Flagship Report Paper Series

Paper 3: Natural resource revenues and macroeconomic policy choices





AFRICAN DEVELOPMENT BANK GROUP



Preface

History shows that an abundance of natural resources does not necessarily improve a country's human development. How can governments turn new discoveries of natural resources into outcomes that matter for their citizens – including better health, better education, and access to quality social services?

Most governments have expressed a commitment to turn revenues from new natural resource discoveries into outcomes that matter for their citizens: better health, better education, and access to quality social services. They also want to make sure the discovery of extractives translates into more and better jobs and business opportunities. Yet they are also aware that delivering on those commitments demands tough and sometimes complex policy choices, including balancing the need for social sector investments with the needs of other sectors across the economy, being transparent and carefully managing citizen expectations, and adequately distributing benefits both between extractives and non-extractives communities and between current and future generations.

In light of these challenges, the African Development Bank (AfDB) and the Bill and Melinda Gates Foundation (BMGF) came together to produce a joint Flagship Report: '*Delivering on the promise: Leveraging natural resources to accelerate human development in Africa*'.

This paper is one of a series of eight in-depth technical background papers which supported the development of the flagship publication. While each background paper can stand alone, they also build on each other. Paper 1 sets out a framework for understanding four key channels through which natural resources can translate into improved human development: 1# public spending on health, education, and social protection; 2# public spending aimed at fostering growth and economic diversification; 3# industry spending on infrastructure, procurement, skills, and employment; and 4# companies' spending on social investments. Paper 2 estimates the likely timing and magnitude of revenue from new discoveries of oil, gas or minerals in six African countries: Ghana, Liberia, Mozambique, Sierra Leone, Tanzania, and Uganda.

The next three papers examine the public spending channels described in the first paper. Paper 3 discusses the macroeconomic risks and policy choices associated with an influx of new revenues from natural resources. Paper 4 explores the potential of new revenues to improve health and education services, comparing the expected scale of revenues to financing needs in the six featured African countries and introducing a diagnostic framework for policy choices. Paper 5 looks at the case for using new revenues to fund basic social protection programs, including the potential to boost demand for health and education services.

The final three papers examine the industry activity channels described in Paper 1. Paper 6 looks at how policies on local content can leverage spending on extractives industry projects to create more broad-based economic growth. Relatedly, Paper 7 explores the policy choices involved in leveraging extractives projects to build skills and human capital. Finally, Paper 8 asks how governments and industry can maximize the human development impact of companies' social investment, a relatively small but potentially important part of company spending in extractives industry projects.

To access the Flagship Report and the other seven background papers presenting complementary in-depth discussions of the policy choices described in this paper, readers are encouraged to consult the dedicated website at: www.NaturalResourcesForHumanDev.org.

Paper 1 – A framework: Human development and the links to natural resources

Paper 2 – Timing and magnitude of new natural resource revenues in Africa

Paper 3 – Natural resource revenues and macroeconomic policy choices

Paper 4 – How to use natural resource revenues to improve health and education in Africa

Paper 5 – How to use natural resource revenues to enhance demand for public services through social protection

Paper 6 – Creating local content for human development in Africa's new natural resource-rich countries

Paper 7 – Leveraging extractive industries for skills development to maximize sustainable growth and employment

Paper 8 – Extractive industries and social investments: Principles for sustainability and options for support

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Disclaimer

This series of papers focuses on one part of the extractives debate and reflects research gaps identified by the contributors within their areas of expertise. The contributors are not held responsible for the views expressed in this report. This paper is based on research, analytics, and expert consultations completed during the writing of the eight background papers. However, this paper should not be considered as an alternative to in-depth technical expertise. Any mention of specific entities, individuals, source materials, trade names, or commercial processes in this publication does not constitute endorsement by the AfDB or the BMGF.

Key messages

- A series of fiscal policy choices determine the impact of new natural resource revenues on the economy as a whole – and thus, in the long term, on human development. The macroeconomic consequences of the natural resource boom influence future economic growth and the fiscal space for government to increase spending.
- Countries with newly discovered natural resources need a legal and administrative framework to safeguard their use and management. This requires greater coordination across public agencies than that required by most policy challenges, and means hiring people with the necessary specialist expertise.
- The influx of natural resource revenues creates a risk of 'Dutch disease', in which nonnatural-resource sectors of the economy are undermined by an appreciation of the real exchange rate (RER). To avoid this risk, spending out of new natural resource receipts should avoid exceeding the economy's capacity to absorb it. The policy prescriptions to mitigate Dutch disease are well known in theory, but identifying changes in the equilibrium RER can be tricky in practice: inflation data need to be well constructed and efficiently produced in order to allow the rapid detection of warning signs and a timely response, for example through monetary policy or curbing spending.
- Policy-makers face a decision as to whether to bring forward new natural resource revenues through borrowing. The opportunity to increase public spending must be weighed against the future burden of debt repayment. Factors to consider comprise the cost of borrowing, the existing debt service burden, and the productivity of borrowed funds that is, will funds will be invested efficiently in well-chosen projects, or will spending be dictated by short-term political imperatives?
- The balance between spending and saving new revenues also needs to be carefully considered. Capital-scarce economies can have high returns on investment but also a low absorptive capacity, leading to the risk of Dutch disease. Policies to increase absorptive capacity include reducing barriers to competition, avoiding price distortions, and mitigating risks to private investment. Several countries have tried to use fiscal rules to prevent overspending, but with mixed results due to strong political temptations to override the rules.
- Sovereign wealth funds (SWFs) are appropriate only if projected revenues are very large. It is costly to set up and run a SWF. If revenues are relatively modest and the aim is to smooth spending over the medium term rather than create income for the long term, it may be more appropriate to save by increasing central banks' foreign currency reserves.
- Spending decisions need to be informed by sound appraisals that account for the need to set aside funds for future operations and maintenance (O&M) spending. A key contributor to Botswana's success in translating diamond revenues into rapid economic growth has been an emphasis on sound project appraisals and ensuring that there is sufficient funding for O&M.
- A common temptation is to respond to new natural resource revenues by raising public sector wages. However, it is necessary to weigh the long-term implications of wage rises against projected natural resource revenues. For example, our analysis shows that, in Uganda,

raising salaries by 25 per cent would use up nearly a third of projected new natural resource revenues over the next 30 years; in Tanzania, it would consume over five-sixths of the total expected revenues. Both Zambia and Ghana have recently suffered from raising wages prematurely.

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List of abbreviations

AfDB	African Development Bank
BMGF	Bill and Melinda Gates Foundation
FDI	Foreign Direct Investment
FPF	Financial Programming Framework
GDP	Gross Domestic Product
GNI	Gross National Income
IMF	International Monetary Fund
MTEF	Medium Term Expenditure Framework
NDA	Net Domestic Assets
NFA	Net Foreign Assets
O&G	Oil and Gas
O&M	Operations and Management
OPM	Oxford Policy Management
RER	Real Exchange Rate
SWF	Sovereign Wealth Fund

1 Introduction

New revenues from the extractive industries represent an opportunity for African countries to transform natural resources in the ground into stronger human development. The impact of a natural resource boom on human development depends on the quality of the macroeconomic management of new revenues, and the extent to which public service provision is improved by additional public spending.

This paper sets out a framework for governments in newly natural resource-rich economies to make strategic choices in the macroeconomic management of new natural resource revenue. Much has been written on the need to avoid the economic risks of a natural resource boom. This paper focuses on certain key macroeconomic policy choices that mediate the impact of new natural resource revenues on human development outcomes. It discusses the factors to consider when making these choices, and the potential implications of different approaches. It also looks at some of the key public financial management decisions that shape the additional 'fiscal space' made available by new natural resource revenues by setting out how to think about the decisions needed for careful natural resource revenue management.

There are, broadly, two sorts of impact from new natural resource revenues, and two corresponding sets of policy choices:

- The first is the broad macroeconomic impact from new natural resource inflows. The policy challenge is to avoid potential Dutch disease effects, whereby an appreciation of the RER threatens to lower long-run growth, particularly in the tradable non-natural-resource sectors of the economy.
- The second relates to public financial management and the transformation of revenue into investments in human development, whether *directly* through public spending on education, health, or other social services; or *indirectly* through new public investment related to economic growth and the diversification of the economy, which are necessary complements to private investment in sustaining economic growth.

Both sets of policy choices are essential for successfully transforming natural resource wealth into human development. The impact of new natural resources on human development depends as much on their impact on the rest of the economy (the non-natural-resource part), and on whether broad economic growth is sustained, as it does on the more direct, linear impact transmitted through the public finances on to public service delivery and public investments.

The rest of the paper is structured as follows:

- Section 2 briefly reviews the literature on the macroeconomic management of a natural resource boom, in particular the avoidance of Dutch disease effects resulting from an appreciated RER;
- Section 3 links natural resource revenues with human development through public finances by looking at the key challenges that countries initially face when they discover new natural resources. First, it outlines issues around setting up a legal and regulatory framework for extractives sectors. Second, it sets out a framework for making a set of key fiscal policy choices faced by countries with new natural resources: whether to take on debt in advance;

the appropriate balance between spending revenue and saving it overseas; and the choice between spending on investment or consumption.

