

# Rule-Based Resource Revenue Stabilization Funds: A Welfare Comparison

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Non-renewable natural resources generate more than 25 percent of government revenue in 50 countries and provide an even higher share of revenue in petroleum-producing jurisdictions. Resource prices are volatile and difficult to predict, so government revenue in resource-producing regions is also uncertain and volatile. Adjusting government expenditure in response to revenue movements involves economic, social and political costs. To deal with revenue volatility, many jurisdictions utilize revenue stabilization funds, but there is little empirical research on whether stabilization funds improve welfare or on how stabilization fund characteristics affect fund performance. We contribute to the literature by quantifying the impact on welfare of different types of rule-based resource revenue stabilization funds. This allows us to determine whether a fund can improve welfare and whether some fund designs increase welfare by more than others.

Our comparison of stabilization funds focuses on a petroleum-producing jurisdiction since, for many countries and subnational governments, petroleum products are a major revenue source. Petroleum prices are also one of the most volatile types of commodity prices, so stabilization is likely to be particularly important to petroleum-producing regions. As the future path of resource-based revenue is uncertain, we use Monte Carlo techniques to quantify the welfare implications of different stabilization funds. Since the path of resource depletion is likely to have an important impact on welfare, we evaluate the funds under two depletion scenarios: one in which petroleum

production continues indefinitely, and a second in which production falls rapidly to zero. The non-depletion scenario emphasizes the stabilization function of a fund, while the depletion case focuses the analysis on both the stabilization and savings roles of a fund.

Four major types of funds are considered: a *moving average* fund, where government spending is set equal to an equally-weighted moving average of past petroleum revenue; a *revenue band* fund, which constrains only large movements in expenditure; a *rainy day* fund that prevents large declines in government expenditure; and a *fixed deposit — fixed withdrawal* fund, where a fixed proportion of petroleum revenue is deposited in the fund and a fixed proportion of the assets are withdrawn each year to support current spending.

We find large potential welfare gains from the use of a rule-based stabilization fund. The *fixed deposit — fixed withdrawal* fund, when it incorporates a gradual transition to the desired deposit rate, generally yields the highest welfare in both the resource depletion and non-depletion scenarios. An advantage of this fund is that, by design, it incorporates feedback from the accumulated asset stock to current expenditure. This prevents the stock of assets from following an unsustainable path. Simulations for different sets of model parameters show that the fixed deposit and withdrawal rates that yield the highest welfare— a 50 percent deposit rate and a 5 to 10 percent withdrawal rate — are relatively robust. In addition to yielding the highest welfare, a *fixed deposit — fixed withdrawal* fund is easy to understand, implement and monitor.

We also find that the low durability of some stabilization funds is likely due to instability imbedded in their design. For example, funds that specify government expenditure to be a moving average of past resource revenue have a high probability of accumulating infeasible levels of debt or assets. In addition, funds with high savings rates and low withdrawal rates, such as the fund employed by Norway, do not generally lead to the highest welfare as funds of this type accumulate very large asset stocks and generate low levels of current consumption.

