Journal of Energy and Natural Resources
2014; 3(1): 6-10
Published online April 10, 2014 (http://www.sciencepublishinggroup.com/j/jenr)
doi: 10.11648/j.jenr.20140301.12

Does a windfall lead to a downfall? A study of mineral rents and genuine growth in selected African countries

Ishmael Ackah[1], Dankwa Kankam[2], Kwaku Appiah- Adu[3]

[1]Department of Economics, Portsmouth Business School, University of Portsmouth, Portsmouth, UK
[2]Opoku, Andoh& Co, Chartered Accountants and Management Consultants, Accra, Ghana
[3]Central Business School, Central University College, Accra, Ghana

Email address:

Ackish85@yahoo.com (I. Ackah), okyeamek@yahoo.com (D. Kankam), kwaku_appiahadu2001@yahoo.com (K. Appiah- Adu)

To cite this article:

Ishmael Ackah, Dankwa Kankam, Kwaku Appiah- Adu. Does a Windfall Lead to a Downfall? A Study of Mineral Rents and Genuine Growth in Selected African Countries. *Journal of Energy and Natural Resources.* Vol. 3, No. 1, 2014, pp. 6-10.
doi: 10.11648/j.jenr.20140301.12

Abstract: The mining industry helps governments to increase revenues resulting in job creation, infrastructural development and enhancing the standard of living of the local communities. However, it is also a potential source of environmental pollution and rent-seeking. This study examines the relationship between mineral rents and genuine income in a multivariate panel data analysis in Botswana, Egypt, Ghana, Morocco, South Africa and Zambia at the aggregate and industrial levels. The findings suggest that mineral revenues have been a blessing to these countries at the aggregate level but affected industrial growth negatively. These findings support evidence in the literature that mineral resource abundance slows growth in industrial output. The study also reveals that growth in mineral rich countries is principally driven by investment in capital and energy consumption. It is therefore recommended that mineral revenues should be invested in capital and alternative energy sources to boost aggregate and industrial growth.

Keywords: Mineral Rents, Genuine Income, Energy Consumption, Resource Curse

1. Background

Resource abundance should lead to growth and institutional quality (Brunnschweiler and Bulte, 2008). This is because; the discovery of resources such as gold or diamond brings windfalls which can be invested in other sectors of the economy. According to Limi (2010), natural resource abundance should lead to development since resource revenues can be invested in economic infrastructure and human capital development. However, this has always not been the case. Resource discoveries have led to slow growth, corruption, stagnated manufacturing sector and local currency appreciation in many countries (Ross, 2012). The reasons for the poor performance of oil-rich countries have been varied in the mineral resource literature.

According to the literature on natural resource economics, there are four channels through which natural resources become a curse. Firstly, the Dutch disease (Corden and Neary, 1982): secondly, rent seeking (Collier and Hoeffler, 2004):thirdly, institutional failures (Mehlum et al, 2006) and finally, the type of natural resource (Boschini et al 2007). The summary of these literatures indicates that resource scarce economies often outperform their resource rich counterparts with higher growth rates, thus, natural resource abundance inhibits growth. This paradoxical hypothesis suggests a shift from the classical conception of the growth enhancing effect of rich natural resource endowments to a growth inhibiting effect termed as the 'Resource Curse'.

The Dutch disease has been found to be a major determinant of the resource curse. It describes an economy where a booming sector and a lagging one co-exist due to natural resource discovery. For instance, in an open economy, when a windfall such as diamond or gold find occurs, it leads to current account surplus which intend leads to the appreciation of the local currency under a flexible interest rate regime. This makes the non- natural resource sector uncompetitive and leads to high prices (Sachs and Warner, 2001). In addition, the natural resource earnings are absorbed by the domestic non-tradable sector which leads to real appreciation of the local currency (Corden and Neary, 1982). These high prices of local produce leads not only to a stagnated export sector which deprives the economy of the benefits of export-led growth but also increase unemployment.