- Section 4 develops the discussion in Section 3 using country-specific projections, derived from a financial programming framework (FPF), for three of the sample countries in Paper 1 Uganda, Tanzania, and Sierra Leone.¹ For each country, it looks at the impact of a plausible borrowing scenario on the country's revenue and debt profiles, and the implications of various increases in public sector salaries, by projecting the cost of salary increases against the expected value of new natural resource revenues under different scenarios.
- Section 5 presents policy implications.
- Annex A describes the FPF applied to model the implications of discrete policy choices in selected sample countries with new natural resources, and the assumptions underlying the figures.

¹ The FPF methodology is also used by the International Monetary Fund (IMF) for the purposes of analyzing the current state of the economy, projecting where the economy is heading, and identifying economic policies that could change the course of the economy (for more detail see Annex A).

2 Managing a natural resource boom

An extensive body of literature exists on the macroeconomic management of natural resource booms. This section briefly reviews this literature in order to frame the discussion of the key fiscal policy choices that countries face when deciding how to use new natural resource revenues, as discussed in detail in Section 3. We start by briefly describing some of the key terms used in this section (see Box 1).

Box 1: Key terms

Tradables: Goods or services that are commonly traded between countries. An appreciation of the RER tends to undermine growth in these sectors by damaging their competitiveness, as was the case with the Dutch manufacturing sector in the wake of the country's gas boom.

Non-tradables: Goods or services that are not commonly traded between countries, such as housing and many personal services that cannot be provided remotely (e.g. cleaning, haircuts, plumbing, and other construction activities).

RER: This is the ratio of the price of tradables and non-tradables. It can be loosely proxied by taking the product of the nominal exchange rate (e.g. the dollar cost of the local currency) and the ratio of domestic prices in the two countries under comparison. The RER, therefore, indicates the number of units of a domestically produced good that can be exchanged for one unit of an equivalent good produced abroad. An RER appreciation, caused by an appreciation of the nominal exchange rate and/or domestic inflation, means that fewer units of the domestically produced good can now be exchanged for one unit of the foreign-produced good, which means that the former is now less competitive.

Elasticity of supply: The extent to which production can be expanded to meet an increase in demand. The elasticity of supply tends to be higher in sectors where large, upfront investments are not required to expand supply, and where key inputs are readily available. For the economy as a whole, the elasticity of supply will be higher when there is spare capacity (i.e. unutilized capital and labor). The elasticity of supply tends to be higher for imports than for domestically produced goods and services because any given increase in demand can be met across a much larger number of producers. Certain types of public spending, like investments in infrastructure or education, are likely to boost the longer-term elasticity of supply by alleviating constraints to the economy's productive capacity.

Absorptive capacity: The capacity of the domestic economy to meet an increase in demand. When supply is not able to keep up with an increase in demand, the economy is said to have run into absorption constraints. This means that more money is now chasing the same amount of goods, which fuels inflation.

Source: authors

2.1 Dutch disease and RER management

The literature on the impact of natural resources on economic development has its roots in the economic models developed to explain the manufacturing recession in the Netherlands (see Box 2),² especially Max Corden's seminal research paper in the *Economic Journal* in 1981.³ This occurred after a resource boom caused the reallocation of factors of production away from the tradables sector and started a process of de-industrialization.

² Examples of this literature include van der Ploeg, 2011; Magud and Sosa, 2010; and Roe, 2010.

³ See Corden and Neary, 1982; and Corden, 1984, for a consolidation of that work.

Box 2: A short introduction to Dutch disease

When a country experiences a natural resource boom, it typically has to deal with a sudden influx of foreign currency, received in return for the exported natural resources, and as an investment in their exploitation. To the extent that it is spent domestically, this influx of foreign currency will drive up both the nominal exchange rate and/or local prices, and, as a result, also drive up the RER – a measure of how many units of a good produced in one country can be exchanged for an equivalent good produced abroad.

The appreciation of the RER makes it harder for other, non-natural-resource sectors of the economy to compete internationally, as it makes their exports more expensive. In consequence, a country's economic gains from its natural resources may be offset by losses in other sectors, working against the drivers of long-run growth that are necessary to sustain economic development once the natural resources have been depleted. The phrase 'Dutch disease' was coined by *The Economist* in the 1970s to describe these adverse economic effects in the Netherlands, where the manufacturing industry experienced a decline after the discovery of natural gas.

Source: authors

While these distributional changes can lead to a recession in the tradables sector, overall gross domestic product (GDP) growth may remain positive because of the increase in national wealth brought about by the natural resource discovery. This was the case in the Netherlands – the onset of gas production was followed by a recession in manufacturing, and an associated increase in unemployment; but total GDP continued to grow.

Since Corden (1984), a body of empirical literature has emerged on whether there is such a thing as a 'resource curse', either because of Dutch disease effects, an increase in rent-seeking, or other consequences of a natural resource boom. This literature has roots in the cross-country regression analysis of Sachs and Warner (1995). In a recent survey comprising 60 papers that examine the link between Dutch disease and economic growth, Magud and Sosa (2010) conclude that:

- 1. Dutch disease does exist, in that as the RER appreciates there is a reallocation of factor inputs and production switches away from manufacturing;
- 2. While Dutch disease *per se* does not appear to reduce overall growth, exchange rate volatility, which may be brought about by a combination of natural resource dependence and commodity price volatility, does hamper growth. In addition, the misalignment of the RER away from its fundamental value tends to lower growth, with over-valuations always having a negative impact on growth (see Figure 1). So, Dutch disease is indeed a risk for countries experiencing natural resource booms.

These findings indicate that countries with new natural resource discoveries do need to be wary of the risk of Dutch disease, and of a decline in growth owing to exchange rate volatility or overvaluation.



Figure 1: Key findings on the RER and growth

2.1.1 The absorption challenge

The degree to which an economy will bump up against the Dutch disease constraint will be determined to a large extent by the magnitude of new natural resources relative to the size and maturity of the economy and the scale of existing financial flows coming into and out of the country.

The core of the policy package required to avert Dutch disease and adverse developments of the exchange rate lies in the fiscal response to new natural resource revenue. Key policy choices related to spending new natural resource revenues are clearly linked to the risk of Dutch disease – the pattern of spending has implications for how much can be spent. In particular, the rate at which spending is increased is key to avoiding adverse impacts on growth – whether through an overvaluation of the exchange rate or volatility. If increases in domestic spending outstrip absorptive capacity, this would lead to an increase in the price of non-tradables and an appreciation of the RER. A pattern of spending that either has a high import content or raises the elasticity of supply of non-tradables would thus accommodate a faster increase in public spending than spending solely focused on non-tradables. As a corollary, spending that makes the supply of non-tradables more elastic mitigates the longer-term risk of RER appreciation dampening growth (see Adam and Bevan, 2006).

One key question here is how governments can tell whether the growth of spending is too fast. In an economy with flexible prices, increases in the prices of tradables will be reflected fairly quickly in inflation. If inflation data are reasonably well constructed and efficiently produced, the government would be able to tell quite promptly whether or not the RER has appreciated. The challenge is then to quickly curb spending in response to these warning signs. Countries that have deep, wellsupervised financial sectors could also use monetary policy to sterilize rapid growth in public spending, as well as to smooth volatility arising from sudden swings in commodity prices.

An additional challenge is to distinguish between a shift in the equilibrium RER, which would be a result of an increase in a country's wealth, and temporary volatility in the RER. However, differentiating between an equilibrium shift and a temporary fluctuation is difficult. As Roe (2011) points out, 'The conventional technical policy response ... is by now very well established in principle... but the actual implementation of the appropriate policy package will invariably be much more difficult' (p. 5).

In conclusion, the policy to avoid an overvaluation of the RER, and thereby moderate the risks of Dutch disease, is mainly fiscal: avoid ramping up spending too fast, work to identify the shift in the equilibrium RERs, and avoid volatility. In practice, this sort of policy package is hard to apply consistently. It is also strikingly conventional in that it advocates being prudent with respect to increases in public expenditure. The challenge for the government, therefore, is to assess the rate of additional spending at which Dutch disease effects begin to materially offset the economic and social benefits gained from increased public expenditure (Henstridge and Page, 2012).

3 Linking natural resource revenues and human development through public finances

Correctly interpreting the macroeconomic context in each country will provide insight into some of the key policy questions that emerged in Section 2: how much of the revenue can effectively be invested straight away, how much ought to be prudently set aside for future use, and how much (if any) should be brought forward by borrowing, and when.

This section starts by looking at the immediate challenges that countries face when they discover new natural resources. It then discusses a set of key fiscal policy choices that shape the impact of natural resource revenues on macroeconomic performance: whether to take on debt; the appropriate balance between spending revenue and saving it overseas; and the balance of spending on investment and consumption. Later, in Section 4, we review some of the calibration of these decisions using FPFs for a selection of our sample countries.

