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Optimal Fiscal Management of Resource Windfalls

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Resource windfalls create significant challenges for fiscal management, particularly in low-income countries. On the one hand, there are huge pressures to spend—these countries usually suffer from a lack of access to public services, especially in infrastructure, which generates a wide range of externalities. On the other, however, poor countries also suffer from weak governance and absorption constraints, which militate in favor of spending less today and saving more, most notably by parking resources in a sovereign fund and spending them—or the income that they generate—gradually over time. But are the "corner solutions" (spending it all, or saving it all), as advocated by some, optimal? Recent analytical research suggests not. If governments are concerned with minimizing volatility in the economy, measured in term of the volatility of private consumption (a measure of welfare) and either the nonresource primary balance or a more general index of macroeconomic stability (which accounts for the volatility of the real exchange rate), then neither full spending nor full saving is optimal in response to resource windfalls.

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LA FERDI EST UNE FONDATION RECONNUE D'UTILITÉ PUBLIQUE. ELLE MET EN ŒUVRE AVEC L'IDDRI L'INITIATIVE POUR LE DÉVELOPPEMENT ET LA GOUVERNANCE MONDIALE (IDGM). ELLE COORDONNE LE LABEX IDGM+ QUI L'ASSOCIE AU CERDI ET À L'IDDRI. CETTE PUBLICATION A BÉNÉFICIÉ D'UNE AIDE DE L'ÉTAT FRANÇAIS GÉRÉE PAR L'ANR AU TITRE DU PROGRAMME « INVESTISSEMENTS D'AVENIR » PORTANT LA RÉFÉRENCE « ANR-10-LABX-14-01 »

The design of fiscal policy in developing countries with large endowments of non-renewable natural resources continues to generate much debate among economists and policymakers. While the economic rents created by high commodity prices, or the discovery of new reserves, provide an opportunity to promote economic growth and human development in these countries, managing those resources effectively has proven to be a daunting challenge. Time and again the abundance of natural resources has led to a so-called natural resource curse, which has taken the form of increased rent-seeking, a weakening of institutions, and heightened risks of conflict and civil wars[1]. Global commodity price volatility has often translated into domestic macroeconomic instability. At the same time, large and sustained inflows of foreign exchange associated with resource windfalls have led to Dutch disease effects, that is, a contraction of domestic production of traded goods resulting from increased demand for nontraded goods and a real exchange rate appreciation.

Much of the debate on natural resource management has been dominated by the permanent income hypothesis (PIH) approach. The standard PIH approach implies that, for a country where the only source of government revenues is resource income, the intertemporal budget constraint is satisfied when the nonresource primary deficit is limited to the perpetuity value of resource wealth, that is, the present value of all future resource revenue. From that perspective, the PIH provides a benchmark for the nonresource primary fiscal balance that can be financed indefinitely[2]. In its narrow interpretation, the PIH implies that resource windfalls should be saved in their entirety in the form of financial assets held abroad.