Gylfason et al (1999) identifies several main channels of transmission of abundant resources into a stunted economy. The first channel is through the surge in primary raw material exports and upward adjustment of the exchange rate which reduces the exports from other productive sectors such as service, high-tech and manufacturing sectors. This leads to overvaluation of a country's currency or real wages. Again, since mineral prices are volatile, the recurrent booms and busts put pressure on the exchange rate regime (Corden, 1984). These challenges coupled with mass exodus of workers from other productive sectors to the natural resource sector have been referred to as the Dutch disease. In addition to currency appreciation, resource abundance leads to reallocation of natural resources and deindustrialization. Other factors include the lack of incentive to collect taxes in mineral rich countries. According to Harford and Klein (2005), natural resources such as gold and diamond export remove incentives to establish a well-functioning tax system, reform institutions or even improve infrastructure development due to increased rent-seeking and corruption.

On Africa, Aryeetey et al., (2012) suggest that the major challenge to growth has been the inability of African economies to translate mineral resource revenues into development. The reasons for the inability of natural resource to play a major role in economic growth have been partially attributed to the different sides of mineral revenues. On the positive side, resource revenues have the distinctive qualities of scale, stability, source (Ross, 2012) and superiority. These qualities should translate into growth in the form of job creation, access to credit facilities by the companies and individuals, technological transfer from major foreign mineral companies to local partners, training and capacity building and increased government revenue mineral related taxes and resource rent. Aryeetey et al (2012) suggest that resource revenues can be used to finance diversification as was the case of Malaysia which used resource revenues to fund the expansion of light manufacturers that now dominate its export.

On the negative side however, mineral revenues are volatile, exhaustible, and uncertain and traced to international market conditions (Barnett and Ossowski, 2002).Owing to the exhaustible nature of mineral revenues, issues of intergenerational and intragenerational development have become central in policy design in mineral producing countries. Since long term plans require near stable prices and conditions for predictions, volatility makes economic forecasts challenging which subsequently creates loopholes for rent seeking.

The resource abundance-growth hypothesis has attracted increased attention in Africa. For instance, Sala-i-Martin and Subramanian (2003) find a negative and nonlinear association between natural resource abundance and growth in Nigeria and attribute this inverse relationship to corruption and poor institutional quality. Iimi (2006) explores the case of Botswana and concludes that natural resources have growth impact and attributes this finding to good governance.

Minerals such as gold, diamond, bauxite and steel abound in Africa. Figure 1.0 shows the mineral rent of Ghana and Botswana over the estimated period.

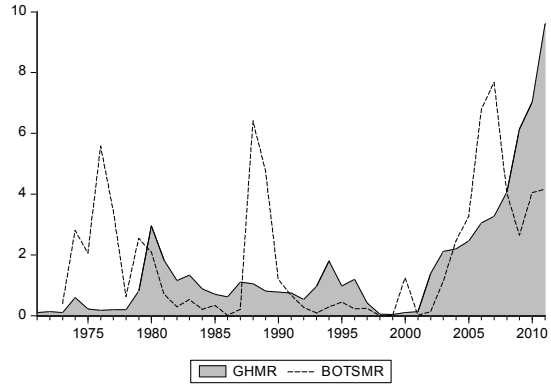

Fig1.*Mineral rent for Ghana and Botswana*

Often, the mineral revenue-economic growth hypothesis has been investigated by modelling minerals abundance as a function of GDP. However, Aryee et al, (2002) suggest that mining leads to siltation, coloration and chemical pollution of streams and rivers that provide drinking water for mining communities. In Africa, the mining sector is generally thought to be the second largest source of pollution after agriculture. The sector is resource intensive and generates high concentrations of waste and effluents. For example Kuhndt et al (2008) argue that during the extraction process and smelting process, a ton of copper generates about: 100-350 tons of residues, 50-250 tons of extraction waste and 300 kg of sulphur dioxide.

It would therefore be prudent if environmental damages due to mining are considered when estimating the resource curse hypothesis. This study contributes to the resource literature by using the genuine growth as a proxy for GDP. The reason is that, genuine growth captures the environmental effect of growth. That is, the mining related pollution is quantified and subtracted from the GDP. In addition, a multivariate fixed effect model that controls for country specific effect is used. Apart from mineral rents, the impact of variables such as energy consumption, human capital development, investment and inflation on growth are also measured. Finally, an industrial model is estimated to ascertain the impact of mineral rents on industrial output. Six countries: Botswana, Egypt, Ghana, Morocco, South Africa and Zambia are used for this study due to their relatively higher mineral (gold, diamond, copper) output in Africa. For instance, Botswana produced 27.9% of the African diamond production in 2009. Africa is the world's largest producer of diamonds, producing as much as 52.4% of global production in 2009 (Brown et al., 2010), and reserving 60% of the global diamond. Ghana is the second largest producer of gold in Africa and accounted to for 20% of total gold production in Africa in 2009 (Sharaky, 2010). In addition, it produces diamond, manganese, and bauxite just as South Africa.