3.1 Immediate challenges: Policy, authority, and coordination of new natural resource discoveries

When countries discover natural resources, an immediate challenge they face relates to ensuring that the legal and administrative framework for the sector, and for revenue management, is fit for purpose. This means defining up-to-date policies, drafting and approving a range of laws to reflect policy and regulations to guide implementation, and assigning clear responsibility to government agencies for administration. These are the elements necessary for assigning authority and achieving coordination across the sequence of transformations that take sub-soil natural resources and turn them into stronger human development outcomes.

The sequence of transformations which link natural resources to human development is illustrated in

Figure 2. These transformations are complex – from stock to flow, sub-soil mineral to welfare, and public control to private recipient – and the policy and administration is also complex, requiring stronger coordination across public agencies than is required by most policy challenges. It is also vulnerable to a weakest link problem: the connection between new natural resource assets and stronger human development is broken if one link in this chain fails.



Figure 2: Asset transformation – from natural resource wealth to human development progress

Figure 3 illustrates most of the elements in the process of establishing and administering this framework. These range from the way that exploration licenses are issued and production contracts agreed, to the regulation of the environmental impacts of the extractive industry, and the management and use of natural resource revenues. The extent to which extractive industry revenues lead to positive economic and social outcomes hinges on the quality and transparency of each of the decisions within this framework. For further information on the design of the fiscal and regulatory framework, see the IMF's handbook and technical note on administering fiscal regimes for extractive industries (IMF, 2014c; IMF, 2014d).



Figure 3: Legal and administrative framework

Countries with new natural resource discoveries may already have laws and policies for the extractive sector. However, these are often out of date or not fit for purpose in the new natural resource-rich environment. This may be because they assign overlapping responsibilities to different government agencies, or because there are ambiguities in the policy framework, or a lack of capacity within key agencies to carry out their assigned roles. This means that most countries with new natural resource discoveries will face the task of developing a legal and regulatory framework for the sector.

This presents governments with their first key challenge – that of finding suitable people and technical resources to develop and manage the regulatory framework. A new, modern, complex industry requires specialist skills and experience if it is to be well regulated. Indeed, regulators often need many of the skills required by the industry itself, for instance to negotiate appropriate contract terms. Even though highly skilled specialist negotiators can be brought in, they are not cheap, and a minimum level of capacity is needed even just to hire the right specialists.

A related challenge is that governments need to establish tight coordination across a range of public agencies that are unlikely to have worked together in such a way. Such coordination requires appropriate specialist knowledge and experience. It also requires that different agencies choose to work together toward the common good, instead of using their veto power to obstruct policies that are in the broader national interest. A coordinated outcome is unlikely to be achieved by sitting down in a committee. No-one likes to be 'coordinated' by others: it implies a power relationship. Therefore some power has to be applied to deliver coordination, which requires both authority and technical expertise – it is hard for even a powerful generalist to coordinate a

specialist. And this likely entails some pooling of power: a mutual renunciation of a veto on collective action.

A second key challenge that countries face early on is resisting the often strong public pressure to see immediate results from the natural resource boom. Natural resource discoveries tend to lead to soaring expectations of instant improvements in standards of living. However, this is at odds with reality – it takes time for production to begin, and even longer for extractives companies to recover their capital costs and start to make significant payments to the government. Meanwhile, if people start to wonder where all the money they had been expecting has gone, public dissatisfaction may set in, creating pressure for the government to show quick results through visible increases in spending. If that pressure is part of an election cycle, then the political imperative to take short-term decisions may be overwhelming.

Whenever strategic decision-making on investment is best tackled with a long-term perspective, pressure for quick spending is problematic. This is especially true when deciding how to use a large, potentially volatile increase in revenue for long-term development. Offsetting such pressure entails the management of expectations through a public information campaign to spread awareness and spark debate about the risks of different fiscal decisions, the lessons from other countries, and the long-term need to save and invest a portion of revenue in order to ensure that spending increases can be sustained. Recognition that the long term spans several terms of office can provide impetus to establish a cross-political party consensus on long-term public investment. In addition, transparency in relation to the receipt and use of revenue is key: if people can see that revenues are indeed being saved, this may mitigate the pressure to see immediate large spending increases.

3.2 Policy choices: a framework for making fiscal decisions

The link between new revenues and human development outcomes is sustained through a sequence of policy decisions. We focus on some specific decisions to frame the trade-offs in a way that could mitigate, through argument and evidence, the political pressures that could compromise reasonably sound policy-making.

We use a simple framework with a sketch decision-tree for policy choices, as shown in Figure 4. One of the earliest choices is whether to bring forward new natural resource revenues by borrowing in advance against the security of future expected revenues. Once revenue begins to flow, governments then need to decide whether to spend or save it; how to save it; and, if it is to be spent, then how much should be spent on consumption, and how much on investment? Higher consumption may be driven by an increase in public sector salaries, which is a recurrent cost in the government budget, or by higher spending on O&M. Higher public investments may be channeled into infrastructure or public sector capabilities. All these policy choices will impact the potential of natural resource revenues to improve human development.



Figure 4: A framework for key fiscal policy choices

3.2.1 Borrowing in advance to bring forward natural resource revenues?

When there is a secure prospect of foreign revenues that are due to materialize in the future, there will be both an economic and a political case for borrowing to bring spending forward. There is a time value to money and effective public spending is better increased sooner rather than later. Political incentives will also invariably push for more spending now rather than later. However, borrowing to bring spending forward entails a burden of repayment in the future, with associated interest costs.

In terms of the economic arguments, the decision to borrow will hinge critically on the extent to which debt-financed expenditure is expected to have a positive impact on growth (and hence the tax base) and human development outcomes; and therefore the degree to which increased debt servicing costs are a justified additional burden. This will partly be dependent on the cost of borrowing, the existing debt stock and debt service burden, and the productivity or otherwise of the borrowed funds.

The calibration of debt burdens is usually done with a 'debt sustainability analysis' that assesses whether more debt can be expected to be repaid without a severe burden on public finances. The current debt sustainability analyses for our countries, as reported in the latest IMF Article IV reports, show that there is space to borrow. However, this does not mean that all of these countries should borrow. Rather, as mentioned above, this decision hinges on how productively additional natural resources are likely to be spent. An important reason for caution is the time-inconsistency that drives the political imperative to borrow: revenue brought forward for current political reasons may be spent to meet current political goals rather than longer-term more productive objectives.

Figure 5 shows the consequence of borrowing in advance for three countries with the prospect of new natural resource revenues on two parameters: share of public investments and the debt-to-GDP ratio. The shifts depicted in the figure are based on the assumption that all new debt is put toward public investment (as opposed to consumption). There is of course no assurance that all new borrowing will in fact be committed to investment, and nor need it be. The purpose of the figure is merely to illustrate the *potential* impact of advanced borrowing on the ratio of public investment to GDP. The impact of such investment spending would depend on a range of factors, notably the extent to which investment projects are evaluated for their social and economic impact, whether there is a credible O&M plan, and whether the public capacity to execute projects exists (see Section 3.2.4 below for further discussion of the effectiveness of spending).



Figure 5: The possible impact on public investments from borrowing in advance of receiving natural resource revenues

Source: authors' calculations based on IMF IV Reports. Note: The dollar amounts we used in these scenarios were based on the scope for new borrowing implied by debtsustainability analyses. The details for each country are discussed in the next section.

Countries expecting new natural resource production could face pressure to bring forward revenues by issuing sovereign bonds. Ultimately, borrowing only makes sense if it will generate enough economic returns to at least cover the future interest payments. However, past experiences show immense political pressure to borrow and spend less wisely.

Within the last decade, beginning with the Seychelles in 2006, the use of sovereign bonds has rapidly grown in sub-Saharan Africa. This trend has been driven by easy global financing conditions as well as rising financing needs, reduced access to concessional loans, and

undeveloped domestic financial markets among the issuing countries. In addition to providing finance for infrastructure investments, sovereign bond issuance can also represent an opportunity for countries to lower their debt servicing costs, provide a benchmark for pricing corporate bonds in international markets, strengthen macroeconomic discipline, transparency, and structural reforms, and lessen dependency on traditional aid providers. Conversely, issuing foreign debt exposes a country to greater risks, specifically debt sustainability risk, exchange rate risk, and refinancing risk.

The risk is that giving in to the pressure to borrow could result in future generations missing out, as illustrated by the recent experience of Zambia (see Box 3). Some of these risks may be mitigated through advance preparation in conducting debt sustainability analyses and formulating a debt strategy, analyzing refinancing risks in advance, developing a clear plan for infrastructure investments, maintaining prudent fiscal policy, and strengthening governance.

Box 3: Zambia – the dangers of borrowing against future natural resource revenues

Zambia's experience serves as a case study to show that risks are larger in contexts where there is a limited debt management capacity and political pressure meets weak governance. This is because there will always be pressure to spend sovereign bond receipts on immediate needs rather than on investments. If the sovereign bond is not allocated to growth-enhancing investment projects, however, the government will face severe difficulty in repaying the bond at maturity.