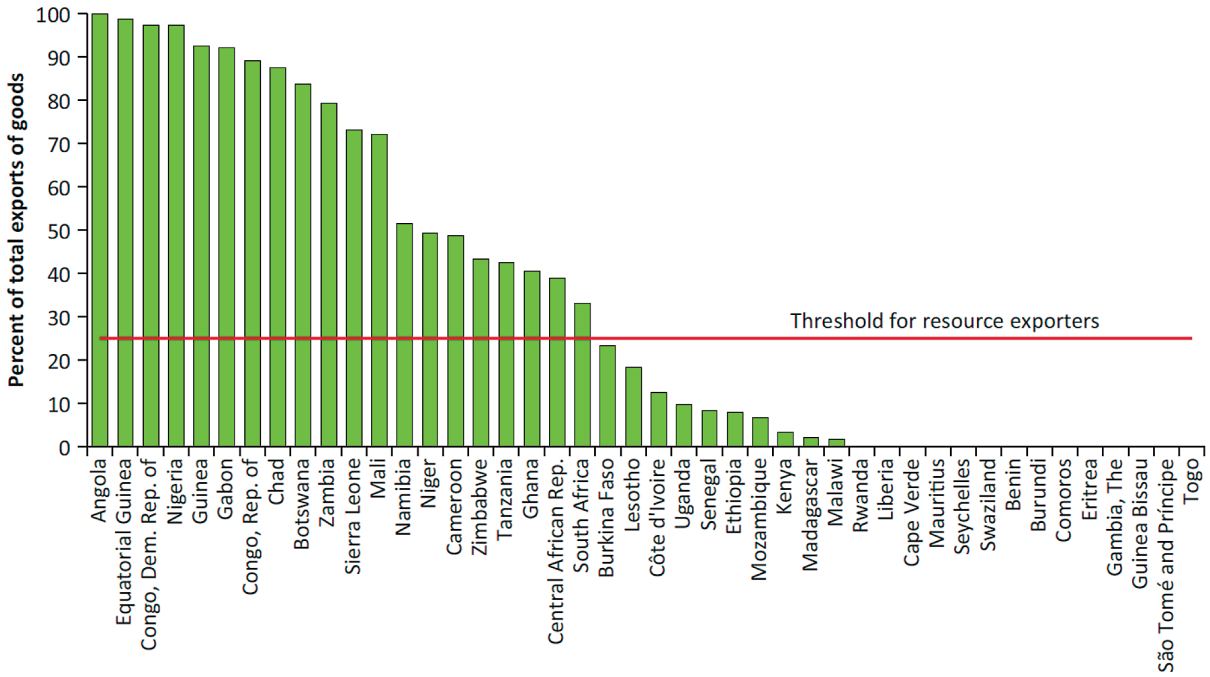
However, some recent research has questioned the relevance of the PIH approach[3]. It has been argued that the PIH is not appropriate for resource-rich countries because it ignores the fact that they suffer from significant weaknesses in terms of access to infrastructure, and that investments in infrastructure, given their lumpy nature, may need to be raised significantly over the short to medium run to create a Big Push (see Agénor (2012, Chapter 6)). Moreover, in the presence of a strong complementarity effect between public capital and private investment, and large externalities in terms of education and health, the rate of return on public investment in infrastructure can potentially be very high. Thus, a fiscal rule that requires investing all income from a resource windfall in safe financial assets held in a sovereign wealth fund can have a high opportunity cost.

The key issue therefore has been to devise more flexible fiscal management rules that allow governments, in response to resources windfalls, to allocate sufficient resources to meet short-term needs in infrastructure investment—and possibly other components of productive spending, in education and health, most notably—while at the same time maintaining fiscal and macroeconomic stability, achieving long-term fiscal sustainability, and ensuring adequate savings for future generations. At the same time, these rules need to account for absorption capacity constraints, which could hamper the quality and effectiveness of government outlays. Indeed, infrastructure spending itself may be inefficient due to a lack of administrative or managerial talent within government. This debate is particularly important for the low-income countries (such as Côte d'Ivoire, Ghana, Kenya, Senegal, and Uganda) that have recently discovered new resources but at the same time

1. For a review of the literature on the resource curse, see van der Ploeg (2011).
2. With projections for nonresource revenue, the nonresource primary balance benchmark also provides an estimate of the "sustainable" level of expenditure (see Baunsgaard et al. (2012), Lundgren et al. (2013)). Note that, in this analysis, there is no distinction between government consumption and total public spending (which includes investment), even though strictly speaking the PIH is a model of (optimal) consumption behavior.
3. The (in)appropriateness of the conventional PIH prescription has been discussed extensively in the literature; see Collier et al. (2010), Gelb and Grassmann (2010), van der Ploeg (2011), Baunsgaard et al. (2012), Lundgren et al. (2013), and Collier (2014).

