# Revenue Sharing in Mining in Africa: Empirical Proxies and Determinants of Government Take

Summary of Working Paper 81 by Olav Lundstøl

Government revenues from mining represent a significant potential source of domestic finance for development. There is limited evidence available to assess to what extent the government share captured through taxes, royalties and ownership interest has represented an optimal degree of revenue sharing with private mining companies. There are however strong indications of imbalance when considering the relative growth in mining sector income and the accompanying tax payments, even when considering investments and operative costs.

The paper examines the resource rent literature and find it a complicated basis for assessing revenue sharing between government and companies. An alternative approach that compares the relative contribution of mining to government revenue and gross domestic product is utilised as a proxy for this purpose. Using a twenty-year data set for dominant mining countries in Sub Saharan Africa together with two benchmark global mining countries, we estimate foregone mining government revenue of 2–13 percent of GDP per year on average for countries such as Ghana, Tanzania and Zambia in particular.

## The theory and empirics of resource rent, and a practical benchmark approach

The initial concept of rent in mining was developed already by Ricardo in 1817, when he emphasised that the cost of the lowest quality mine would decide the market price and thereby the profit and rent for the other mines. Later contributions developed among others by Hotelling in 1931 developed an equilibrium condition for such a resource, that the price should grow at a rate equal to the rate of interest. Implicit in this literature was the availability

of profits and resource rent. Hartwick in the 1970s developed an associated savings and investment rule, where the rents had to be invested in reproducible capital to maintain per capita consumption and wealth over time.

It has proven difficult to test the Hotelling equilibrium condition even in modern adaptations of it. Authors such as Tilton 2004 and Hart-Spiro 2011 argue that either there are no or very low levels of Hotelling type scarcity rent in mineral extraction over longer periods. Livernois 2009, argue that there is little in the empirics of mineral prices that in the long term invalidates the theory, indicating that Solow 1993 may be right pointing out that most tests have only calculated gross margins (sales values less extraction cost) rather than rents.

Despite the above, contributions such as Gelb and Grassman 2010, and Collier and Venables 2011, argue that there is significant rent in mining and the extractive sector in general. Linked to the underlying principle in this literature is the recognition that there exists an inherent factor of production and different associated rents. Based on this a simple principle put forward by Conrad 2012 is introduced; 'that mineral revenues should be a greater share of total revenue relative to the sector value added because government is collecting royalties on a factor of production, a phenomenon unique to mining'.

## Proxies of revenue sharing through value added and government take ratios

As a proxy of the degree of revenue sharing in mining we develop ratios for a twenty year period from 1994-2013 for five of the dominant mining countries in SSA, accounting for above 70 percent of key mineral output from the

region. The analysis include two international advanced mining countries, Australia and Chile, that respectively account for a major percentage of several of the main minerals produced in the comparator countries. The period covered incorporate both what have been seen as low and high real price cycles in the global minerals market according to Cuddington and Jerrett 2008.

Two main ratios are calculated. The only difference between them is that one use in the denominator the mining exports instead of the mining contribution to the gross domestic product. The formulas are respectively: (MGT/TR) / (MGDP/TGDP) and (MGT/TR) / (ME/TGDP). The reason why the second ratio is included is that in many developing countries the national account data for mining is based on old input-output ratios that often do not reflect the economic realities of the sector. The ratio comparisons reveal large differences between the countries, with Botswana and Chile as the top performers with ratios of 1.94 and 1.80 and 1.44 and 1.21, for the twenty-year period from 1994-2013. For Ghana, Tanzania and Zambia the ratios are significantly below 1.00 when the denominator adjustment is made in the second ratio (for Australia and South Africa the difference is minor, similar to Botswana and Chile).

For Botswana and Chile, the state ownership interest is significant in the overall government take/revenue collected from the mining sector. In Chile, it accounted for as much as 71 percent over the period whereas in Botswana the equivalent data breakdown is not available for the entire period but from 2000-2012 it was 58 percent. Utilising the average ratios (for ratio 2 described above), the Conrad ratio (1.00) and the highest ratio (Botswana), we see that if the countries in the sample had achieved improved benefit sharing between the state and the companies, it could on average have meant as much as 3-13 percent of GDP in higher mining revenue per year over the twenty year period for Zambia. For other countries, the difference is somewhat smaller, with 1.3-4.4 percent of GDP/year for Ghana, 0-2 percent of GDP/year for Tanzania, and

somewhat surprisingly as much as 0.8-2.8 percent of GDP/year for South Africa and 0.8-2.2 percent of GDP/year for Australia.

## Determinants of resource revenue sharing measured through government take

The primary purpose of this paper is to estimate to what degree the revenue sharing between the state and companies has been optimal in mining over the last few decades in key mining countries in SSA. From the above the conclusion is clearly no to this question, but with the added information that it has been far from optimal also in more advanced mining countries such as Australia and South Africa as well. This point to a finding tentatively confirmed by the IMF as well in a 2012 report where mining on average has roughly half the effective tax burden of petroleum. Researchers such as Bonnie Campell have written well on the historical regulatory path in mining (including the fiscal element). Regulatory approaches including the fiscal does not form in isolation, and sometimes old approaches developed in a completely different time and place are continued for too long.

The paper ends with an attempt to shed some light on the possible determinants of the observed revenue sharing between the state and companies in mining in the period we study herein. Through a panel regression we find that overall by far the strongest impact was associated with the compound tax rate estimated for each of them (we combine corporate income tax and royalty), followed by mineral prices and production volumes. Investment level was not found to have a significant effect on government take in mining. Cost levels, outside the investment levels, were not included in the main regression for the entire twenty-year period due to lack of comparable data. For the period 2001-12 and excluding Zambia due to lack of comparable data, we found that cost levels did not have a significant effect. This finding is in line with what Clausing and Durst 2015 found when examining the mining sector revenue sharing across countries.