Zambia debuted on the sovereign bond market in 2012, with an issuance of US\$ 750 million amortized over ten years for the notional purpose of funding infrastructure projects in energy and transportation. While average bond inflows for countries with gross national income (GNI) comparable to Zambia (US\$ 1,000 per person) are the equivalent of 0.05 per cent of GNI each year, Zambia's 2012 sovereign bond inflow amounted to the equivalent of 3.75 per cent of GNI, or 0.375 per cent per year – over seven times the average.

Although Zambia's copper production was expected to support continued strong GDP growth, having a greater share of its GDP and debt represented by foreign bonds increased the country's exposure to external shocks. In addition, because sovereign debt creates a mismatch between a government's revenues and its liabilities, any currency depreciation would lead to increases in the effective yield, thus creating higher debt servicing costs. Exchange rate risk heightens debt sustainability risk inasmuch as a negative shock, such as a fall in global resource prices, could lead to currency depreciation, GDP contraction, higher debt servicing costs, and an increased debt-to-GDP ratio that threatens debt sustainability.

Zambia experienced the costs of taking these risks in 2014, when global copper prices fell by over 30 per cent. This not only dampened growth prospects but also sparked a rapid depreciation of the kwacha, thereby increasing the country's effective debt servicing costs. Furthermore, Zambia's public wage bill increased by approximately 40 per cent between 2011 and 2013 under domestic political pressures. As a result, some of the financing for infrastructure investments was reallocated toward recurrent expenditures. In combination, these pressures have widened Zambia's fiscal imbalance and increased its debt-to-GDP ratio, threatening macroeconomic stability and increasing refinancing risk. Between its first bond issuance in September 2012 and its second one in April 2014 for an additional US\$ 1 billion over ten years, the bond yield at issue increased by three percentage points, from 5.6 per cent to 8.6 per cent, reflecting the country's increased exposure to refinancing risk in addition to exchange rate and debt sustainability risk.

Source: authors' analysis based on IMF Article IV report data

3.2.2 The balance between spending or saving abroad: Macroeconomic absorption constraints

Once revenue starts to flow, countries need to decide how much to spend and how much to save abroad. If one thinks of natural resource revenues in terms of the monetization of an asset that is gradually being depleted, this suggests that all natural resource revenue should be invested in new public capital in order to sustain the public sector balance sheet. However, natural resource wealth can also be thought of as an addition to national wealth, justifying an increase in consumption.

In a capital-scarce economy, returns to domestic investment tend to be high. However, decisions as to how much to spend immediately should also be informed by absorptive constraints. The prospect of high returns in a capital-scarce economy creates an economic case for fairly large increases in public spending at the outset. However, capital scarcity also implies that the elasticity of supply for most goods and services may be relatively low, at least initially. As a result, beyond a point, increases in spending would tend to drive up prices rather than lead to higher production. This would contribute to the Dutch disease effects described in Section 2, which would compromise growth in the rest of the economy, particularly in the non-natural-resource tradables sectors.

Over time, supply constraints can be alleviated using appropriate public policies and through public investments (for instance in roads and power) that complement and support private investment. The policies required to support productive capacity and alleviate supply constraints are fairly widely recognized. These include reducing barriers to competition, avoiding price distortions, and mitigating risks to private investment.

A number of risks will need to be overcome, and supportive policies put in place, if public spending is to be scaled up without running into Dutch disease. Part of the literature on the economic impact of natural resources notes that the presence of natural resource rents distorts the incentives faced by political leaders. This makes it harder to sustain sound economic policies, and creates a tendency for political support to be sustained through the distribution of natural resource rents. In extreme cases, competition for natural resource rents can lead to conflict and a collapse in growth (Auty, 2004).

In addition to supportive policies, some targeted spending is likely to be required to alleviate supply constraints. This may include spending to improve the quality of public infrastructure or the supply of skilled labor. However, once again, governments face a balancing act when deciding how quickly to increase spending. While targeted expenditure can help to boost the elasticity of supply over time, in the short term, if it is increased too fast, it is likely to become unproductive precisely because supply constraints still exist.

Besides issues of absorptive capacity, an additional argument for saving a portion of natural resource revenue is the need to safeguard the economy from the effects of commodity price volatility. Recent research suggests that natural resource revenue volatility has resulted in more pro-cyclical fiscal policy in natural resource-abundant countries, such as Venezuela and Nigeria, than in non-natural resource countries. This has resulted in boom and bust cycles of economic activity (IMF, 2012). Commodity price shocks can also lead to sharp movements in the exchange rate (for instance, the recent slump of the Zambian kwacha), which have an adverse effect on growth. The policy challenge here is to de-link revenue from expenditure to avoid destabilizing cycles. This can be achieved by accumulating savings when prices are high, and creating a pool of natural resources that can be tapped into when revenue falls. If these funds are saved abroad, this would also weaken the link between natural resource revenues and foreign-exchange inflows, and therefore the exchange rate.

Commodity prices often change in unforeseeable ways. For instance, the price of crude oil has varied from around US\$ 60 per barrel to US\$ 110 per barrel over the past five years (BP, 2014). For much of the past few years, it was remarkably stable, until it suddenly halved in the second half of 2014 to

below US\$ 50 per barrel in early 2015. This type of pattern presents significant challenges because it creates a false sense of security during periods of price stability, and makes it difficult to sustain the impetus to save during these periods.

Price fluctuations partly explain the mixed experience with fiscal rules, which many countries have tried to use to smooth revenue, prevent macroeconomic volatility, or side-step temptations to overspend.

There is a range of possible fiscal rules for thinking about the transformation of revenue into public spending. A fiscal rule is defined as a permanent constraint on fiscal policy through simple numerical limits on budgetary aggregates (Kopits and Symansky, 1998). Regardless of the type of fiscal rule, they are institutional mechanisms aimed at supporting fiscal credibility and discipline. They can be budgetary rules, debt rules, spending rules, or revenues rules. The aim of a fiscal rule in this context is to formalize the amount of revenue that can be spent in any fiscal year.

Box 4: Examples of fiscal rules on spending

Fiscal rules can be based on a range of targets imposed on the non-resource budget or based on resource prices. Non-resource balance targets can either provide a ceiling for the non-resource budget deficit linked to a medium-term estimate of the resource revenue, or take into account the absorption capacity of the economy by setting expenditure targets based on indicators such as inflation, the RER, and interest rates.

Cases of countries that have used non-resource rules include the following:

- **Norway** has successfully implemented an approach whereby the portion of natural resource revenues used to finance the non-resource deficit is set at a maximum level of 4 per cent over the medium term;
- **Timor-Leste** used a similar approach to Norway, whereby the current non-resource deficit is linked to 3 per cent of the net present value of natural resource wealth. However, in this case adherence to the rule has been waived by parliament in favor of scaling up public expenditure;
- In Papua New Guinea, largely successful rules were adopted, although the use of GDP figures instead of non-natural-resource GDP has caused volatility in spending;
- In **Botswana**, the portion of diamond revenues used to finance the budget has to be equal to capital spending in the budget;
- In Ecuador the rules were abandoned;
- Chile's successful arrangement is based on a structural balanced budget mechanism.

Source: authors

Van der Ploeg and Venables (2011) set out a formal model for comparing choices related to how much spending should be increased over time, whether funds should be invested in the domestic economy or in foreign assets, and the optimal balance between private and public domestic investment. They note that the answer will depend on the context: the appropriate choice for a capital-scarce economy (meaning most sub-Saharan African countries) will differ from that for a mature capital-abundant economy (such as Norway).

Under the 'bird-in-hand' rule, all natural resource revenues are saved in an offshore SWF, and only the interest on these funds is spent. As revenue accumulates in the SWF, interest income rises steadily, allowing for larger increases in consumption over time. Once revenue ceases to flow, the amount of money in the SWF stabilizes, and the country receives a constant level of interest income (assuming no fluctuations in interest rates).

The second rule, the 'permanent income hypothesis', represents an extreme form of consumption smoothing. Under this rule, the increase in wealth represented by the natural resource discovery

leads to a permanent, one-off increase to a new level of consumption that remains constant over time. This would involve some borrowing at the start, while natural resource revenue accumulates. Ultimately, the step increase in consumption will be sustained by interest income on the accumulated funds.

The 'developing' rule, as modeled by van der Ploeg and Venables (2011), involves a large increase in public spending at the outset, and progressively smaller increases over time. The rationale for this rule is that, in countries with low levels of income, the returns to consumption today will be higher than those for a future generation that is better off. Similarly, the returns to domestic investment and the paying off of national debt will be higher in the current capital-scarce environment than in a future situation where capital is more abundant. This justifies a relatively rapid increase in spending at the start, as opposed to a pattern of revenue use that leads to a steady level of consumption over time.