2. Method

The purpose of this study is to examine the relationship between mineral revenues and economic growth in mineral producing African countries at both the aggregate and industrial levels. The panel fixed effect is used since it has the ability to control for individual country effects such as culture, education, corruption and institutional quality. According to Ackerberg et al., (2007) the panel fixed effects model has the advantage of overcoming simultaneity bias and gives consistent estimates. The equation proceeds as:

$$Y_{it} = e^{\beta} MR_{it}^{\alpha} K_{tt}^{\psi} H_{it}^{\phi} EN_{it}^{\delta} IN^{\gamma}{}_{it} e^{\varepsilon_{it}} \qquad (1)$$

Where $Y_{it'}$ is genuine income, $MR_{it'}$ is mineral rent, K_{it} is investment, H_{it} is human capital development, EN_{it} is energy consumption and IN_{it} is inflation. $\alpha, \psi, \phi, \delta$ and γ represent the elasticities of mineral rents, investment, human capital, energy consumption and inflation respectively.

Applying logs to equation 1, For instance mr = log MR

$$y_{tt} = \beta + \alpha mr_{tt} + \psi k_{tt} + \phi h_{tt} + \delta en_{tt} + \gamma in_{tt} + \varepsilon_{tt} \qquad (2)$$

The same procedure is followed to estimate the relationship between industrial output and mineral rents.

2.1. Data Sources

The study relied on secondary data obtained from the World Bank Development Indicators (WDI). Instead of GDP, the study used genuine income. This is because; the value of the genuine income is GDP minus environmental damages such as pollution and degradation due to mining and other commercial activities. Energy consumption is measured in tonnes of oil equivalent. Government expenditure on education is used as a proxy for human capital development and is measured in US dollars. In addition, fixed capital formation is used as a proxy for investment in capital. The estimation period is from 1971 to 2011. Export, industrial output, and all other data are in current US dollars.

3. Data Analysis

3.1. Panel Unit Root

To estimate the long relationship among the variables, a panel unit root test is carried out to examine their stationarity. Four different tests are applied. These are Levin, Lin and Chu test, the lm, Pesaran and Shin, the ADF Fisher test and the PP Fisher test. The panel root equation is given as:

$$Y_{it} = \chi_t Y_{tt-1} + \varpi_t F_{tt} + \varepsilon_{it}$$

Where if $\chi_t = 1$, then Y_{it} contains a unit root but if $\chi_t < 1$, then Y_{it} is considered a weakly trend stationary. F_{tt} represents the fixed effects, individual time trends and other exogenous variables. All four tests rejected the null of unit root 1%, 5% and 10% confidence level at level but were significant after the first difference as shown in Table 1.Table 1.presents the output of the unit root test.

Table 1.*panel unit root results*

Test	Results
Levin, Lin and Chu	-29.687***
lm, Pesaran and Shin-W stat	-29.956***
ADF Fisher	787.004***
PP Fisher	862.484***

Table 2. *Panel data output - Aggregate estimation*

Regressors	Coefficients
C	1.945***
MR	0.021**
H	0.191***
IN	-0.002
EN	0.363***
K	0.533***

Table 2 shows the estimated output of the panel estimation. All the regressors have a positive relationship with genuine income apart from inflation which is not significant even at 10% confidence level. The results suggest that genuine growth is mainly driven by investment in capital and energy consumption. Table 3 presents the preferred model after insignificant variables are removed from the estimation.

