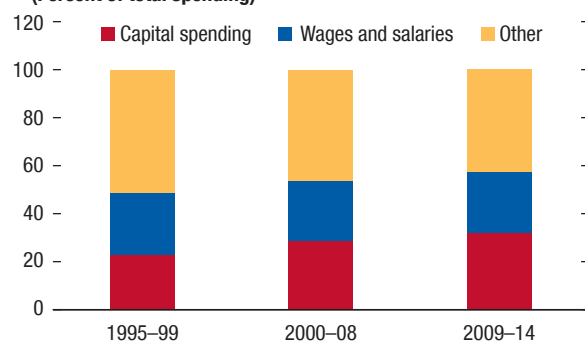
Figure 1.12. Current and Capital Spending during the 2000–08 Boom

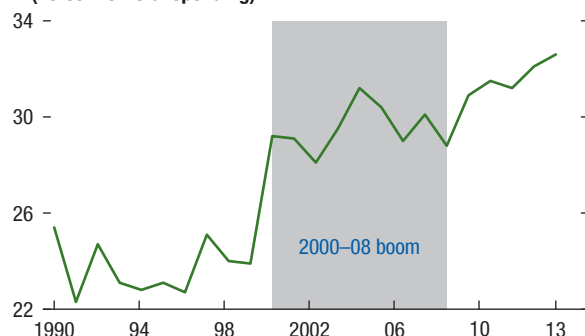Countries took advantage of the windfall to accelerate both current and capital spending.

1. **Spending Growth during the 2000–08 Boom[1]**
   (Constant prices, yearly average)

2. **Spending Components in Commodity-Exporting Countries**
   (Percent of total spending)

3. **Public Investment in Low-Income Commodity-Exporting Countries**
   (Percent of total spending)

Source: IMF staff estimates.
[1]Before = 1998–99, during = 2000–08, after = 2009–10.

the various areas to improve inefficiencies in public investment management processes.[16]

- *Political economy constraints.* Especially if institutional frameworks are weak, accountability is poor, and rent-seeking is prevalent, there is a risk that funds will be used for the benefit of special interests, rather than for the development of the economy.

Current spending also expanded at a robust pace during the 2000–08 period, which may not be sustainable in the future. Current expenditures grew by almost 10 percent yearly (in real terms), while public wage bills expanded by 7¼ percent yearly. Encouragingly, these increases reflected higher outlays on education (Chad, Ghana, Iran, Mexico) and health (Democratic Republic of the Congo, Equatorial Guinea, Sudan), which have led to improvements in social indicators—although progress has been limited in some other countries (Figure 1.14). However, as with spending on public capital, the challenge is to ensure that scaling up in these areas also avoids overheating the economy in the shorter term, or leads to spending levels that cannot be sustained when commodity prices decline.

Finally, many oil exporters directed some of their revenue windfall to fuel subsidies. In many of these countries, and particularly in the Middle East, the retail price of fuel adjusts only slowly, if at all, to movements in international prices (Figure 1.15). The pretax fuel subsidies typically are not reflected in the budgets, but are sizable (amounting to 10–50 percent of budgetary expenses).[17] In addition to the revenues foregone, these subsidies can lead to domestic overconsumption of fuel products and reduce oil exports—a tendency observed in oil exporters (Algeria, Oman, Saudi Arabia). They also have important health and environmental costs. But progress is being made. Many countries have already initiated energy subsidy reforms (Angola, Cameroon, Iran, Kuwait, Qatar, United Arab Emirates).

Long-Term Fiscal Management under Uncertainty

A central fiscal challenge facing resource-rich countries is to reconcile long-term objectives with the

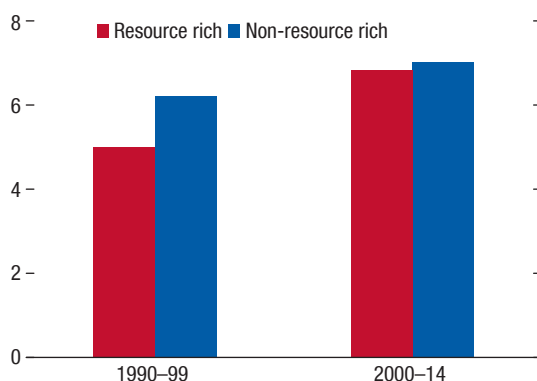[16] In addition, the October 2014 *World Economic Outlook* illustrated the important growth payoff of public infrastructure investment, but also noted that payoffs were highest where project selection processes direct spending to high-return investments and when project execution capacity is high.

[17] These pretax subsidies are estimated as the difference between domestic and international prices.
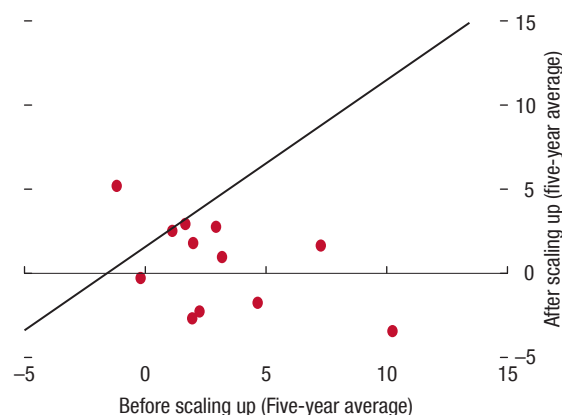
Figure 1.13. Impact of Public Capital Spending Scaling up on Growth

In some cases, the scaling up of capital spending in response to the commodity windfalls did not deliver significant growth dividends, in part reflecting low efficiency and high volatility of public investment in resource-rich countries.

1. Capital Investments in Low-Income Countries
(Percent of GDP)

■ Resource rich ■ Non-resource rich

2. GDP per Capita Growth Rate before and after Public
Investment Scaling-up Episodes, 1970–2009[1]

After scaling up (five-year average)

Before scaling up (Five-year average)

3. Quality of Public Investment in Low-Income Resource-Rich
Economies
(Percent of GDP)

Public capital

Public capital (quality adjusted)

Efficiency gap

4. Volatility and Investment in Resource-Rich Countries[2]

— Linear trend

Average capital stock
(percent of nonresource GDP)

Public investment volatility

Sources: Gupta and others (2014); and IMF staff calculations.
Note: All capital investment refers to public capital investment.
[1] Scaling-up episodes were identified as five consecutive years of investment increases, for a total increase of at least 5 percent of GDP over those five years.
[2] The horizontal axis refers to the coefficient of variation of the volatility of the real growth rate of public investment.

Figure 1.14. Health and Education during the 2000–08 Commodity Boom

Health and education improved after the recent boom, partly as a result of the rise in public spending.

1. Infant Mortality Rate before and after the 2000–08 Boom
(Deaths before age 5 per 1,000 live births)

2. Secondary School Enrollment Rate before and after the 2000–08 Boom
(Percent of total secondary-age population)
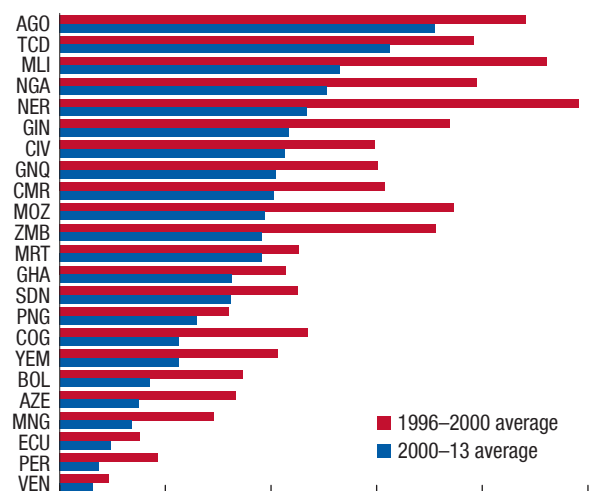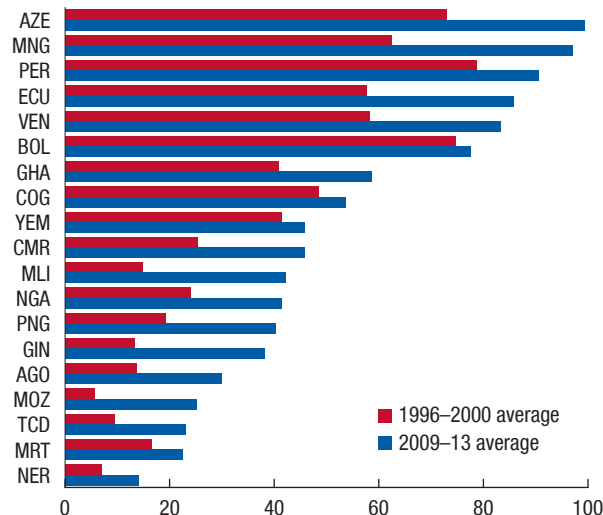

Sources: Global Health Observatory, World Health Organization; and the World Bank.
Note: Data labels in the figure use International Organization for Standardization (ISO) country codes.