The latter rule is most relevant to our sample countries and is illustrated in the scenario illustrated in Figure 6. The assertion underpinning this scenario is that there is an optimal social return to spending some, but not all, new revenue – thanks to a combination of regular savings and the characteristics of compound interest, a considerable accumulation of savings is achieved between 2018 and 2045, when the oil runs out. These savings provide the government with a constant income stream (assuming a 5 per cent return annually). This scenario illustrates the long-run power of compounding, if governments save the revenue they are unable to absorb effectively. Of course, it might be harder to sustain savings under political pressure than it is to develop the capacity to manage increased public investment effectively, and this scenario is, of course, devoid of politics. In addition, it does not contain any of the elements of the scenarios we have set out below, in particular in relation to increased public sector pay.

The formal modeling of van der Ploeg and Venables (2011) also abstracts from reality, as they point out, among other things:

- It abstracts from the Dutch disease effects that come from bottle-necks, or changes in relative prices, and the sort of absorption constraints discussed in the previous section;
- As we have noted, it abstracts from the politics of spending: most accounts of a 'resource curse' effect underline the political pressure to spend too much, too fast.



Figure 6: The 'developing' rule – a scenario for revenue, spending, and saving⁴

3.2.3 When saving: The choice between central bank reserves or a SWF

If governments choose to save some portion of the foreign currency they receive in return for natural resources, there are broadly two ways in which they can do so – through the central bank or by setting up a SWF. The simplest way for a country to save foreign currencies is to increase the reserves of those currencies held by its central bank. Building the institution of a SWF is an alternative but more complex way for a government to seek to protect returns.

SWFs present an advantage when the expected revenues are large enough to justify saving for the long term, as dividends from investments can potentially generate a permanent income stream for the government and therefore for future generations. However, there are disadvantages – setting up and running a SWF involves considerable fixed costs, and it can be difficult to insulate long-term investment decisions from short-term political considerations. Only when the expected revenues are large enough to justify saving for the long term are the benefits likely to outweigh the costs – a SWF is less likely to be a good idea when the expected revenues are relatively small and the aim is only to smooth expenditure over the medium term. In many of the mining economies, for instance, this threshold is unlikely to be met.

A range of different fiscal rules have been used, in some cases including the establishment of special funds as savings or smoothing devices. In Box 5, we describe a number of different resource funds set up in Ghana, Norway, and Nigeria, and the various challenges they have faced in achieving their objectives.

⁴ This illustration was constructed by taking the baseline for development expenditure (i.e. what the government is projected to spend assuming the extractives project did not happen), and then assuming that the absorptive capacity – both in the economy and the capacity for managing – sharply increased public investment. We assume that there is a rapid increase in oil production from 2019, and an initial capacity to spend an additional 15 per cent on top of baseline development expenditure, rising to 30 per cent by 2023. Each year, the balance (i.e. new revenue minus the additional spending) is placed into a saving mechanism that returns 5 per cent per annum at constant prices.

Box 5: Examples of the use of savings funds

Norway, one of the world's largest petroleum exporters, channels a portion of its oil revenue into a sovereign fund, which invests in financial assets across 42 different markets and 31 currencies. The fund is Europe's largest and, of those run by governments, lags behind only that of the United Arab Emirates. What distinguishes it from most sovereign funds is the transparency of its overall strategy and investments. Its performance and risk exposure are reported on a quarterly basis and its holdings in about 3,500 companies are detailed annually; in most cases, its investment in any single company amounts to less than 1 per cent of the available shares.

The Petroleum Revenue Management Act in **Ghana** provides a framework to determine the allocation of petroleum revenues between the annual budget and two sovereign funds managed by the Central Bank: the Stabilization Fund (designed to offset revenue volatility across years) and the Heritage Fund (a savings account for the benefit of future generations of Ghanaians). To date, the major constraint to the effectiveness of this regime has been the regular political interference in determining the 'reference price' which determines how much of the revenue is allocated to the funds and how much is transferred to the annual budget.

In **Nigeria**, the allocation of oil revenue between the budget and the Excess Crude Account (a revenue stabilization fund) is, similarly, governed by the difference between actual oil prices and a benchmark price. The funds accumulated in the Excess Crude Account played a key role in insulating the Nigerian economy from recession following the slump in global oil prices in 2009. However, the fund has not been replenished since then, despite the recovery in global oil prices, resulting in significant fiscal pressure following the decline in oil prices in early 2015.

Source: IMF (2012)

3.2.4 How to best balance spending on consumption and investment

A country's success in identifying sound public investment projects will determine its success in translating natural resource revenues into economic and human development. This requires proper budgeting for the recurrent O&M spending needed if one-off capital investments are to remain productive – for example, the decision on whether or not to build a new hospital must accurately account for factors including the future salaries of staff, cost of drugs, and maintenance of buildings.

There are a number of factors to consider when choosing between public investment and consumption. For instance, recent economic modeling has shown that the returns to sensible O&M spending are significantly higher than the returns to new public capital investment (Adam and Bevan, 2014). The design and execution of capital investment projects, as well as the scheduling and budgeting for O&M programs, both require strong capabilities within the relevant government institutions. Gupta et al (2011) show that project selection and implementation are important contributors to public capital and growth. Building such capabilities is itself an investment of great significance, and therefore an important complement to investments in infrastructure.

In regard to the more direct channels of impact on human development outcomes, a combination of consumption on skilled personnel and an appropriate public sector pay policy are often important determinants of the government's ability to deliver public services. At the same time, investment expenditure associated with building, operating, and maintaining public capital is often an important complement to private capital investment, and thus contributes to economic growth. This, in turn, supports the increases in income required for people to pay for improved service delivery (either directly or through their taxes).

Experience in developing countries suggests that public investment can often lead to a relatively low accumulation of installed public capital, as O&M expenditures are neglected or poorly planned. The potential pay-off to a combination of strong institutional arrangements for budgeting and implementing O&M expenditures is substantial, especially if combined with a sound public investment program, as illustrated by the experience of Botswana (see Box 6).

Box 6: O&M in Botswana

One of the major contributors to Botswana's success in translating diamond revenues into rapid economic growth was a firm insistence on good quality appraisal for each public investment project. The ability to prepare sound appraisals, and to recognize and reject weak or inadequate appraisals, was a required capability for officials to advance in their careers in the Ministry of Finance.

In addition, the public investment program in Botswana was careful to provide for the recurrent maintenance costs for new public assets. There was a rule of thumb that some 18 per cent of the capital cost had to be budgeted to cover the ongoing operating costs of any asset, whether a school, medical facility, road, or bridge. When they went and checked later, planners found that the actual ratio was a bit higher and responded by cutting back on the investment program. This is another example of feedback being used to sustain the quality of a public investment program.

Source: Henstridge and Page (2012)

3.2.5 The implications of an increase in consumption to increase public sector wages

A common temptation is to use new natural resource revenues for immediate consumption by increasing public sector wages. The extent to which salaries should be increased hinges on three main considerations. First, is there a sustainable increase in national wealth that should be reflected in consumption, including in relation to expenditure on public sector wages? Second, what is the current size of the wage bill relative to GDP, to current revenues, and to the anticipated new natural resource revenue? Third, are some wage increases justified by the need to attract better-qualified staff, for instance to ensure that the policy challenges associated with managing the natural resource sector are met effectively, or that the public sector has the skills required to invest natural resource revenues productively?

The scale of sustainable salary increases differs dramatically across our study group countries, depending on the factors set out above. To illustrate this, Figure 7 compares absolute step changes in wages (the horizontal axis) with the proportion of natural resource revenues – expected between 2015 and 2030 – accounted for by such an increase (the vertical axis) across the three countries of comparison. The contrast between Tanzania (with relatively little scope for increasing wages) and Uganda (where fairly large increases might account for less than 50 per cent of the expected revenue) is particularly striking.



Figure 7: How much of a wage increase can be afforded?

In recent years, both Ghana and Zambia have sharply increased public sector wages, partly in response to higher actual or expected levels of natural resource revenues. Both have subsequently been in negotiations with the IMF as their fiscal positions have deteriorated, with the increase in salary costs being compounded by falling prices for their main export commodities. Most dramatically, this concerns the drop in the price of oil (in Ghana) and copper (Zambia) in the second half of 2014 (see Box 7).

Box 7: Wages and salaries - lessons from Zambia and Ghana

In the years following his election in 2011, President Michael Sata's administration in Zambia was challenged by a number of public sector employee strikes, including by unions of teachers, nurses, and university lecturers. Concessions to these workers contributed to a real expansion of the public sector wage bill by approximately 40 per cent between 2011 and 2013, increasing from 7.9 per cent to 9.8 per cent of GDP. At the same time, the fiscal deficit widened from 2.2 per cent to 4.9 per cent of GDP, equivalent to the costs of running a basic social protection program (see Paper 5 for more details on this). As a result, Zambia's debtto-GDP ratio grew from 20.1 per cent to 30.3 per cent during these two years. This deterioration of the fiscal situation has played a role in Zambia's credit downgrade from B+ to B by Fitch and, accompanied by rising inflationary pressures and a steep depreciation of the kwacha, has exposed Zambia's inherent economic vulnerability.

