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Abstract

The study investigates the role of mineral resources in economic development and sees how the extractive sector impacts the overall performance of the economy of a country endowed with a diverse minerals and metals. The authors analyze the economic growth model using human capital, population growth, property rights, and political rights, share of mineral exports to total exports, real growth of mining, real growth of agriculture, real growth of manufacturing and growth in foreign direct investments for the period 1970-2008. In addition, the study employs the ordinary least squares (OLS) since it is the widely used model in the field of study. The empirical results show that real manufacturing growth, real mining growth, share of mineral exports to total exports, property rights and political rights are important determinants of economic growth. Of major importance the study accepts the hypothesis of the presence of a resource curse in Zimbabwe. Actually for the period under review the study could not reject the hypothesis that mineral resources have a negative impact on economic growth using both variables used to proxy resource abundance. The policy makers therefore ought to improve the management of mineral resources to realize economic gains from these endowments.

Keywords: mineral resources, institutions, economic growth and OLS estimation.
JEL Classification: Q5.

Introduction

Zimbabwe is a nation blessed with a diversity of minerals and metals according to the Geological Survey of 1990. Zimbabwe is endowed with vast amounts of platinum, gold, diamonds, asbestos, nickel, coal and chrome, iron and other diverse kinds of minerals (see Appendix section for the trends). Zimbabwe is exploiting about 40 different types of minerals and metals. These minerals and metals present great potential for the economy to grow and foster economic development. Thus mineral resources have potential to contribute tremendously to sustainable economic growth and development which can lead to massive poverty reduction and create a number of jobs through the forward and backward linkages across the productive sectors of the economy. While mining has constantly been a major source of foreign currency generation through huge exports, its contribution to economic growth has constantly been very poor and on the decline over the period 1980 to 2008.

After long periods of exploiting the abundant mineral resources in Zimbabwe one could ask where is the wealth of the nation? Thus the study explores the following questions, do mineral resources contribute negatively to economic growth? And do institutions improve the contribution of mining sector to economic growth? Specifically, the paper investigates the nexus between mining sector performance and economic growth, to assess the impact of institutions in the mining sector on overall economic performance. This study basically tests two hypotheses: Mineral resources contribute negatively[1] to economic growth, and Institutions do improve the correlation between mining output and economic growth. This is motivated by the view that mineral resource abundance might promote rent-seeking behavior among policy makers and hence result in negative returns to economic outcome (Leite and Weidmann, 1997).

In this research, the resource curse hypothesis was tested empirically. What is different from previous research is that this study reviews the time series to compute results. In addition, the measure for natural resource abundance is different from most of previous research in that per capita measures are used instead of only percentages of resources in exports. Also more recent and informative indices on institutional quality are utilized.

1. Production trends of major minerals in Zimbabwe

Given the comparative advantage in mineral resources Zimbabwe has, in comparison with other Southern African countries and other developed countries, it is therefore imperative to study the role these mineral resources play on the overall performance of the economy. Since independence mining

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[1] Dutch Disease models demonstrate that the existence of large natural resources sector will affect distribution of employment in the economy and will lead to wealth being pulled in and out of non-tradable sector. During the period of price boom and bust it will have long term negative impacts on the rest of the economy, this was noted also by Sachs and Warner (1997).

sector has contributed an average of about 40% of total exports, Hawkins (2009); the major share coming from gold and other minerals such as ferrochrome, nickel and platinum. There is a geologically created feature known as the Great Dyke which has several types of metals and minerals. This phenomenal feature contains large quantities of chrome and platinum as well as chromite. In the uppermost layers various ores of other metals are found as gold, nickel, copper, and cobalt. Most of these metals occur in company with iron where they are disseminated as metal sulfides. The specific question to be addressed in the study is that, since the country has been exploiting around 40 different minerals and metals in Zimbabwe for the past 30 years the period covered by this research, have these resources contributed to economic growth and development or not.