Figure 1.15. Fuel Subsidies in Oil-Exporting Countries

Fuel subsidies are large and fuel prices are low in oil-exporting countries.

1. Pretax Fuel Subsidies
(Average 2011–14, percent of total expenditure)

2. Domestic Retail Gasoline Prices
(U.S. dollars a liter)

Source: IMF staff estimates.
Note: MENA = Middle East and North Africa; SSA = Sub-Saharan Africa. Data labels in the figure use International Organization for Standardization (ISO) country codes. All other exporters = all exporters except for SSA and MENA.

tions; and how to shield the economy from the large volatility associated with commodity prices. Developing economies tend to prioritize the promotion of economic development whereas advanced economies tend to focus on the intergenerational sharing of the natural resources. However, conceptual frameworks for the design of fiscal policy in resource-rich countries have paid less attention to the issue of how to manage the long-term uncertainty regarding commodity prices. This remains a key challenge, as discussed.

Designing an appropriate long-term strategy to manage natural resources is a complex task. Governments need to decide how much of the resource wealth to consume at any given year and how much to save. These savings can be used to accumulate financial assets or other assets (such as public infrastructure, or
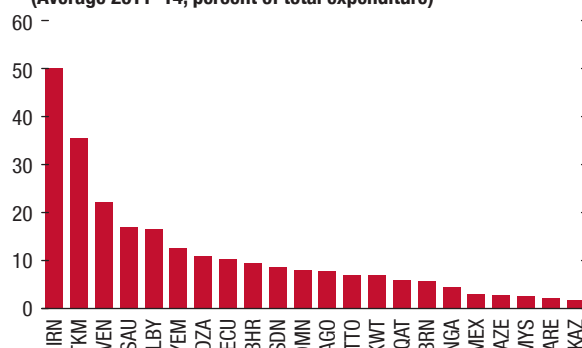
need to manage the high volatility and uncertainty surrounding resource revenue. Policymakers usually face three key choices: how to leverage this wealth to promote economic development; how to allocate the nonrenewable natural resource wealth across genera-

Figure 1.16. Simulation of the Impact of Various Strategies to Manage Resource Wealth under Uncertainty

Different strategies can have a large impact on the volatility of public spending and the fiscal stance.

1. Hypothetical Price Scenario: Actual and Projections
   (U.S. dollars a barrel)

2. Some Strategies Will Lead to High Volatility

Source: IMF staff estimates and calculations.
Note: PIH = permanent income hypothesis, MPIH = modified version of the PIH. The simulated price path is similar to price developments since 2000. The simulations assume that shocks are highly persistent (coefficient equal to 1). Production is assumed to be fairly stable and reserves are estimated to last 50 years. The "price smoothing rule" assumes that spending is linked to resource revenues evaluated at a reference price (the average of 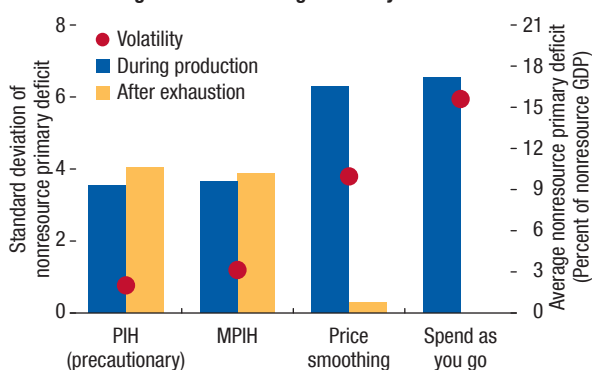the previous three years of prices, the current price, and the three-year forward projections). The coefficient of risk aversion used was set at 6 (usually the literature uses between 4 and 8).

human capital, or both), with the allocation depending on the returns of the different assets. Indeed, for developing economies, where infrastructure may be scarce and where access to capital markets is limited, the growth dividends may be highest from using a larger share of the savings to scale up investment. These decisions are complicated because of the need to project resource prices and reserves of commodities over the very long run. There is also uncertainty regarding the returns on the different types of investments. Box 1.1

discusses some of the long-term fiscal benchmarks that have been proposed for resource-rich countries.

The experience of recent years has driven home the need for commodity exporters to also take into greater account the considerable uncertainty that surrounds commodity revenues when establishing their fiscal goals.[18] In particular, because commodity prices are highly volatile and shocks can be very persistent, it is prudent to accumulate long-lasting precautionary savings. The size of the buffers will depend on several factors, including the size and persistence of shocks and the cost of insurance.[19] The approaches typically used (Box 1.1) do not envisage precautionary balances to insure against long-term uncertainty. Recent studies discuss in greater depth the need for significant levels of stabilization savings (for example, van der Ploeg 2013).[20]

The implications for both fiscal savings and stabilization policies of taking account of long-term uncertainty can be illustrated by simulating the experience of a typical oil exporter (Figure 1.16). For these illustrations we use the modified version of the permanent income hypothesis (PIH) approach and a precautionary version of the PIH (Box 1.1 describes these approaches).[21]

- The "*spend as you go*" *approach,* whereby resource revenues are fully spent. This approach results in more spending (higher nonresource fiscal deficits) upfront, a more volatile and procyclical nonresource fiscal balance, and no financial buffers.
- The *price-smoothing rule,* whereby only a share of revenue consistent with a reference price is spent (implicitly targeting a balanced budget over the medium term). This approach still involves significant volatility but would result in some degree of savings during a windfall.
- The *modified PIH approach (MPIH),* which assumes a temporary scaling up of public investment, results in significantly higher levels of financial savings and considerably more stable spending patterns.

[18] Other sources of uncertainty include fluctuations in production, costs of production, and the return on the physical investment that has been scaled up.
[19] See background notes http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.
[20] Cherif and Hasanov (2013) also argue that there is a strong case for precautionary savings for oil exporters. They estimate that the precautionary savings rate is sizable (about 30 percent of income) for oil exporters, whereas investment is relatively low, given high (persistent) shocks to oil revenues and the low productivity of the tradable sector.
[21] See background notes with a simple illustrative model http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.

Figure 1.17. Saving Rates during Boom Years
(Share of commodity revenues)

Some resource-rich countries increased their net financial assets (or reduced net debt) during the 2003–08 resource revenue windfall.

Source: IMF staff estimates.
Note: Saving rates are calculated as the change in net assets as a percentage of commodity revenue during the 2003–08 and 2009–14 periods (used the longest sample available for each country within the specified periods). Countries included in the sample are Angola, Algeria, Azerbaijan, Chile, Equatorial Guinea, Iran, Kazakhstan, Kuwait, Libya, Nigeria, Norway, Peru, Qatar, Saudi Arabia, Trinidad and Tobago, United Arab Emirates.

- The *precautionary version of the PIH approach (PPIH)* results in even higher levels of savings and even less volatile spending than the previous approaches. The PPIH is derived in the same manner as the PIH benchmark, but takes into account the uncertainty that surrounds commodity revenues and the preference that policymakers have for stability. Simulations of this benchmark result in a somewhat higher level of financial savings in the early years, leaving fiscal policy better prepared to manage the volatility of commodity prices.[22]

These illustrative simulations suggest that building precautionary balances beyond simple price smoothing is likely to be desirable. However, the approaches based on the PIH models, which envisage large long-term savings, are likely not affordable for many countries. In the next section, we discuss an alternative operational

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[22] The level of precautionary savings will depend especially on the uncertainty regarding commodity prices. The simulations assume that shocks have a high degree of persistence (that is, they follow a random walk). The amount of precautionary savings also increases with the degree of volatility, the dependence on resource revenues, and the degree of risk aversion (see background notes http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.).

benchmark for precautionary savings to shield spending plans from the volatility.