Ghana's public sector wage bill similarly increased between 2011 and 2013. This was in response to electoral pressures and demands for wage increases from public sector employees in the midst of the country's transition to the Single Spine Pay Policy, which was designed to ensure equal pay for equal work. Ghana's compromised fiscal position contributed to downgrading of its credit rating from B+ to B in 2013, rapid currency deflation (the cedi fell by one-third against the dollar between January and August 2014), rising interest rates, and an increase in the current account deficit, which stood at 12.3 per cent of GDP in 2013. The deterioration in the country's macroeconomic performance has been politically costly for president John Dramani Mahama's administration, generating criticism from the opposition that it has mishandled the economy. Politically unpopular but necessary measures undertaken as a result have included subsidy cuts, an increase in VAT, and a freeze on public sector salaries and hiring.

In both Zambia and Ghana, attempts to satisfy immediate public demands have compromised fiscal positions and longer-term political leverage. Both have been in negotiations with the IMF, with a program agreed with Ghana in April 2015.

Source: IMF Article IV reports

4 Impact of policy choices in selected sample countries

This section provides more country-specific detail on the topics discussed above in relation to three countries: Tanzania, Uganda, and Sierra Leone. It analyzes the potential macroeconomic impact of new revenues in each country and the policy challenges that need to be addressed in order to maintain a credible and stable fiscal regime. This is achieved through the use of an FPF that helps us to understand the size of new financial flows – such as Foreign Direct Investment (FDI), government revenue, and imported capital goods – relative to the status quo, on the basis of which an educated judgment can be made regarding the level of investment that the economy can reasonably absorb without causing problems elsewhere in the economy. For more detail on FPFs, see the example concerning Tanzania set out in Annex A.

4.1 Overview of assumptions

For each country, we first look at the impact of a plausible borrowing scenario on the country's revenue and debt profiles. The size of the loans in these scenarios is based on two considerations: estimates of the maximum amount that each country is likely to be able to borrow given the size of recent sovereign debt operations in Africa and the amount of new debt that it could take on while maintaining a debt-to-GDP ratio of less than 50 per cent. For all countries, we assume the interest rate on capital is 5 per cent throughout the repayment period and the repayment agreement includes a five-year grace period from the start of the debt operation, followed by a ten-year repayment plan. The country-specific assumptions made are shown in Table 1.

#	Year of bond issue	The cumulative value of the bond spread across five years (equal installments)				
Tanzania	2016 (*)	US\$ 2.5 billion (US\$ 500 million)				
Uganda	2015 (*)	US\$ 2.0 billion (US\$ 400 million)				
Sierra Leone	2015	US\$ 350 million (US\$ 70 million)				
Source: authors Note: Five years ahead of the start of production.						

Table 1: Country-specific assumptions in borrowing scenarios

We then consider the implications of decisions to increase public sector salaries, by projecting the ongoing cost of salary increases against the expected value of new natural resource revenues under three different scenarios. Each scenario assumes a single-step increase to the level of salary expenditure in 2015, followed by a rate of annual growth consistent with the baseline – simply defined as the trajectory of wages as a share of GDP without any further step increases. Scenario 1 considers a very modest increase of 10 per cent; scenario 2 projects a more substantial increase of 25 per cent; while scenario 3 examines a 50 per cent increase. These increases are broadly consistent with the magnitudes of increase experienced in Ghana and Zambia.

4.2 Estimated impact of policy choices in Tanzania

Since 2010, international oil and gas companies have made several large-scale discoveries in Tanzania. Richmond Energy Partners estimated in 2014 that BG/Ophir had 14 trillion cubic feet of

reserves and that the Statoil/ExxonMobil consortium had discoveries of 13 trillion cubic feet. Although large in absolute dollar terms, Tanzania's revenue from gas is expected to account for a relatively small share of the economy – under the baseline price scenario, it is projected to amount to US\$ 1.4 billion per year on average over the first ten years of production, but to account for 1.9 per cent of GDP and 9 per cent of baseline government revenue. These figures are highly sensitive to price fluctuations, with the contribution of new natural resource revenues to GDP over the first ten years of production ranging from 1.4 per cent to 2.9 per cent in two alternative price scenarios (see Paper 2 for more detail).

Figure 8 highlights that the impact of the debt operation on revenue smoothing is relatively limited. This is because the size of borrowing, while substantial compared to the existing stock of public debt, is small relative to the scale of projected new natural resource revenue between 2020 and 2050. Given the size of recent sovereign debt operations in Africa, it is very unlikely that Tanzania would be able to secure a debt operation much larger than the assumed US\$ 2.5 billion. As a result, the main benefit of carrying out such a debt operation would be to bring forward growthenhancing investments prior to the onset of oil revenue.

At US\$ 1 billion, the total cost of borrowing (the total interest paid during the course of the debt operation) is equivalent to just 5.8 per cent of new natural resource revenue between 2016 and 2030 (the length of the debt operation). However, it amounts to 40 per cent of the value of the borrowed funds, which is substantial. This is largely due to the length of the repayment period, as well as to the fact that interest on capital is being paid during the five-year grace period (where no repayment of capital is taking place). As a result, for the debt operation to be fully justified, it would be necessary to ensure that any investment projects financed by the loan could generate a substantial economic or social return relatively quickly. Furthermore, with public debt already in excess of 50 per cent of GDP (see Figure 8: Debt profile), the quality of investment choices would be critical in ensuring that the pace of economic growth is positively impacted, and therefore that the country's debt-servicing capacity is sustained.



Figure 8: Tanzania – borrowing scenario

As illustrated in Figure 9 below, the fiscal space provided to the government through new revenues is extremely sensitive to even relatively modest changes in public sector salaries. For example, if the government raised salaries by 25 per cent in 2015, the cost of this increase over the following 35 years would represent 84 per cent of total expected resource revenues over the period. A decision to increase salaries by 50 per cent would be economically infeasible since it would account for more than 100 per cent of the expected revenue enhancement.



Figure 9: Tanzania – public wage bill scenarios

4.3 Estimated impact of policy choices in Uganda

Projections suggest that government revenue from the Albertine Graben project in Uganda will account for 17 per cent of baseline government revenue. This reflects both the significant size of the project and Uganda's low prevailing tax collection rates. These projections are highly sensitive to price. Over the first ten years of production, new oil revenues are expected to amount to 2.9 per cent of GDP in the event of a 25 per cent decline in prices, and 6.9 per cent of GDP if prices were to rise by 25 per cent. In the baseline scenario, they are projected to amount to 4.9 per cent of GDP (see Paper 2 for more details).

As in the case of Tanzania, the impact of the debt operation on revenue smoothing is limited (see Figure 10). While the magnitude of borrowing is substantial compared to the existing public debt stock (partly as a result of which a larger debt issue is unlikely), it is small compared to the scale of projected new natural resource revenue between 2020 and 2030. As a result, the main benefit of carrying out such a debt operation would be to bring forward growth-enhancing investments prior to the onset of oil revenue.

The cost of borrowing also has similar features to those seen in the case of Tanzania. At US\$ 750 million, total interest payments over the course of the debt operation would be equivalent to just 2 per cent of new natural resource revenue over the same period, but would amount to 37.5 per cent of the value of the borrowed funds.

As a result, for the debt operation to be fully justified, it would be necessary to ensure that proposed investment projects generate a substantial economic or social return relatively quickly, particularly as the public debt-to-GDP ratio already exceeds 40 per cent (see Figure 10: Debt profile).



Figure 10: Uganda – borrowing scenario

Three public wage bill scenarios are illustrated in Figure 11, which shows that the fiscal space provided to the government through new revenues is sensitive to even relatively modest hikes in public sector salaries. For example, if the government were to raise salaries by 25 per cent in 2015, the cost to the government of this increase over the following 30 years would represent 32 per cent of new natural resource revenue over the period.



Figure 11: Uganda – public wage bill scenarios

4.4 Estimated impact of policy choices in Sierra Leone

The projections suggest that government revenue from the Tonkolili and Marampa iron-ore mines project will be equivalent to a sizable share of the government of Sierra Leone's revenue in the absence of the mining projects – 23 per cent over the first ten years of production in the baseline price scenario. While the economic significance of new natural resource revenues is sensitive to commodity prices in all sample countries considered in this paper, this vulnerability is most stark in the case of Sierra Leone. If the price of iron ore were to rise by 25 per cent, new natural resource revenue would account for roughly 7 per cent of GDP and 48 per cent of baseline government revenue. If prices were to fall by 25 per cent, we expect that the four projects under consideration would become uneconomical, cutting off revenue flows from this source.