Table 3. *Panel data output- preferred Aggregate model*

Regressors	Co-efficients
C	1.911***
MR	0.017*
H	0.183***
EN	0.384***
K	0.536***

Table 2 reports the output of the of the panel data estimation at the aggregate level. The results indicate a positive relation between mineral revenues and genuine income. Similar findings are reported in Cavalcantiet al (2009) van der Ploeg (2011). This implies that at the aggregate level, mineral resources contribute to increased genuine income to the extent that any 1% increase in mineral revenues leads to 0.017% increase in genuine income. This finding may be due to three reasons. First, mineral companies contribute immensely to government revenues through the payment of tax and royalties. The mining sector has been consistently contributed to Africa's growth. To illustrate this point with examples, on the average mining accounted for 12.1 per cent of government revenue from 1990 to 2004 in Ghana, and 48.3 per cent from the 1998/1999 to the 2008/2009 fiscal year in Botswana. The high contribution of mining revenue to total revenue in Botswana is due to the high value addition to diamonds. In

addition, minerals such as gold, diamond, and bauxite form a vital part of the export of these countries. Finally, the introduction of environmental regulations seems to have reduced the impact of mining activities on the environment. Investment in capital is the main driver of genuine income. This finding buttress Hartwick's (1977) assertion that investment in man-made capitalis the key to sustainable growth in resource rich countries. A change of 1% percentage in investment leads to a 0.536% change in genuine growth in the same direction. This may be due to the capitalintensive nature of the mining industry and the trickledown effect of capital investments to other sectors of the economy. Energy consumption plays a vital role in every economy. Energy is an important resource in the production process of firms and source of comfort in households. Energy consumption explains 0.384of variations in genuine income.

Table 4. *Industrial sector*

Regressors	Co-efficients
C	-6.724***
EX	0.561***
MR	-0.055**
EN	2.541***

Table 4 shows the preferred model of the industrial estimation. The results confirms the findings of Sachs and Warner (1997, 1999 and 2001) and Gylfason et al (1999) who reported a negative relationship between resource revenues and output .The results show that the main growth determinants in the industrial sector are energy consumption and export. This may be due to the fact theindustrial sector relies on energy to power its machines for production. The study reports that, any 1% increase in mineral revenues reduces industrial output by 0.055% which confirms the Dutch disease hypothesis. The results further indicate that energy consumption is very vital to industrial performance. There is a need to enhance energy access and security since reductions in energy supply can have a negative effect on industrial output. Finally, mineral rich countries should open their economies since exports have a direct relationship with industrial growth.

4. Conclusion and Policy Recommendations

This study examines the relationship between mineral revenues and genuine income in 6 mineral-rich African countries. These are Botswana, Egypt, Ghana, Morocco, South Africa and Zambia. Multivariate panel data estimation with controls for country specific effects is used. The results indicate that mineral revenues contribute positively to genuine income in these countries. In addition, the study reveals that genuine growth at the aggregate level is principally driven by investment in capital and energy consumption. On the contrary, the resource curse hypothesis is confirmed in the industrial sector. Increased mineral revenues lead to a reduction in industrial output. This may be attributed to the Dutch disease or movement of skilled labour from the industrial sector to the mining sector. This could alsobe due to the fact that increased natural resource revenues lead to increased growth in the service and agriculture sectors at the expense of the industrial sector. Besides, growth in industrial output is influenced positively by export and energy consumption. Ross (2012) suggests that the best means of avoiding or minimizing the impact of the mineral curse is to avoid export-oriented extractive industries and develop the agriculture and the manufacturing sectors. Furthermore, the role natural resources play in economic development is highly dependent on policy choices (Auty, 1998) and therefore policy makers should make choices that are optimal for long term growth. Atyeh and Al-Rashed (2013) suggest that the diversification of the economy with emphasis on modernization of agriculture can lead to growth in mineral rich countries.

Since minerals are exhaustible resources, mineral revenues should be invested in man-made capital to enhance sustainable development. Therefore, investment in physical capital such as schools, roads, hospitals and other forms of capital such as bonds and equity holdings should be encouraged. This will help to spread the benefits of the resources to the present as well as future generations.

Additionally, since energy consumption has a direct and significant relationship with both genuine income and industrial output, there should be investment in alternative sources of energy. This is because, renewable energy sources are not depletable and abounds in Africa. Investment in renewable energy will enhance security of supply and minimize the impact of energy consumption on the environment.

Our study recommends that mineral revenues should be invested in human capital development such as education and health infrastructure and training, since it is a major determinant of growth. Finally, policies which seek to promote export should be encouraged to enhance aggregate and industrial growth.

Regarding future research areas, subsequent studies can compare the effect of oil and mineral revenues on growth to ascertain if the curse is resource specific. This study was limited by lack of data on corruption, institutional quality and other factors that can affect the mineral resource-growth relationship.