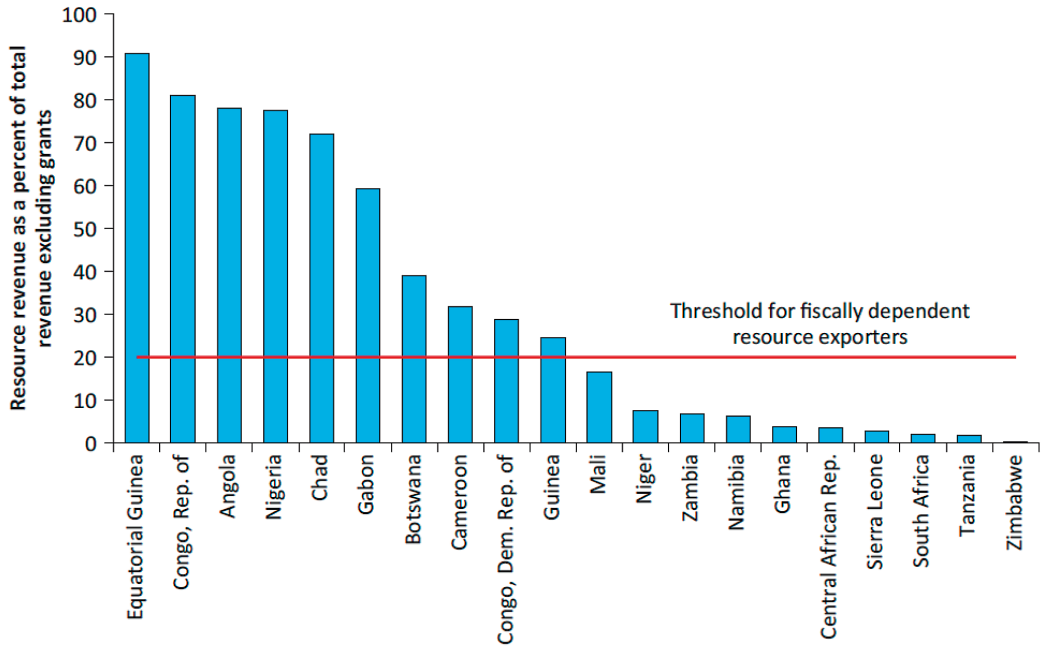
continue to suffer from institutional weaknesses in their ability to select, manage, and evaluate large and complex investment projects. It is also of great practical importance for a number of other poor countries that already suffer from a high degree of concentration of their exports and a high tax dependence on resource revenue, as illustrated in Figures 1 and 2.

Figure 1. Sub-Saharan Africa: Resource Exports, Average 2005-10



Source: Lundgren et al. (2013).

Figure 2. Sub-Saharan African Resource-Intensive Countries: Resource Revenue, Average 2005-10



Source: Lundgren et al. (2013).

Analytical contributions

A number of analytical contributions have attempted to address these issues[4]. Several of them bring together elements of the literature on the optimal management of resource windfalls and the literature on the Dutch disease, which considers more broadly the macroeconomic consequences of large inflows of capital (in the form of aid, remittances, or private capital flows, rather than government-related flows only). They also capture absorptive capacity constraints by negatively relating the efficiency of public investment to the level of investment and provide theoretical support to the view that public investment in infrastructure may dominate saving in foreign assets as an optimal strategy to manage resource revenue in economies where, to begin with, borrowing opportunities on world capital markets and access to infrastructure are limited. However, and somewhat surprisingly, none of these contributions addresses explicitly the issue of the optimal allocation of resource windfalls in a stochastic environment.