The evidence shows that many countries did save considerably during the 2003–08 revenue windfall, but much less so in the subsequent years. As the precautionary approach suggests, many countries did accumulate buffers (net financial assets) during the height of the latest revenue windfall (2003–08). Among those that saved part of the windfall, the savings rate averaged 30 percent of the resource revenue (Figure 1.17). Some countries saved more than half (for example, Algeria, Chile, United Arab Emirates, Norway). However, there was no improvement in financial buffers on average in the more volatile 2009–14 period—when many countries experienced a large deceleration in economic growth relative to the 2003–08 period. Initially, as an appropriate response to the sharp fall in commodity revenue in 2009, some countries (for example, Angola, Chile, Iran, Nigeria) reduced significantly their buffers (or increased their debt levels). However, some are now more vulnerable to the latest commodity price shock because buffers were not subsequently replenished.

A Risk-Based, Comprehensive Approach to Fiscal Policy

The preceding analysis illustrates the potential benefits for resource-rich countries of adopting fiscal frameworks that take better account of the large uncertainty they face. Although fiscal policy will need to reflect country-specific circumstances to be most effective, fiscal frameworks need to be comprehensive. In particular, they should encompass four priorities: (1) setting appropriate levels of stabilization savings, (2) strengthening the broad institutional framework, (3) establishing more effective spending policies, and (4) making better use of taxation to reduce revenue volatility.

Fiscal Indicators Need to Account for Commodity Price Volatility and Uncertainty

Fiscal policy in resource-rich countries can benefit from more systematically using fiscal indicators that take into account their countries' specific characteristics. Three indicators, in particular, can be helpful:

- *A long-term anchor.* This is particularly important for resource-rich countries, given that their resource base is exhaustible and subject to persistent shocks. A long-term benchmark can provide guidance as to the appropriate fiscal stance and would need to be tailored

Figure 1.18. Impact of the Fall in Commodity Prices on Fiscal Balances in Resource-Rich Countries

The fall in commodity prices has led to a significant upward revision in projected fiscal deficits, especially among oil exporters, despite much lower public expenditures.

1. Fiscal Balance
  (Percent of nominal GDP)

2. Total Expenditures
  (Real growth rates, percent)

Source: IMF staff projections.
Note: FM = *Fiscal Monitor*.

to account for country-specific circumstances. For example, some countries may prefer to direct resource revenues to infrastructure and social needs instead of accumulating financial assets for future generations.

- *A benchmark for stabilization savings.* Regardless of the approach chosen for the long-term sustainability benchmark, there should be an explicit consideration of uncertainty. Countries that set a benchmark based on the projection for commodity prices should add additional precautionary (stabilization) savings to protect spending plans from the shocks. Importantly, such a buffer would be countercyclical, especially during large commodity prices booms and busts. Box 1.2 illustrates a possible operational benchmark for stabilization buffers.

- *A short-term fiscal target.* This should be set informed by the long-term benchmark. Since the overall fiscal balance will be distorted by the volatility of commodity prices, the nonresource balance as a share of nonresource GDP (NRB) provides a better indicator of the underlying fiscal stance and the impact on aggregate demand. The NRB is especially used by oil exporters as a target (Norway, Timor-Leste).[23] Several countries, especially metal exporters, target the structural balance (SB), which corresponds to the overall balance excluding the cyclical component of resource revenues and the business cycle of the nonresource economy. The SB is especially useful when the economy is less dependent on the commodity cycle. Because this indicator can be heavily influenced by assumptions regarding the "structural" price (Villafuerte, Lopez-Murphy, and Ossowski 2010), Chile relies on an independent committee to assess the long-term reference price while other countries use price formulas. Countries should also monitor other indicators depending on country circumstances (Medas and Zakharova 2009).[24]

Fiscal policy will need to be set in coordination with other policy objectives. For example, in deciding on the level of the nonresource primary balance, it will be important to assess the absorption capacity of the economy. Fiscal policy will also need to be coordinated with monetary policy and will vary depending on the exchange rate regime, as flexible exchange rates provide some buffer to the budget.[25]

What is the relevance of these benchmarks in the current circumstances, which involve a large fall in commodity prices? Commodity prices have been on a downward trend over the past few years; however, the drop in oil prices in the second half of 2014 was particularly pronounced (almost 50 percent). This decline is expected to persist, and for many commodity exporters will mean the erosion of a sizable share of government revenues (Figure 1.18). The deficits in oil-exporting countries are expected to widen the most (amounting to a decline of 8 percent of GDP in 2015, on average) compared with metal exporters (a 2 percent decline).

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[23] The NRB can also be used to correct for the nonresource economic cycle. For example, Norway's target is implemented flexibly over the cycle.

[24] These could include the overall balance and gross financing needs (for countries under tight financing conditions) and public gross debt.

[25] A flexible exchange rate will partially protect the budget from the first impact of movements in commodity prices. However, this implies that the domestic economy will receive the brunt of the shock—and thus tax revenues will eventually fall.

Most countries will need to adjust their budgets to the new commodity prices.

Fiscal consolidation should rely on measures that minimize the effects on growth. Those countries that had taken advantage of the earlier boom to accumulate sufficient financial buffers, or that have relatively ready access to capital markets, can adopt a more gradual fiscal adjustment. Others will have fewer options and may have to make more painful adjustments:

- Spending cuts should be as growth friendly as possible. Nevertheless, in some cases a scaling down of public investment may be unavoidable; it is already being implemented or planned in several countries (Angola, Gabon, Nigeria). Further efficiency gains in health, education, and the social sectors could be pursued to contain pressures on the budget, especially in Latin America (Celasun and others 2015).

- Many of the policies proposed in this *Fiscal Monitor* can also help. Energy pricing reforms can deliver significant gains to the budget. Improvements in public investment management systems will help increase the efficiency of investment and mitigate the negative impact of lower resources. Most countries also have space to increase nonresource taxation.

The Broad Institutional Framework Needs to Be Strengthened

The volatility that commodity exporters face make it exceptionally challenging for policymakers to adhere to medium- and long-term plans. Thus, strong fiscal institutions are especially critical. These need to translate long-term policy objectives for the use of large and volatile resource revenues into operational guidance for the annual budget, and to hold policymakers accountable for meeting these objectives. The key elements follow:

- *Medium-term fiscal framework.* This needs to provide a clear linkage between medium-term and long-term objectives, and a guide for annual budgets. A well-defined mechanism is also needed to reassess these objectives at regular intervals. Several countries (Angola, Sierra Leone, Tanzania, Timor-Leste) have been moving forward with reforms in these areas with support from the IMF (Box 1.3).

- *Enhanced management of fiscal risks.* As part of a more risk-based approach to fiscal policy, budget documents should include alternative macro-fiscal scenarios that present the fiscal implications of changes in key macroeconomic assumptions, including different price and production scenarios.[26] This analysis of fiscal risks should also consider the implications for precautionary savings and other policies to mitigate risks.

- *Transparency.* A commitment to transparency should be a core principle in all areas related to the management of resource revenues (Box 1.4). Transparency allows for informed understanding and scrutiny of resource revenues by lawmakers, external analysts, and the broader public. It also helps build a constituency for precautionary approaches to policymaking, ensures that resources are used in line with national objectives, and reduces the risk of their misuse.

Numerical fiscal rules or resource funds can help achieve policy objectives if they are supported by strong institutions, are well designed, are closely linked to broader policy objectives, and are backed by a strong political commitment. The examples of Chile and Norway show that these fiscal rules can both help discipline policies and provide the necessary flexibility to respond to shocks.

The preceding discussion argues that the design of fiscal rules for resource-rich economies should be based on fiscal anchors that take account of volatility and uncertainty (Box 1.5). Instead, some countries rely on price-smoothing rules that are not adequately linked to long-term fiscal benchmarks. These rules often define the amount of resource revenue that is made available to the budget based on an average of past prices or forecasts of future prices, thereby limiting the extent to which budgetary revenues respond to actual prices. They can dampen price-related procyclicality, but they are less effective than rules that take into consideration a risk-adjusted longer-term fiscal anchor. As such, price-smoothing rules should be used in conjunction with appropriate fiscal anchors and financial buffers.