References

[1] Ackerberg, D., Benkard, C.L., Berry, S. and Pakes, A. (2007) Econometric tools for analyzing market outcomes In J. Heckman and E. Leamer (eds), Handbook of Econometrics (Vol. 6(1), pp. 4171–4276) Amsterdam: North-Holland

[2] Aryee, B. N. A., Ntibery, B. K., Atorkui, E. (2002) Trends in small-scale mining of precious minerals in Ghana; a perspective on its environmental impacts. Journal of Clean production, vol. 11, pp 131-140.

[3] Aryeetey, E., Devarajan, S., Kanbur, R., &Kasekende, L. (Eds.) (2012) The Oxford companion to the economics of Africa. Oxford University Press

[4] Atyeh, M and Al-Rashed, W. (2013) Testing the existence of integration: Kuwait and Jordanian financial markets, International Journal of Economics, Financial and Management Sciences 2013; 1(2): 89-94

[5] Auty, R. M., & Mikesell, R. F. (1998). Sustainable development in mineral economies. Oxford University Press.

[6] Boschini, A. D., Pettersson, J., & Roine, J. (2007). Resource Curse or Not: A Question of Appropriability. The Scandinavian Journal of Economics, 109(3), 593-617.

[7] Brunnschweiler, C. N., &Bulte, E. H. (2008). The resource curse revisited and revised: A tale of paradoxes and red herrings. Journal of Environmental Economics and Management, 55(3), 248-264.

[8] Cavalcanti, Tiago V. de V., Kamiar Mohaddes, and Mehdi Raissi (2009), "Growth, Development and Natural Resources: New Evidence Using a Heterogeneous Panel Analysis," Faculty of Economics, University of Cambridge (mimeo).

[9] Collier, P., & Hoeffler, A. (2004). Greed and grievance in civil war. Oxford economic papers, 56(4), 563-595.

[10] Corden, Max W. and J. Peter Neary (1982), "Booming Sector and De-Industrialization in a Small Open Economy," The Economic Journal 92 (368), pp. 825–848.

[11] Gylfason, Thorvaldur, Tryggvi T. Herbertson, and Gylfi Zoega (1999), "A Mixed Blessing: Natural Resources and Economic Growth," Macroeconomic Dynamics 3, pp. 204–25.

[12] Hartwick, J. M. (1977). Intergenerational equity and the investing of rents from exhaustible resources. The American economic review, 67(5), 972-974.

[13] Harford, T. M. Klein, Aid and the Resource Curse, The World Bank Group, Private Sector Development Vice Presidency, Note #291, Washington, DC, 2005.

[14] Iimi, Atsushi (2006), "Did Botswana Escape from the Resource Curse?" IMF Working Paper06/138, Washington, D.C.

[15] Mehlum, H., Moene, K., &Torvik, R. (2006). Institutions and the Resource Curse*. The Economic Journal, 116(508), 1-20.

[16] SHARAKY, A. M. Mineral Resources and Exploration in Africa. Egypt: Cairo University. 2010

[17] Kuhndt M, Tessema F, and Martin H. (2008) Global Value Chain Governance for Resource Efficiency Building Sustainable Consumption and Production Bridges across the Global Sustainability Divides. Environmental Research, Engineering and Management, 2008. No. 3(45), P. 33-41.

[18] Ross, M. L. (2012). The oil curse: how petroleum wealth shapes the development of nations. Princeton University Press.

[19] Sachs, Jeffrey D. and Andrew M. Warner (1997), "Natural Resource Abundance and Economic Growth," Center for International Development and Harvard Institute for International Development, Harvard University, Cambridge, Mass.

[20] Sachs, Jeffrey D. and Andrew M. Warner (1999), "The Big Push, Natural Resource Booms and Growth," Journal of Development Economics (59), pp 43–76.

[21] Sachs, Jeffrey D. and Andrew M. Warner (2001), "Natural Resources and Economic Development. The curse of natural resources," European Economic Review 45(2001), pp. 827–838.

[22] Sala-i- Martin, Xavier and Arvind Subramanian (2003), "Addressing the Natural Resource Curse: An Illustration from Nigeria," NBER Working Paper 9804, Cambridge, Mass.

[23] Van der Ploeg, F. (2011). Natural resources: Curse or blessing? Journal of Economic Literature, 49(2), 366-420.