Figure 12 illustrates the impact of the debt operation described above. It would be relatively significant in terms of its revenue smoothing potential, despite the relatively small scale of the borrowing in comparison to the other countries analyzed. This is because the size of borrowing is substantial relative to the scale of the projected new natural resource revenue between 2015 and 2030. In line with this, one potential benefit of conducting this debt operation would be to avoid the sudden jump in revenues that is projected to occur between 2019 and 2021 (from US\$ 185 million to US\$ 350 million), which the economy may not be able to absorb without some disruptive consequences.

Although the total cost of borrowing is equivalent to just 2.7 per cent of the total revenue between 2015 and 2029 (the length of the debt operation), at US\$ 131 million it is high relative to the size of the total borrowing (37.5 per cent). As in the other two country cases, this is largely due to the length of the repayment period, as well as to the fact that interest on capital is being paid during the five-year grace period (during which no repayment of capital is taking place). As a result, for the debt operation to be fully justified, it would be necessary to ensure that proposed investment projects generate a substantial economic or social return relatively quickly.

Furthermore, with public debt currently hovering around 40 per cent of GDP (see Figure 12: Debt profile) the quality of investment choices would be critical for ensuring a positive impact on the pace of economic growth. This would, in turn, ensure that the government would be able to repay the additional debt.



Figure 12: Sierra Leone – borrowing scenario

Three public wage bill scenarios are illustrated in Figure 13, which shows that the fiscal space provided to the government through new revenues is extremely sensitive to even relatively modest hikes in public sector salaries. For example, if the government were to raise salaries by 25 per cent in 2015 (scenario 2), the cost over the following 15 years would represent 54 per cent of new natural resource revenues over the period. A decision to increase salaries by 50 per cent would wipe out the entire value of the new revenue, leaving nothing for other forms of spending or investments in the economy's productive capacity.



Figure 13: Sierra Leone – public wage bill scenarios

5 Policy implications

This paper shows that the macroeconomic management of new natural resource revenues has major implications for their impact on human development outcomes. This creates a strong rationale for paying careful attention to the types of fiscal decisions outlined above, and to find ways to insulate governments from the pressure for politically driven, short-term decision-making.

The potential for natural resource discoveries to strengthen human development depends as much on their impact on the rest of the economy as on their contribution to the financing of public services.

The impact on the non-natural-resource economy determines whether broad economic growth will be sustained, which is necessary for the sustainability of public services targeting human development outcomes. This impact is, in turn, mediated by fiscal policy choices, which influence whether the country is able to avoid Dutch disease and the extent to which new natural resource revenues translate into a long-term shift in the economy's productive capacity.

When countries discover natural resources, the first task that they face is to create a legal and administrative framework to determine and safeguard their use and management.

This framework needs to be well designed and skillfully handled in order to maximize the impact of the resource boom on human development. However, this typically runs into two key challenges: a lack of specialist, industry-specific skills and experience within the government; and the difficulties of getting various disparate public agencies to coordinate effectively with each another. These early challenges need to be tackled effectively, for instance by bringing new, high-caliber staff into key public agencies. However, these people may need to be recruited from abroad given that industry-specific skills are unlikely to be available locally in the early stages of the industry's development. In addition to accumulating skills, power and authority need to be deployed to align the interests within government for a coordinated outcome.

Governments of newly natural resource-rich countries need to withstand early and strong public pressure to deliver immediate results.

If this pressure is part of an election cycle, then the political imperative to take short-term decisions may be overwhelming. This, in turn, can present a major stumbling block – long-term strategic thinking is undoubtedly needed when deciding how to use a potentially large but volatile increase in revenue to lay the foundations for sustainable, broad-based growth. One way to tackle this may be to launch a public information campaign to spread awareness and spark debate about the implications of different fiscal decisions, particularly the less-obvious, unintended negative consequences of spending too much, too fast, as described in this paper.

A longer-term challenge is to prevent commodity price volatility from leading to boom and bust cycles of economic activity.

This requires de-linking public revenue from expenditure to avoid destabilizing cycles. This can be achieved by accumulating savings in good times that, in principle, can be tapped when natural

resource inflows fall short. Clear and strong fiscal rules of the type adopted by Chile provide one way of doing this, although these need to be carefully formulated to shield them from political interference.

A key early fiscal choice is whether to borrow in advance to bring spending forward.

There may well be a rationale for this, especially in capital-scarce economies where returns to investment tend to be high – though a capital-scarce economy may also have absorption constraints. However, the benefits of spending early need to be weighed carefully against future debt repayment costs. This trade-off will be shaped by the cost of borrowing, the existing debt stock and debt service burden, and the productivity or otherwise of the borrowed funds. The productivity of spending will, in turn, depend on whether borrowed funds are invested or used to finance recurrent costs, and the efficiency with which they are invested.

To avoid Dutch disease, countries need to be cautious about the balance between saving and spending, and the rate at which spending is increased.

If the economy is unable to absorb increases in spending, this is likely to translate into a faster appreciation of the RER, with adverse consequences for non-resource tradables sectors. A pattern of spending that either has a high import content or which raises the elasticity of supply of non-tradables (for instance by making the economy as a whole more productive) would thus accommodate a faster increase in public spending than otherwise. There is also an important role to be played by targeted spending that can help to boost the productivity of the tradables sectors and, therefore, combat the adverse effects of Dutch disease.

On the question of how to save, SWFs are unlikely to be appropriate if expected revenues are relatively small and the aim is only to smooth expenditure over the medium term.

In this case, the large fixed costs of a SWF are unlikely to be justified, and it may be more sensible to smooth expenditure simply by allowing the central bank to accumulate more foreign reserves. SWFs are suitable primarily when the expected revenues are large enough to justify saving for the long term, to create an income stream for future generations.

On the question of how to spend, the key policy choice is to balance investment with consumption (such as increasing public sector wages).

In recent years, both Ghana and Zambia have sharply increased public sector wages partly in response to higher actual or expected natural resource revenues. Both have subsequently been in negotiations with the IMF as their fiscal positions have deteriorated, with the increase in salary costs compounded by falling prices for their main export commodities. The key lesson here is that countries need to think carefully about how much of an increase in wages they can sustain.

For example, in Uganda, if the government was to raise salaries by 25 per cent in 2015 the costs over the following 30 years would use up nearly a third of projected new natural resource revenues; in Tanzania, a similar decision would consume over five-sixths of the total expected revenues. Countries also need to consider whether the increase in the wage bill has implications for future revenue-raising capacity, for instance because higher wages are being used to attract

better-qualified staff. However, the typical pattern has been one of governments succumbing to political pressure for broad-based pay increases that are not linked to performance or productivity.

A final critical issue is the efficiency of public expenditure.

The experience of developing countries suggests that, often, such efficiency is low. This points to the need for two critical measures: improving the quality of investment project appraisal, selection and execution; and planning and budgeting for the recurrent costs relating to O&M. Botswana has risen to these challenges, partly by making project appraisal skills a required capability for officials to advance in the Ministry of Finance, and by introducing rules of thumb to set aside funds for O&M.

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Annex A FPF approach and assumptions

This annex describes our approach to financial programming that we applied to each of our sampled countries. It is illustrated here using the specific example of Tanzania to show the details of the approach. It is applied to the other countries following the same approach. For further details on Uganda and Sierra Leone, please contact OPM.

A.1 The approach

In order to gain insight on the potential macroeconomic impact of natural resource revenues, we have adopted the FPF methodology used by the IMF for the purposes of analyzing the current state of the economy, projecting where the economy is headed, and identifying economic policies that could change the course of the economy. Financial programming involves constructing a consistent set of accounts for each sector of the economy (GDP, public finances, balance of payments, and the banking system) based upon a set of historic data drawn from the IMF. By making assumptions on some key variables, such as future rates of economic growth, government revenue and expenditure and the provision of external aid, the FPF is able to forecast estimates of the potential fiscal position of the government under different scenarios.

We used a simple set of assumptions consistent with existing IMF projections, to give a baseline scenario. To understand the potential macroeconomic impact of additional revenues, we mapped project cash flows – such as FDI, imported capital goods and services, exports, dividends and remittances, and the various streams of revenue to the public finances – on to the balance of payments and fiscal accounts of each country. We then analyzed the impact of these new financial flows on the central bank balance sheet to assess the extent of the monetary impact, from which inflation and exchange rate concerns typically emerge. These do not offer a finely wrought or precise forecast, which would be infeasible for the lifetime of the projects we are looking at; rather, they provide a cartoon-like impression of the main macroeconomic accounts through to 2050.

A.2 Example: Application of FPF to Tanzania

The outcome of the baseline projection is summarized in Table 2 below, which highlights the combination of a fiscal adjustment through the rest of this decade (predicated on foreign concessional finance falling as a share of GDP) and a stronger trade balance. These provide the basis for a combination of sustained gross reserves as a multiple of (prospective) imports of goods and services, contained changes in credit to government, and sustained growth in broad money and credit to the private sector.