The creation of a natural-resource-revenue fund can provide a useful mechanism for managing saved resource revenue flows. While keeping financial assets at the central banks (Algeria, Saudi Arabia) is an option, some countries have opted to establish resource funds to manage their assets. These funds can be used

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[26] Countries could bring the two approaches together into stochastic projections of the key fiscal aggregates (see Gaspar, Hughes, and Jaramillo 2015).

to save for future generations and for short-term stabilization purposes. Cross-country experience with these, including in the context of IMF technical assistance, suggests that to be successful their design should be shaped by the following principles:

- They should support the fiscal policy framework. In particular, the accumulation of financial assets in funds should be derived from actual fiscal surpluses. Otherwise, accumulating revenue in funds without regard for budget needs can result in a simultaneous and undesirable buildup of expensive debt.[27] The budget should specify how much of the fund would be used each year in line with fiscal policy objectives. It should also specify how much will be retained in the fund for stabilization and saving purposes.

- The fund should be fully integrated into the budget process and should not have independent spending authority. All withdrawals should require legislative approval and flow through the government budget. Spending should be subject to the same scrutiny and accountability as any other public spending—at a minimum. Financing funds are preferable because they are fully linked to the budget and do not attempt to limit the availability of resources to the budget (Ossowski and others 2008).

- The operations of the fund should be transparent and there should be a strong governance structure (see Box 1.4).[28] Transparency requirements should include regular and frequent disclosure and reporting on the principles governing the fund, its inflows and outflows, the investment policy, and the allocation and return on assets.

- Fund assets should be prudently managed in line with a transparent investment strategy. Funds could be operated by the central bank or by a body created

for asset management purposes, with a strategy set by the ministry of finance.[29]

- The assets of a resource fund should be part of the government's overall asset and liability position. This will allow for better asset-liability management of the public balance sheet.

An important asset-liability issue is the extent to which market-based insurance (such as hedging instruments) can be used to shield the budget from commodity price volatility. A detailed examination of this issue is beyond the scope of this chapter, but it is important to recognize that, despite their potential advantages, these instruments have in general not been used by resource-rich economies. One exception is Mexico, which uses options to hedge the value of roughly half its oil exports for one year ahead (Annex 1.2). The fact that other countries have shown less interest may reflect the lack of liquidity for contracts with long horizons, and the unwillingness of policymakers to place themselves in a position of having to justify the cost of hedges in years when the insurance is not used. Countries tend to prefer to self-insure by accumulating financial savings, which also has the advantage of helping to protect against production volatility.

Well-Designed Tax Systems Can Also Help Reduce Vulnerabilities

Resource-rich countries tend to collect relatively more revenue, relative to GDP, than do other countries, but less from the nonresource sector (Figure 1.19). This is not surprising since taxes on the resource sector can be less distortionary than most instruments applied to the nonresource sector.
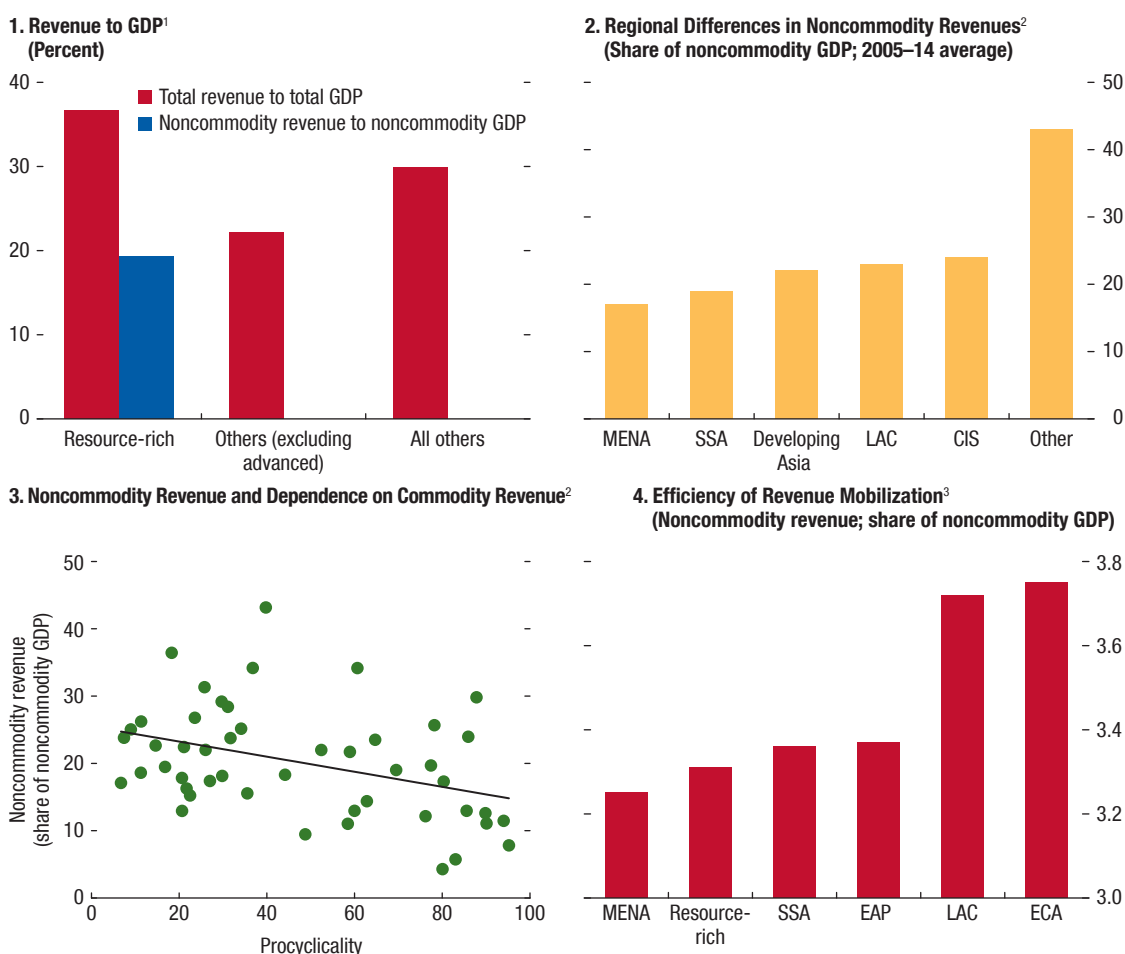
Nonetheless, even many countries with large revenues from the resource sector can benefit from developing tax systems with more meaningful and well-designed tax collection from the nonresource sector. This is important for several reasons:

- It helps to better insulate spending plans from disruptive price and supply shocks to the resource sector (Figure 1.20).

- A more developed tax system can enhance equity by better matching contributions to government revenues to the ability to pay, or, in some cases, to

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[27] Countries with a large nonconcessional debt might opt to pay down public debt rather than accumulate financial assets. Such a strategy can be justified not only on purely financial grounds (for example, borrowing rates are higher than lending rates) but also to reduce the country's interest premium and thereby foster private sector growth. By the same token, countries with low levels of debt may opt to issue debt to support the development of local financial markets or to provide a yield curve that serves as a reference for private sector development.

[28] There are several initiatives on improving transparency, including the International Forum of Sovereign Wealth Funds (see http://www.ifswf.org).

[29] For more details on investment strategies and operational management of these funds, see IMF 2014a. Best practice guidelines are also provided by the International Working Group of Sovereign Wealth Funds (2008) (the "Santiago Principles").

Figure 1.20. Resource and Nonresource Revenues
(Fiscal buffers; percent of 2015 GDP)

Resource revenues are more volatile than nonresource revenues.

Source: IMF staff estimates.

Two broad areas in which many nonresource tax systems can usefully be strengthened stand out. One is establishing a simple and broad-based value-added tax (VAT). This can improve the efficiency of the tax system and reduce the costs associated with complex fees and charges, which are prevalent in many resource-rich countries in the Middle East (Mansour 2015). Generally, a VAT tends to be a more stable and growth-friendly source of revenue than most other taxes (Acosta-Ormaechea and Yoo 2012). However, resource-rich countries on average collect only about half of what resource-poor countries do from goods and services taxes, suggesting considerable scope for boosting these revenues (Figure 1.21). The other avenue to pursue is increased reliance on the personal income tax, which in these countries typically generates revenues equivalent to only about 2 percent of GDP. A properly designed personal income tax system can help improve equity and serve a critical role in complementing, and ensuring acceptability of, the VAT. Other areas that merit attention include property taxation, often identified as relatively pro-growth and capable of being aligned to equity objectives, and the corporate tax, whose importance in these countries largely reflects its role in capturing resource returns.