A stochastic framework for optimal fiscal policy analysis

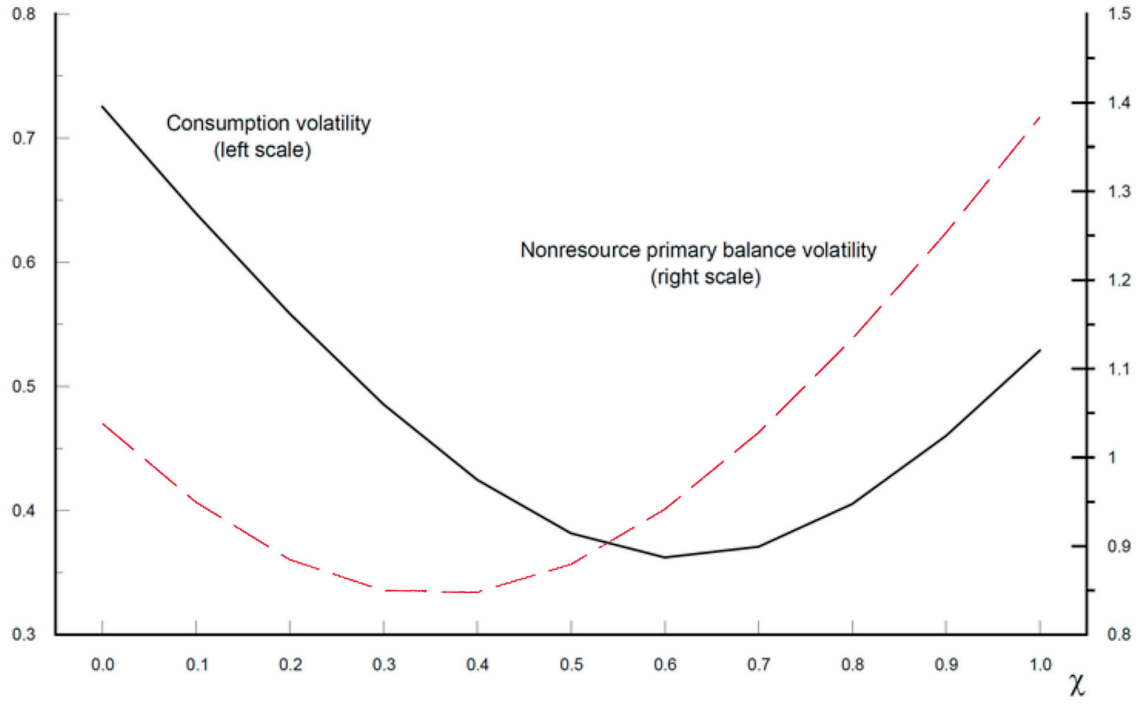
In a recent contribution (Agénor (2014)) I have developed a dynamic stochastic general equilibrium model to study the optimal fiscal response to resource price shocks in a small open low-income country, where agents have limited access to infrastructure. In modeling the externalities associated with public capital, the model accounts for benefits not only in terms of the productivity of private inputs (as conventionally emphasized by macroeconomists) but also in terms of household utility, direct complementarity with private investment, and a reduction of distribution costs. Accounting for these externalities is important to understand the nature of the trade-offs that governments face between spending today or tomorrow. However, public capital is also subject to congestion, and absorption constraints, which depend on the relative scale of public investment itself, adversely affect the efficiency of infrastructure spending.

The model is parameterized for a "typical" low-income country and is used to study the effects of a temporary, positive shock to real resource prices. As noted earlier, because temporary resource windfalls may create (through fiscal expansion) sizable aggregate demand pressures and macroeconomic volatility in the short run—even though supply-side effects may mitigate these effects in the longer run—fiscal rules, in the form of asset accumulation in a sovereign fund, can play an important role in smoothing fluctuations and stabilizing the economy. The key policy issue is thus the following: given dire infrastructure needs and significant constraints on absorption capacity, but also concerns about household welfare and economic volatility, what should be the optimal allocation of a resource windfall between spending today and spending tomorrow, through accumulation in a resource fund? Put differently, how should precautionary buffers be determined? As noted earlier, this issue is of great practical concern to a number of low-income countries, particularly those that are highly vulnerable to volatility and uncertainty of resource revenue as a result of a high degree of concentration of their exports. The analysis aims therefore to account for the revealed preferences of policymakers, in addition to pure welfare considerations.

The answer to this question is obtained by minimizing, with respect to the share of the windfall that should be saved, a social loss function defined as a weighted geometric average of the volatility of private consumption (a measure of household welfare, assuming risk aversion) and the volatility of either a fiscal indicator (the nonresource primary balance) or macroeconomic indicator (which combines the non-

4. See van der Ploeg (2012), Berg et al. (2013), van der Ploeg and Venables (2013), van den Bremer and van der Ploeg (2013), and Collier (2014).