Onyeukwu (2006/2007) did a paper for Nigeria which showed that the country was under a resource curse during the period the study was carried out. Further work by Weeks (2008), also showed that Zambia was under a resource curse trap even though the country has large reserves of the precious copper mineral amongst others. There exists a paradox, in which resource rich countries are outperformed by non resource rich countries in economic growth and development. Sachs and Warner (1995) were some of the first people to investigate this scenario where countries believed to be rich in natural resources lag behind countries without huge deposits of minerals. This paradox is widely referred to as the 'Resource Curse' in literature. Natural resources have been central to debates about economic development since Malthus and Ricardo as highlighted by Brander and Taylor (1998).

Mills (2010) highlighted that Nigeria despite having an estimated US$ 400 billion earned from oil for the past 40 years the number of Nigerians living under US$1 per day has consistently been increasing. In addition, Greg Mills said, 'Nigeria would have been better – by some estimates the economy would have been 25% bigger – if the Niger delta had no oil' Mills (2010, p. 171b).

Gold production: Gold production has been one of the major contributors to the success story of the mining sector in Zimbabwe. Gold exports have been one of the major foreign currency generations in Zimbabwe and again it is also one of the major export products historically. On the other hand, there is weak correlation between the price of gold and the volume of production as shown in Appendix 1.

Nickel production: The production of Nickel has been impressive for the period 1980 to around 1999. Mining of nickel has been playing a pivotal role in the success story of the mining sector. Appendix 2 also shows some evidence of correlation between nickel production and the price of the mineral.

Coal production: Coal is one of the mineral which is mined chiefly for domestic use though some of it is exported but in small quantities. Most of the coal that is mined in Zimbabwe is used for industrial production purposes chief among them being electricity generation and in the melting of iron to produce steel products. The bulk of coal production is therefore for domestic rather than export purposes.

Copper production: Copper production has witnessed a downward trend since 1980 until 2002. The downward trend in production levels of copper points to the effect of depletion in Zimbabwe and lack of new discoveries to support the increasing demand of the mineral. See Appendix 3.

Platinum production: The Great Dyke is endowed with Platinum Group Metals. Since early 1920s platinum production has been taking place in Zimbabwe. The production of platinum has been increasing considerably from 1996 to 2008. Extrapolating this growth trajectory shows that platinum has 16 great potential to contribute to the growth of the economy, Appendix 4 gives the trend in platinum production for the period 1996 to 2008.

Mineral contribution to exports: the recent massive discovery of diamonds, presents great potential for the mining sector to become the major export drivers. Data shows that since the start of the commodity boom in 2002, the share of minerals in total exports has averaged 49 percent. Table 1 shows the average annual mining exports in US$. This spells out how the mining sector has been instrumental in foreign currency generation. The period 2000 to 2008 registered the highest average annual export compared to the other periods. The same period registered the highest GDP growth rate of 5.6% and again the average share in total exports was 40.4% showing the dominance of the mining sector in the export market.

Table 1. GDP growth rates, mineral exports and share of mineral exports

Period	Average annual mining exports (US$ millions)	GDP growth rate (% p.a.)	Mineral export share in total exports (%)
1980-1988	533	-2.5	41.2
1990-1999	629	-1.8	32.3
2000-2008	720	5.6	40.4
1980-2008	564	1.3	37.8

2. Empirical evidence on natural resource curse and economic development

The origins of the natural resource curse phenomenon date back from the 1980s where studies done revealed interesting results in which countries heavily endowed with natural resources like oil and min-

erals were being out performed in economic growth by countries with little or no resource at all. The term natural resource curse was first used by Auty (1993) using it to describe how countries rich in natural resources were not able to use that wealth to boost their economies and how these countries have lower economic growth than countries with abundant natural resources. It is expected that countries rich in natural resources may be able to exploit these resources for the benefit of higher economic growth, poverty alleviation and technological transfer. Other things being equal, resource abundant countries should be able to increase their level of per capita welfare. Atkinson and Hamilton (2003) describe the advantage of natural wealth as two folds. First, the discovery and development of natural resources can lead to a short-term increase in the rate of economic growth; second, this can raise the level of income that can be sustained into the future.