Encouragingly, a number of countries have made helpful efforts to increase nonresource taxation. For example,

Iran introduced a VAT in 2008, which brought in revenues of 1 percent of GDP in 2013–14 (and is expected to increase further in the future). Bolivia increased tax revenues by more than 3 percent of GDP from 2005 to 2013, strengthening tax administration and significantly broadening the tax base. Mozambique made strides in improving its tax administration; this has helped boost revenues by the equivalent of 1¼ of GDP each year from 2010 to 2014, excluding windfall taxes.

The fiscal treatment of the resource sector itself requires close attention. Of the many challenges,[31] one of the most fundamental is that of striking a balance between mitigating the volatility of government revenue and ensuring that the public sector receives an appropriate share of the natural resource wealth. A broadly progressive fiscal regime that increases the government share as profits and commodity prices rise has the advantage of encouraging investment and maximizing government revenues during windfalls. However, more progressivity inherently generates more volatility in revenues. Some governments, especially those with liquidity constraints, may prefer early and more stable revenues, even if the budget will benefit less when prices increase—which generally calls for stronger reliance on royalties. Balancing these considerations, some countries use, as is often recommended, a combination of royalties and some form of resource rent tax alongside the corporate income tax.[32]

Expenditure Policy Can Help Reduce Vulnerabilities and Achieve Development Objectives

Several studies have suggested that resource-rich economies have an important opportunity to improve their public investment management (PIM), which in turn could boost growth prospects. Dabla-Norris and others (2011) find that on average oil exporters had lower PIM scores than others, particularly in the project appraisal and evaluation stages of the PIM process. Albino-War and others (2014) find that oil exporters in the Middle East and North Africa region lag behind the most efficient international performers in all PIM

[31] These challenges are reviewed in IMF (2012b) and, in more detail, in Daniel, Keen, and McPherson (2010).

[32] These industries also require careful attention to treaty policy and withholding taxes (IMF 2014b) given the prevalence of multinational companies, as well as to the distinct challenges that effective administration of fiscal regimes for the extractive industries pose (Calder 2014). See also background notes http://www.imf.org/external/pubs/ft/fm/2015/02/pdf/fmtn1502.pdf.

Figure 1.21. Revenue Shares from Taxation in Resource-Rich Countries, 1990–2014
(Percent of 2015 GDP)

Resource-rich countries have lower revenue shares from personal income tax and goods and services tax.

Source: IMF staff estimates.
Note: Personal income taxes (PIT), corporate income taxes (CIT), goods and services taxes (GST), and trade taxes (TT) as a share of GDP for resource-rich and non-resource-rich countries.

areas (Annex 1.3). A study by IMF staff (IMF 2015) discusses the different areas to make public investment more efficient. Developing PIM practices should therefore be a priority in resource-rich countries, and ideally should take place before investment spending is scaled up.

In addition, reforming fuel subsidies would allow better use of resources and reduce fiscal vulnerabilities. Although fuel subsidies can be used to share the resource wealth and shield the domestic economy from volatile oil prices, subsidies have several disadvantages. They are very poorly targeted devices for supporting the poor (Clements and others 2013). Moreover, they can generate significant environmental and health costs. The issue is not just—or even mainly—addressing the global harm from climate change. It is very much a matter of the local damage (Box 1.6). Fuel subsidy reforms should be accompanied by well-targeted transfers to those most vulnerable. For oil exporters, where fuel subsidies are seen as a way to share the oil wealth, it may also be useful to design a transfer system that allows some direct sharing of oil revenue that would accompany the reform of fuel subsidies.

Conclusion

The experience of the past several years has provided a stark reminder of the considerable uncertainty that resource-rich economies face and the implications this has for fiscal policy. In particular, as the analysis in this chapter has shown, fiscal policies have not been successful in shielding the domestic economy from the effects of commodity price shocks, and in many cases have actually exacerbated their effects, with possibly important adverse consequences for growth and intergenerational equity.

More efforts are needed to establish a comprehensive fiscal policy framework in resource-rich countries that can help them cope with heightened uncertainty. The key elements of this framework should include the following:

- *A solid longer-term anchor to guide fiscal policy.* Countries face important trade-offs between how much of the nonrenewable resource wealth to consume and how much to save in financial and other assets (such as public infrastructure). Given their large development needs, for low-income countries a large share of the savings should likely be allocated to public investment, commensurate with their absorptive and institutional capacity.
- *Stabilization savings to help weather the large and persistent shocks.* The long-term strategy should also ensure an appropriate level of financial savings for precautionary purposes, which will lead to countercyclical policies that will help stabilize the economy

and promote long-term growth. To achieve this, such benchmarks will need to account for the uncertainty that surrounds the returns to natural resource wealth.

- *Stronger institutional fiscal frameworks to help ensure longer-term objectives.* These should include the following:
  - Comprehensive medium-term budget frameworks, which demonstrate and ensure consistency between the longer-term objective, fiscal targets, and the annual budgets.
  - Fiscal risk statements that explore the consequences of uncertainty for the government's fiscal plans and explain how these might be addressed.
  - Strong public investment management and expenditure policies that help ensure that government spending plans are efficient and are likely to yield important growth dividends.
  - Tax policies that diversify the revenue base and avoid an overdependence of government spending on the resource sector.
  - Fiscal regimes for extractive industries that strike a balance between limiting the volatility of government revenue and ensuring an appropriate share of the resource wealth for government. A combination of fiscal instruments is usually recommended.
  - Sufficient transparency in each aspect of this policy framework to help ensure adherence.
- *Strong underlying institutions.* Experience suggests that such institutions (including governance) are essential for ensuring that natural resources are used in a manner that supports long-term growth and avoids disruptive procyclicality. In the context of strong institutions, fiscal rules can help constrain the response to windfalls and avoid unhelpful procyclicality. Resource funds can be a useful tool to manage financial assets.

Achieving these objectives has become even more difficult in the current environment, given the recent collapse in commodity prices. After a period of abundance in the 2000s, many countries will need to adjust to a period of scarcer resources that is likely to persist. Countries that have accumulated savings will be able to adjust gradually. But in some cases, large adjustments in spending may be unavoidable. These countries may have options for ameliorating the effects on priority spending by examining the scope for curbing subsidies and other unproductive outlays, or by boosting tax revenue. In the current circumstances, the priority is

to ensure that fiscal positions are brought to sustainable levels (in cases in which they are not, given the commodity price declines). But steps to strengthen the underlying fiscal and policy frameworks as described in this chapter could both enhance confidence and place countries in a better positon to manage future shocks.

Annex 1.1. Data Sources

The primary sources for this chapter are the IMF's *International Financial Statistics* (IFS), *Balance of Payments Statistics*, *Direction of Trade Statistics*, World Economic Outlook, and fiscal rules databases; United Nations Statistics Division "National Account Official Country Data" database; the World Bank's *World Development Indicators* and *Worldwide Governance Indicators*; the Macro Data Guide Political Constraint Index (POLCON) Dataset; and Polity IV and *International Country Risk Guide* data. Data for all variables of interest are collected on an annual basis from 1970 to 2013, where available.

The sample comprises 51 countries that are exporters of oil, gas, and metals (such as copper, gold, iron, and silver), where these commodities represent a large share of exports (20 percent or more of total exports) or fiscal revenues. The countries are Algeria, Angola, Australia, Azerbaijan, Bahrain, Bolivia, Botswana, Brunei Darussalam, Cameroon, Canada, Chad, Chile, Colombia, Democratic Republic of the Congo, Republic of Congo, Côte d'Ivoire, Equatorial Guinea, Ecuador, Gabon, Ghana, Guinea, Guyana, Indonesia, Iran, Iraq, Kazakhstan, Kuwait, Libya, Mali, Mauritania, Mexico, Mongolia, Mozambique, Nigeria, Norway, Oman, Papua New Guinea, Peru, Qatar, Russia, Saudi Arabia, South Africa, Sudan, Suriname, Syria, Timor-Leste, Trinidad and Tobago, United Arab Emirates, Venezuela, Yemen, and Zambia. The sample varies for each analysis depending on data availability.