Table 2: Tanzania – summary of b	paseline projections
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	2013/14	2019/20	2029/30	2049/50
Fiscal:				
Tax and non-tax revenue	18.0%	21.2%	23.2%	24.1%
Expenditure	28.4%	25.5%	25.8%	26.8%
Of which: salaries and wages	7.7%	7.4%	7.5%	7.7%
Overall balance (before grants)	-10.4%	-4.3%	-2.6%	-2.7%
Foreign financing (net)	6.4%	1.5%	0.8%	0.2%
Domestic financing (net)	0.3%	0.5%	1.0%	2.5%
Balance of payments				
Trade balance	-19%	-15%	-13%	-12%
Current Account balance	-17%	-12%	-10%	-8%
Overall balance	0%	0%	1%	1%
Gross reserves (prospective months of imports of goods and services)	3.5	3.3	3.1	3.1
Monetary				
Growth in M3 (average for previous five years)	10%	11%	10%	10%
M3/GDP	33%	40%	52%	90%
Private sector credit/GDP	21%	22%	27%	43%
Memorandum Items:				
GDP per capita (US\$/person) (*)	663	809	1,224	2,965
Public sector debt/GDP	53%	50%	39%	34%

 $\textbf{Source:} authors' \ calculations \ based \ on \ selected \ IMF \ IV \ Reports$

Note: (*) Data for calendar years: from 2015, then 2020, 2030 and 2050. Figures are shown as a percentage of GDP, unless otherwise indicated.

When we map the new financial flows from the project onto the baseline, we do not make any assumptions on the spending of these new natural resources. Instead, we assume that all government revenues are saved (i.e. built up as reserves – 'net foreign assets' (NFA) – in the central bank, with a corresponding credit to the government's bank account – 'net domestic assets' (NDA)). Public savings are taken to be essential for maintaining projections broadly consistent with macroeconomic stability. If and when these revenues are spent, the impact on macroeconomic stability in the short term will be determined by the import-intensity of such expenditure.

Assumptions

We used actual data for recent years from AfDB data and IMF Staff Reports to build the baseline scenario for each model. We made simplifications where possible and provided further elaboration where necessary.⁵

We also used the initial projections sometimes available in AfDB reports and usually available in IMF Article IV Staff Reports. However, we simplified the basis for our framework as follows: we used constant price, constant exchange rate US\$ data for all accounts. Therefore, there is no inflation and no exchange rates in our framework. This generally simplifies the analysis, and is consistent with a broadly sketched macroeconomic framework within which it is possible to illustrate the scale and timing of the opportunity relating to new spending out of new natural resource revenues.

We sought to converge on a more or less 'straight-line' set of consistent baseline projections before illustrating the impact of the projects.

- We needed to conduct a consistency check between the balance of payments and the fiscal projections, and set up projections of the monetary survey with steady growth in broad money and private sector credit consistent with avoiding 'crowding out', continued monetization of the economy, and broad macroeconomic stability. This allowed us to check that our projections of the balance of payments and the fiscal position were consistent with baseline monetary projections.
- For example, in the case of Tanzania, the baseline required a stronger trade balance so as to sustain an overall position on the balance of payments that was consistent with gross reserves being maintained at three months of imports of goods and services. At the same time, the fiscal projections needed to show an initial period of tightening, followed by a long period of steadily improving tax revenue as a percentage of GDP as our projections of donor inflows remained constant in US\$ terms.

The following summarizes our approach to baseline projections for Tanzania:

- The average growth of GDP is 7.2 per cent, based on UN demographic projections of working-age population and average productivity growth rate.
- The base line assumptions for the fiscal table are:
 - Tax revenue rises briskly from 16.3 per cent of GDP in 2012/13 to 18.3 per cent in 2015/16, consistent with the objectives in Tanzania's five-year development plan. It then rises smoothly to 23 per cent of GDP by 2034/35, and is then flat as a percentage of GDP.
 - o Non-tax revenue rises to 2.1 per cent of GDP in 2015/16, and is then flat.
 - Program grants are held at US\$ 500 million until 2020/21 and then fall by US\$ 30 million each year to zero by 2035/36; program loans are held flat at US\$ 550 million until 2020/21, then fall by US\$ 30 million from 2020/21, to reach zero by 2038/39. These assumptions are consistent with a 'graduation' from grants for projects and budget support.
 - o The key elements of expenditure are initially lowered as a percentage of GDP, to give an adjustment to a fiscal position more consistent with sustained macroeconomic

⁵ Some lines of spending were not needed in certain cases (e.g. Uganda), but greater detail on the composition of the stock of public debt, and on the timing of specific non-concessional debt flows was needed in other countries (e.g. Tanzania), than was directly available from the IMF Staff Reports.

stability (on our framework), with: (i) wages changing from the 7.7 per cent of GDP that the IMF had projected for 2013/14 in June 2013, to 7.5 per cent of GDP in 2014/15, and then remaining flat for the rest of our projections; (ii) expenditure on goods and services decreases from 10.4 per cent of GDP in 2013/14 to 9.5 per cent of GDP in 2016/17 and is then held flat; (iii) development expenditure, which had risen from 8 per cent of GDP in 2010/11 up to 9.2 per cent of GDP projected (by the IMF) for 2013/14, will be limited to 7.8 per cent of GDP from 2015/16, and then held flat.

- Borrowing, as with grants, is projected in terms of US\$: concessional program loans are projected at US\$ 350 million, and concessional project loans are projected at US\$ 600 million from 2016/17 onwards; non-concessional borrowing is projected at US\$ 400 million through to 2030/31, then rises from 2030/31 to US\$ 800 each year and is held constant as a percentage of GDP from 2033/34 onwards.
- Debt terms: we assume that concessional debt has a 1 per cent charge, five years grace and 30 years repayment broadly equivalent to International Development Association-type terms while non-concessional debt has a 4.5 per cent (real US\$) interest rate, and is repaid over ten years. This allows us to project amortization and debt stock, based on the beginning of period debt stocks and these terms for new borrowing.
- o Interest is charged on the debt stock from the end of the previous period.
- Pipeline debt, financed from China, is included in our projections, as are the loans for the power-generating plants that we have been able to identify (which are on nonconcessional terms).
- Domestic financing is essentially a residual to the fiscal table, some of which is accounted for with net borrowing from the non-bank private sector, the rest being net borrowing from the banking sector.
- The baseline assumptions for the balance of payments entail an adjustment to the trade balance with stronger export performance, and other elements of the balance of payments are flat either as a percentage of GDP, or for public sector grants and borrowing, flat in terms of US\$, matching the fiscal projections. The main assumptions are:
- Exports rise from around 20 per cent of GDP in 2013/14 to 21 per cent of GDP by 2016/17 and then undergo a smooth increase to 2032/33, where they flatten off at just over 24 per cent of GDP.
- Imports fall from just under 37 per cent of GDP in 2013/14 to just under 34 per cent of GDP in 2016/17, and are flat at just over 32.5 per cent of GDP from 2022/33.
- o Income (which is other factor income) is flat at -0.7 per cent of GDP.
- FDI is set at 4 per cent of GDP in 2014/15 and 2015/16 because we are looking to exclude from our baseline the impact on FDI expected from the investment in gas production and LNG; it rises to 4.5 per cent of GDP in 2016/17 and from 2018/19 rises to 5 per cent of GDP in 2024/25, from which point it is flat.
- o Current transfers (other private flows) are flat at 1.2 per cent of GDP.
- o Public transfers and borrowing are flat in US\$ terms, matching the assumptions in the fiscal table.
- The overall balance is, in effect, a residual, which is matched by changes in gross reserves – apart from the projected changes in fund credit between 2013/14 and 2015/16.

- We project a simplified **monetary survey** as a broad consistency check:
 - The growth in base money the central bank liabilities is projected as matching the growth in GDP (which in this framework is both real and nominal GDP).
 - Central bank assets are projected as follow: (i) 'Other Items (net)' is projected flat in dollar terms; (ii) the change in NFA is driven by the change in gross reserves in the balance of payments; (iii) the change in central bank credit to the government is the same as the change in NDA, and is a residual.
 - The growth of broad money in the monetary survey is driven by GDP growth plus an incremental growth of 3.5 per cent on top of GDP growth through to 2025/26, when it slows to an extra 3 per cent, and from 2034/35 it slows smoothly to be 2.2 per cent faster than GDP growth.
 - Private sector credit is also projected to grow by an increment to GDP growth, which is flat at 2.5 per cent until 2028/29. It then rises slowly to 3 per cent in 2034/35, from which point it is flat (as an increment to GDP growth).
 - The net foreign assets of the banking sector comprise the change in central bank NFA and the change in the banks' foreign assets, which is taken from 'other private inflows' in the balance of payments.
 - o Changes in credit to government is a combination of the change in NDA of the central bank, and a residual in the monetary survey as a whole.
- **Consistency check**: we now have two versions of changes in credit to the government. The first is from the monetary survey, which is principally driven by our assumptions about changes in money growth and private sector credit growth, and the outcome of our balance of payments projections. The second is the residual in the fiscal accounts. We secure a reasonable consistency between these two versions by ensuring that they broadly match. This was the case for all the baseline projections we have carried out.