Figure 3. Volatility of Consumption and the Nonresource Primary Balance as a Function of the share of the Resource Windfall Saved



Note: χ, which varies between 0 and 1, is the share of the resource windfall allocated to accumulation in a sovereign fund. Volatility measures are relative (normalized) standard deviations; see Agénor (2014) for details.
Source: Agénor (2014).

resource primary balance and the real exchange rate). The volatility of the nonresource primary balance aims to capture movements in fiscal variables that are not linked to fluctuations in resource prices, whereas movements in the real exchange rate are taken to capture changes in a key relative price, fluctuations in which are often viewed as a key symptom of macroeconomic instability (see Agénor and Montiel (2015)). Thus, the benefits of the self-insurance (or precautionary buffers) provided by a sovereign fund against large commodity price shocks may extend beyond fiscal stability to overall macroeconomic stability, as captured by fluctuations in the real exchange rate.

Intuitively, the reason why an optimal value exists is because each measure of volatility (and thus the social loss function itself) is convex with respect to the share of the windfall that should be parked or invested in a sovereign fund. Spending all the revenues associated with a windfall creates a lot of volatility in the economy. As the share invested increases, more of the windfall is saved; the reduction in today's spending tends at first to reduce that volatility. However, as the share invested continues to rise toward unity, the interest income generated by the assets held in the sovereign fund becomes larger, and this tends to raise spending over time—thereby increasing volatility once again. This effect is not in general symmetric, in part because the increase in spending associated with interest income tends to be more gradual than the reduction in spending initially associated with a higher investment share. But the fundamental point is that there is a dynamic trade-off in the optimal fiscal management of resource windfall. This trade-off is illustrated in Figure 3[5].

5. Sensitivity analysis shows that, as one would expect, the slope of the dynamic trade-off that policymakers face depends on a range of factors; in my paper I analyzed several of them, including the role of absorption constraints.

In the case of a negative shock, the intuition is of course symmetric, with the parameter to be determined being now the proportion of the resources that are taken out of the sovereign fund. With small withdrawals, the adverse shock creates a lot of volatility, in particular through a concomitant contraction in government spending. As more and more resources previously saved are withdrawn from the fund, the adverse effect of the initial shock on spending is mitigated and volatility decreases at first. But as the share of withdrawals continues to rise and public outlays increase, volatility starts increasing again—at a slower rate now, given that (all else equal) the interest income generated by the lower level of assets held in the sovereign fund becomes smaller. Thus, the volatility curve takes again the same convex shape as shown in Figure 3.

Finally, it is also worth emphasizing that the basic intuition of the analysis (the convex shape of the relationship between the share of the windfall saved and volatility) would also hold under a variety of related rules. In particular, instead of assuming (as was done here) that interest income only is transferred to the government budget, it could be assumed, as done in Norway for instance, that all commodity resources are allocated to the sovereign fund, and that a fraction of total fund assets (interest and principal) is withdrawn each period.

Concluding remarks

The foregoing discussion suggests that it is possible to provide a rigorous, yet practical, answer to a crucial question for policymakers in low-income countries confronted with highly volatile movements in resource prices: how much of a windfall should be spent today and how much should be set aside in a sovereign fund to support spending tomorrow, given pressing needs to provide productive goods and promote development, while at the same time accounting for weak governance and absorption constraints? The thrust of the analysis is that in addressing this issue it is important to focus on second moments—in terms not only of the volatility of a household welfare measure but also macroeconomic volatility, in the form either of a narrow indicator of fiscal volatility or a broader measure that also involves fluctuations in the real exchange rate (a key relative price in small open economies). If a government's goal is to minimize volatility then in general neither full spending, nor full saving, represent optimal fiscal responses to resource windfalls in low-income countries—in sharp contrast to the "corner solutions" that some have advocated in the recent literature.

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