Annex 1.2. Selected Experiences with Fiscal Rules and Resource Funds in Latin America and the Caribbean[33]

Chile bases its fiscal framework on a fiscal rule. The rule was introduced in 2001 and institutionalized by the 2006 Fiscal Responsibility Law. According to the law, the government, at the beginning of its mandate,

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[33] With contributions from M. Santoro, J. Delgado, F. Valencia, and M. Lutz.

must set a fiscal objective in terms of a structural balance position to be reached by the end of its term (four years). The structural fiscal balance is calculated by adjusting expected revenues for the cycles in economic activity and expected copper prices (with a committee of experts providing estimates for potential output and long-term copper prices for the annual budget). The path of spending is thus the residual, to be determined on an annual basis given the estimated structural revenues and the target at the end of the government mandate.

The presence of the fiscal rule has reduced the procyclical fiscal bias and increased the credibility of fiscal policy in Chile. The rule contributed to a reduction in net public debt by more than 20 percentage points of GDP before the financial crisis. Moreover, the rule combines a commitment at the end of the mandate with flexibility, in terms of adjusting the path of spending to both the end-of-mandate target and the position in the business and commodity cycles (see Schmidt-Hebbel 2012). The flexibility allows for countercyclical policy, while the fiscal target at the end of the mandate helps anchor expectations. By striking the right balance between rules and discretion, Chile has been able to build a strong reputation for fiscal responsibility.

Colombia reformed its fiscal framework as a response to a large accumulation of debt in the late 1990s and early 2000s. In 1997–98, two laws established strict limits for subnational expenditure and debt accumulation. In 2003, a fiscal transparency law was enacted that aims to protect fiscal sustainability by requiring a detailed 10-year, medium-term fiscal framework each year and establishing indicative balance targets for the nonfinancial public sector.

The introduction of the structural balance fiscal rule in 2012 strengthened the framework for countercyclical fiscal policy. The new law established a quantitative target for the central government overall balance, adjusted for the oil and GDP cycles (structural balance). The rule also allows the deficit target to be relaxed through countercyclical expenditures under some circumstances, and includes an escape clause when macroeconomic stability is at risk.

Mexico hedges a large fraction of oil exports through put options to insure against a decline in international oil prices. Each year, Mexico purchases Asian put options[34] with a strike price equal to the oil reference price used in the budget (which corresponds to an average between historical and future oil prices). Mexico hedges roughly half the volume of its oil exports at a cost that has varied between $2.50 and $5.60 a barrel over the past five years. The program was particularly useful after the collapse of oil prices at the onset of the global financial crisis, when oil prices were 20 percent below the budgeted price.

To further insulate fiscal revenues from transitory fluctuations in oil-related revenues, Mexico recently created a sovereign wealth fund. Since early 2015, the Mexican Oil Fund has managed all oil-related revenues and payments (except for taxes). The federal government receives transfers from the Oil Fund for up to 4.7 percent of GDP—roughly the amount of oil-related revenues received in 2013. Revenues in excess of this threshold will accumulate in the fund. Long-term assets in the Mexican Oil Fund can be used to cover persistent declines in revenues only after smaller stabilization funds have been exhausted.

Peru approved a new fiscal framework in 2013, which became operational in the 2015 budget. It amended a fiscal framework introduced in 1999 with the enactment of the Law on Fiscal Prudence and Transparency (LPTF). The LPTF's main objective is to establish a commitment to fiscal balance over the business cycle through fiscal rules at the national level and by establishing a multiyear fiscal framework.

The fiscal framework set out in the 2000s was not sufficiently flexible to adapt to the economic and institutional changes facing Peru. In particular, the growing importance of resource revenues was not addressed, contributing to the volatility of government revenues. The 1999 framework also did not reduce the bias toward procyclicality, as the rule targeted the nominal deficit. The framework has been repeatedly amended over the past decade, hurting its predictability, simplicity, and transparency.

The new framework, amended in 2013, was named the Fiscal Responsibility and Transparency Law. It includes a new structural deficit target for the nonfinancial public sector, an important shift relative to the past. Like the previous version, it includes a multiyear macroeconomic framework that sets three-year projections for the main macroeconomic and fiscal variables. It allows the national government to use the

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[34] The payoff of an Asian put option is determined by the difference between the strike price and the average price of the underlying asset over a predetermined period, which in the case of Mexico covers one year. More details about Mexico's hedging program can be found in Duclaud and Garcia (2012).

fiscal stabilization fund if revenue declines below the average of the past three years. A fiscal council will provide independent analyses of macro-fiscal projections, the evolution of public finances, and compliance with fiscal laws and rules.

In *Trinidad and Tobago,* fiscal performance has been mixed in the absence of multiyear budgeting and other formal rules. The 1973–74 oil price boom sharply improved the country's fiscal position. However, the oil price collapse in the early 1980s led to a procyclical fiscal retrenchment. A sovereign wealth fund, the Heritage and Stabilization Fund, was established in 2004, to be built over time with "above-normal" fiscal energy revenues. Its assets reached about 20 percent of GDP in September 2014 (external reserves are an additional 35 percent of GDP).[35] While there have been no legally binding fiscal rules, various governments have made pledges regarding overall (or non-energy) balances.

Annex 1.3. Public Investment in Oil-Producing Countries of the Middle East[36]

During the past decade, drawing on oil revenues, most oil-producing countries of the Middle East and Central Asia (MCDOE) have sustained the level of investment spending at about 7–8 percent of GDP—about 3–4 percentage points higher than levels in the early 2000s.

Overall, public investment efficiency[37] in these countries has been lower than in comparator countries. The quality of infrastructure in MCDOE is about 10 percent lower compared with advanced countries or resource-rich countries with strong institutions such as Australia and Canada. It is also about 18 percent lower than the maximum quality index (GCI index), suggesting that significant efficiency gains could be generated. A particular source of concern is the cost of mass transit projects, which appear significantly more expensive than similar projects in advanced countries.

Strong institutions could improve the quality and efficiency of public investment in MCDOE. The Public Investment Management Index (PIMI) suggests that issues arise primarily at the appraisal and selection phases (Dabla-Norris and others 2011). Cost-benefit analyses (at least for large projects), as well as improved fiscal planning with medium-term frameworks, could help.

In *Kuwait*, the authorities are engaged in public investment programs, in part to increase oil production, but also to diversify the economy. Overall, while these investments could lead to significant gains, potential risks remain. In the oil sector, the main risk relates to macroeconomic conditions, as the development of shale gas in competitor countries could lower the profitability of investment in the sector. In the non-oil sector, the main issue relates to the quality of investment, as delays in implementation and potential cost overruns could harm efficiency.

Qatar has enjoyed strong growth rates in the recent past, in part due to large public investments aimed at diversifying the economy. Aware of the need for continued improvements in investment quality, the authorities have taken steps to review capital spending (and related operational costs), and intend to integrate investment spending plans within medium-term fiscal planning, including by establishing a public investment management department at the ministry of finance. The authorities are also in the process of developing a medium-term fiscal framework.

In *Saudi Arabia*, capital spending grew by 24 percent on average annually from 2000 to 2008, on the back of high hydrocarbon revenues. In turn, Saudi Arabia's economy grew strongly from 2000 to 2013; nonhydrocarbon output growth averaged more than 7 percent annually. Large public investments have improved the quality of infrastructure, with the ranking of infrastructure quality by the *Global Competitiveness Report* improving from 41 in 2008/09 to 31 in 2013/14. Efficiency could be further strengthened by adopting a medium-term fiscal framework and by improving the public investment process, notably regarding the assessment and selection of projects.

Annex 1.4. How Selected Sub-Saharan African Countries Have Used Commodity Windfalls[38]

Angola has used windfalls from the recent commodity price boom to rebuild reserves and scale up public investment. Central government deposits at the National Bank of Angola rose from 1 percent of GDP

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[35] Given that contributions are triggered by above-normal energy revenues, contributions have sometimes coincided with overall fiscal deficits.

[36] See Albino-War and others (2014).

[37] As measured by the infrastructure component of the Global Competitiveness Indicator (GCI) developed by the World Economic Forum.

[38] With contributions from R. Sab, C. McLaughlin, and G. Salinas.

in 2004 to 9½ percent in 2014. The sovereign wealth fund was created in 2012 and had accumulated assets of 4 percent of GDP by end-2014. Public investment was scaled up significantly during the boom period, in part driven by the need to rebuild infrastructure after the civil war that ended in 2002. However, there is considerable room to boost the quality of public investment. Measures to improve PIM include enhancing the compliance of the PIM process with existing legislation; better prioritizing and monitoring of the execution of investment projects; conducting ex ante and ex post project evaluations; and improving technical capacity to appraise, select, and monitor investment projects.

The Republic of Congo has also used windfalls to increase financial assets, directing part of them to scale up capital spending and address large social gaps. Government oil revenues more than tripled from 2003 to 2008. This allowed a substantial buildup of financial assets and doubled domestically financed capital spending as a share of non-oil GDP. Higher oil prices also have driven the Republic of Congo's ambitious 2012–16 National Development Plan, which is aimed at addressing large social and infrastructure gaps and diversifying the economy, funding reconstruction and rehabilitation in the aftermath of the 2012 ammunitions explosion, and supporting a large amount of construction spending for the Fall 2015 All Africa Games. The Republic of Congo's investment efficiency still lags substantially behind that of other low-income countries. Improving

the quality of capital expenditures is essential for maximizing their effect on non-oil growth and enhancing economic diversification.

Gabon used a large part of the first phase of the windfall (2003–08) to repay and restructure its debt and rebuild reserves. Public debt was brought down from 126 percent of non-oil GDP in 2003 to 32 percent in 2008, while deposits at the central bank rose to 7 percent of non-oil GDP in 2008. Capital spending increased only moderately during this period, but was scaled up substantially when oil prices rose following the global crisis.

Capital spending grew from 8 percent of non-oil GDP in 2008 to about 20 percent in 2011–13, mainly to improve the country's transport and energy infrastructure and to finance the infrastructure needed to host the 2012 Africa Cup of Nations football championship. Favorable oil prices also allowed the government to draw on external financing sources to finance part of the scale up.

However, the very high level of capital spending proved unsustainable. By early 2014, the government started drawing on its deposits, having accumulated significant domestic arrears (equivalent to 12 percent of non-oil GDP), and had to resort to central bank statutory advances at the maximum permissible level. The government was ultimately forced to undertake a fiscal adjustment and cut back its capital spending in 2014 to about 10 percent of non-oil GDP to repay part of its arrears.

Box 1.1. Long-Term Management of Natural Resources

Assessing the long-term sustainability of macro-fiscal policy in resource-rich countries is both crucial and highly complex. Broadly, the approaches to long-term management of natural resources fall into three main groups (Davis, Ossowski, and Fedelino 2003):

- Under the *"bird-in-hand"* approach, countries would save all oil revenue as financial assets, with only the yield from the accumulated financial assets spent. This approach shields the budget from the impact of oil price movements, but can be very restrictive (particularly in the first years). It is better suited for when there is a strong preference for leaving a substantial share of the oil wealth to future generations. (Norway follows a similar approach.)

- Countries can also target a level of spending guided by the return on overall net government wealth. This follows the *permanent income hypothesis (PIH)*. Under the standard PIH approach, governments would consume a constant share of the net government wealth every year. A country with net government wealth substantially higher than its present financial assets could afford to make higher expenditures earlier than under a "bird-in-hand" approach. The standard PIH has been criticized as not being an appropriate framework for low-income countries especially when there are large infrastructure needs.

IMF (2012a) discusses variations that address some of the weaknesses in the standard PIH:

- A *modified PIH (MPIH)* with scaling up of capital spending. Instead of preserving financial wealth over time, this approach allows financial assets to be drawn down for a few years during the scaling-up period. The drawdown would be offset by fiscal adjustment in the future to rebuild financial assets to the same level as under the traditional PIH. This approach does not explicitly account for the potential impact of the scaling up on growth and nonresource revenues.

- The *Fiscal Sustainability Framework* explicitly takes into account the expected impact of higher investment on growth and nonresource revenues. Fiscal sustainability can be consistent with a fiscal target that allows a drawdown of government wealth and eventually stabilizes it at a lower level than the PIH or the MPIH. Lower financial wealth will generate a lower stream of income to the budget than in the PIH-based framework, but this would be compensated for by "fiscal returns" in the form of larger nonresource revenues.

- Under another alternative, countries would spend all current-period oil revenue. This approach poses significant risks and leads to highly volatile spending.

Box 1.2. A Benchmark for Stabilization Savings

Resource-rich countries need larger and more durable buffers than other countries because shocks can be large and highly persistent. Countries could accumulate financial savings to ensure that the investment returns on those assets are enough to avoid large adjustments in the event that commodity prices fall.[1] Such a buffer would be for stabilization purposes, assuming the expenditure plan is sustainable.
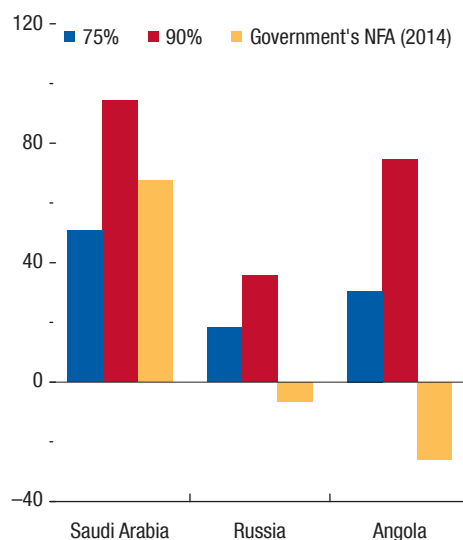
The size of the buffer would depend on the degree of resource dependence and risk tolerance. Countries that already save significant amounts of resource revenues for future generations would have to save less for stabilization purposes (as these are only to guard against shocks to resource revenue that directly funds the annual budgets). The advantage would be that it would help reduce the tendency to spend during revenue booms and provide countercyclical relief during downturns.

As an illustration, the simulations presented in Figure 1.2.1 consider the level of assets that would be sufficient to generate investment returns to cover half the lost revenue over the next five years with 75 percent and 90 percent probability for three major oil exporters: Angola, Russia, and Saudi Arabia.[2] The estimated levels of net financial assets are equivalent to two years of annual resource revenues (for the 75th

Figure 1.2.1. **Precautionary Buffers under Different Degrees of Risk Tolerance**
(Fiscal buffers; percent of 2015 GDP)

Source: IMF staff estimates.
Note: NFA = net financial assets. Estimates of fiscal buffers needed to ensure five-year spending plans (WEO projections) are largely protected with probability of 75 percent and 90 percent under oil price uncertainty. The simulations assume countries would make half of the adjustment in the non-oil balance in the advent of a fall in prices.

[1] Under the PIH with precautionary savings, countries accumulate additional financial assets and use the investment returns on those assets to reduce the volatility. The benchmark proposed here is line with those recommendations.

[2] The simulations assume that the investment returns on these buffers would be used only to shield the budget from downside shock. The level of financial assets would be adjusted annually to ensure the desired level of protection for the next five years.

percentile shocks). Of the three, only Saudi Arabia has net financial assets to provide significant protection over time.

Box 1.3. IMF Technical Assistance to Help Countries Manage Their Natural Resource Wealth

The IMF has had a long history of providing technical assistance to resource-rich countries. In 2010, the IMF extended such efforts in the context of the establishment of the Managing Natural Resource Wealth (MNRW) topical trust fund.

The MNRW is supported by Australia, the European Commission, Kuwait, the Netherlands, Norway, Oman, and Switzerland, and aims to assist low- and lower-middle-income countries endowed with oil, gas, and metals in their efforts to establish the institutional frameworks needed to ensure the management of natural resource wealth in a manner that supports good governance and growth.

The MNRW has funded technical assistance in about 20 countries since its inception, with a focus on improving five areas: fiscal regimes, revenue administration, macro-fiscal policies and public financial management, asset-liability management, and statistics for natural resources.

Box 1.4. The Vital Role of Transparency for the Successful Management of Natural Resources

There are several areas in which greater transparency around resource revenues is particularly important:

- *Estimates of resource wealth.* It is important to provide regular estimates of the value of a country's resource reserves using a range of price scenarios, as well as the rate at which the reserves are being extracted and consumed or converted to financial assets. This information is vital to underpin decisions around the long-term use of natural resources.

- *The collection of resource revenues and their use.* There should be clear reporting on the fiscal regime and on the amount of revenue the government is collecting, and informed understanding and scrutiny of the use of resource revenues by lawmakers, external analysts, and citizens. This should help ensure that revenue collection is effective, resources are used efficiently in line with national objectives, revenues are all incorporated within the budget, and the risk of misuse is reduced.

- *Risks and uncertainty.* Dealing with the volatility of resource revenues, and their finite nature requires effective medium-term and long-term fiscal planning. This should be accompanied by wide-ranging fiscal risk analysis to help ensure the plans are robust in the face of shocks.

The IMF has proposed a draft standard template for the collection of data on government revenues from natural resources, which could be used as a broad guide (*Template to Collect Data on Government Revenues from Natural Resources* 2014). An independent agency, such as the auditor general, could be assigned to assess that the reported revenues are based on the official definition.

An important indicator of the integrity of reporting is the application of international standards, in addition to those developed specifically for reporting on natural resources, such as the Extractive Industries Transparency Initiative. The IMF has also recently published a draft Fourth Pillar of its Fiscal Transparency Code, devoted to resource revenue management, which lays out a set of transparency practices in the full range of areas. Among the key areas are the following:

- The fiscal regime for natural resources should be comprehensive, open, and governed by law.

- Fiscal reporting should cover stocks as well as flows, and include specific assurances of integrity of reported data.

- Specific practices should be stipulated for forecasting and budgeting for resource revenues. This includes transparency around the setting of objectives for the use of resource revenues, the incorporation of all revenues in budget documents, and the transparent operation of any natural resources fund.

- Transparency concerning the fiscal risks arising from natural resource revenues is an important element in the governance of resource revenues. Good practice includes disclosure, analysis, and management of risks, and the publication of a long-term fiscal sustainability analysis. Transparency concerning the activities and finances of public corporations operating in natural resource sectors is also important.

Box 1.5. Fiscal Rules for Resource-Rich Countries

Nonresource primary balance rules (Norway, Timor-Leste). Targeting the nonresource primary balance as a share of nonresource GDP, instead of overall fiscal balance, can lead to a more stabilizing fiscal policy. The target should preferably be set in line with long-term fiscal sustainability goals. This is especially relevant for countries with limited years of commodity reserves. For others, the target could be set to ensure appropriate levels of precautionary savings and be gradually adjusted to converge to the long-term benchmarks over time.

Structural balance budget rules (Chile, Colombia). An alternative rule is based on a structural balance, correcting for both the economic cycle and the commodity price cycle. This approach is especially relevant to countries in which the nonresource economy is significant and the business cycle is not highly correlated with the commodity cycle. It can help avoid procyclical fiscal policy and should be set to ensure an appropriate level of net financial savings. In practice,

the rule is heavily dependent on how the level of the "structural" commodity price is computed.

Price-smoothing rules. Typically, the rule will set commodity reference prices based on a specific formula. If actual revenues exceed the expected revenues, the difference is usually accumulated in a resource fund and can be used in periods of shortfalls. However, such rules have important weaknesses. Usually, they are not linked to sustainability benchmarks, and they are not well prepared to deal with sudden large shocks. They also disregard other shocks (such as those related to production and reserves of natural resources). This type of rule, if used, should be set consistently with a fiscal anchor and ensure that financial buffers are appropriate.

Expenditure rules. These can be useful to contain spending growth during booms and are a good complement to rules based on fiscal aggregates. The rules can reduce the degree of procyclicality and can be set to be consistent with the absorptive capacity constraints (IMF 2012a).
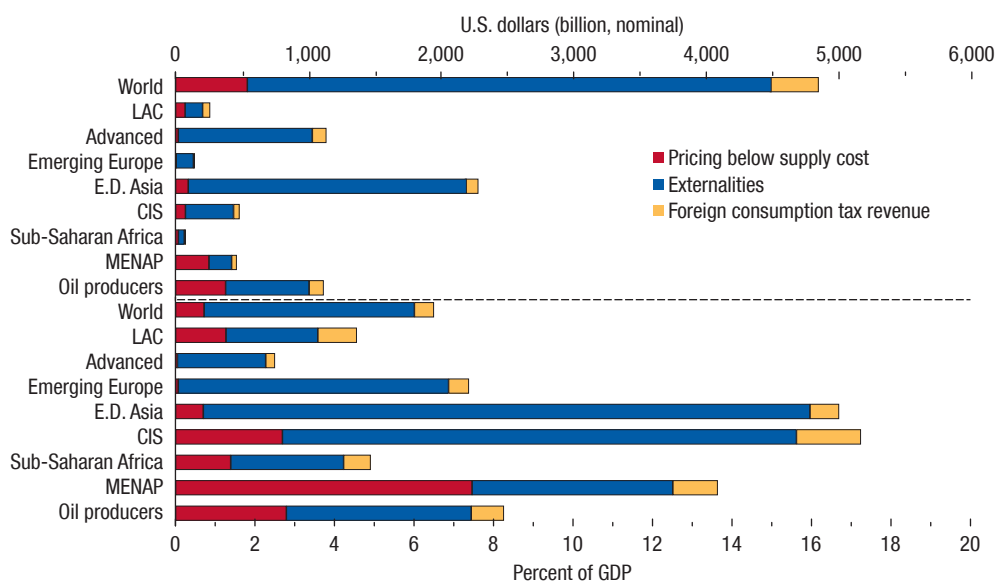
Box 1.6. The Large Size of Global Energy Subsidies

A recent IMF staff study (Coady and others 2015) provides country-level energy subsidy estimates under two different definitions of energy subsidies. Under the first definition, energy subsidies arise when consumer prices are below the opportunity costs of supplying energy—this is the traditional definition of energy subsidies. A broader notion, based on the true costs of energy consumption, also accounts for undercharging for environmental costs—carbon emissions, local air pollution, traffic congestion, and so on—and the failure to fully apply standard rates of consumption taxation.

At a global level, energy subsidies based on the traditional definition were estimated at $541 billion in 2013 (0.7 percent of global GDP), with oil producers accounting for nearly 70 percent of these subsidies. By region, both in dollar terms and in percent of GDP, subsidies were highest in the Middle East, North Africa, Afghanistan, and Pakistan, reflecting the prevalence of oil producers, and lowest in emerging Europe in dollar terms and in advanced economies in percent of GDP.

However, subsidies with respect to the true costs of energy consumption were dramatically larger at $4.9 trillion (6.5 percent of global GDP), with oil producers accounting for a much smaller share (23 percent) (Figure 1.6.1). Energy subsidies under this broader notion are sizable in nearly all countries, with regional averages greater than 2 percent of GDP in all regions. The bulk of these subsidies—over 75 percent at the global level and about 80 percent for oil producers (Table 1.6.1)—are due to underpricing of energy from a domestic perspective (as opposed to global warming). It is therefore in countries' own interests to reflect not only the opportunity costs of supplying energy but also domestic environmental costs in energy prices. Doing so can lead to a substantial fiscal benefit—4.0 percent of GDP at the global level and 6.1 percent of GDP for oil producers—and a significant reduction in deaths related to fossil fuel emissions (55 percent at the global level and 41 percent for oil producers).

Figure 1.6.1. Size of Global Energy Subsidies

Sources: Coady and others (2015); and IMF staff calculations.
Note: CIS = Commonwealth of Independent States; E.D. Asia = emerging and developing Asia; LAC = Latin America and the Caribbean; MENAP = Middle East, North Africa, and Pakistan.

Box 1.6. *(continued).*

Table 1.6.1. Energy Subsidies in Selected Oil Exporters

	Energy Subsidies by Component in Dollars (billions)			Energy Subsidies by Component in Percent of GDP		
	Pricing below supply cost	Externalities	Foregone consumption tax revenue	Pricing below supply cost	Externalities	Foregone consumption tax revenue
Angola	4.6	2.7	0.6	3.7	2.2	0.5
Colombia	0.8	7.4	2.4	0.2	2.0	0.6
Iran	76.2	40.8	1.1	20.8	11.1	0.3
Mexico	11.4	33.9	12.7	0.9	2.7	1.0
Nigeria	3.7	4.4	0.8	0.7	0.8	0.2
Norway	0.1	3.7	0.2	0.0	0.7	0.0
Russia	43.7	241.9	32.2	2.1	11.5	1.5
Saudi Arabia	65.4	49.3	14.2	8.7	6.6	1.9
United Arab Emirates	18.2	12.9	3.5	4.5	3.2	0.9
Venezuela	36.5	19.2	4.4	16.1	8.5	1.9

Source: IMF staff estimates.
Note: The table refers to only energy subsidies in oil exporters. However, some oil importers have similar or even higher energy subsidies in dollar terms and as a share of GDP. See estimates by country: http://imf.org/external/np/fad/subsidies/index.htm

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