Sachs and Warner (1995) look at the natural resource exports as a percentage of GDP in relation to the annual growth rate per capita of a specific country. In resource exports they include agriculture, minerals and fuels. They performed a cross-country regression, regressing the share of primary sector exports and initial income on the growth variable. In addition to the variable 'share of primary sector exports as a percentage of GDP, (SXP)', four other variables are used to measure resource intensity. One is mineral and fuel production in GDP for one year (import prices/GDP). Another measure is the fraction of primary exports in total exports for a particular year. The fourth measure is the logarithm of land area per person in that year (since land abundance and resource abundance tend to be positively correlated). The hypotheses set in the paper are confirmed and evidence of the resource curse is found.

Gylfason (2007) applied an empirical research on the resource curse to Norway. Eleven channels of growth are identified: real capital, human capital, foreign capital, social capital, financial capital and natural capital, rent-seeking and overconfidence, human and social capital crowding out, less saving and investment, financial markets failure and finally, the Dutch disease and less openness.

Gelb et al. (1988) distinguished four theoretical approaches to the debate on the effect of resources on economic growth. These are the linkage theory, the neoclassical and related growth theories, export instability theories and the booming sector and Dutch disease theory. The linkage theory uses interrelations and interactions. The effects of the interactions between the leading sector and other sectors in a country are divided into three linkages namely production linkages, consumption linkages and fiscal linkages. Neary and van Wijnbergen (1986) documented an initial impact of a resource discovery is beneficial for the economy as a whole, only at the expense of reallocation of production, with a rise in the output of non-traded goods and a fall in manufacturing output. The spending effect thus results in deindustrialization and a real appreciation of the exchange rate. Sachs and Warner (1995), in their pioneering work, identify two reasons for the resource curse phenomenon. The first reason is related to linkage theory and states that political factors play a role in the lagging development of resource-rich countries. A second line of reasoning in the paper by Sachs and Warner (1995) is strictly economic, drawing upon development economics and the Dutch disease theory.

Following Sachs and Warner's work a growing interest led to a thorough investigation as to the reasons of such a paradox. The first line of argument was on the issue of the types of resources being considered. The argument centered on the idea that the impact of natural resources is homogeneous. For instance, Brunnschweiler (2006) argued that mineral resources are more likely to have a negative impact on economic growth compared to agriculture products for instance rice, maize and wheat. Minerals such as diamonds and oil were referred to as point resources in the work of Brunnschweiler (2006) and agriculture resources as 'diffuse' natural resources. The explanation is that "point source" resources are more likely to attract appropriation that is taking the proceeds from minerals for own use and rent seeking. Generally, abundant point resources are coupled with higher risk of conflict.

Papyrakis and Gerlagh (2004) investigate the effect of natural resources on corruption, investment, terms of trade, openness, schooling and economic growth. There are four negative transmission channels of bad institutional quality, a false sense of security, the Dutch disease and human capital, combining linkage theory, endogenous growth theory and the Dutch disease theory. A cross-country regression is used to show the effects of resources on the economy. When the variables mentioned above are incorporated in the model, the negative relationship between economic growth and resources disappears.

Boschini et al. (2007) tested the impact of natural resources on economic growth. The study used different measures of natural resources. These include the value of primary exports; value of exports of ores and metals plus fuels; value of mineral production and value of production of gold, silver, and diamonds; all as a percentage of GDP for 80 nations from 1975 to 1998. Their results indicate that gold,

oil, silver, and diamonds have the strongest negative impact on economic growth. A number of papers have offered political and economic explanations for why natural resources have negative effects on growth. Lane and Tornell (1999) have developed theoretical models of rent-seeking where resource abundance increases incentives to engage in "non-productive" activities to capture the rents from the resources. Even though these papers provide important insights, they also predict a linear negative effect of natural resources on economic growth. Miguel, Satyanath and Sergenti (2004) present evidence on the effects of economic shocks on the likelihood of conflict, and Collier and Hoeffler (2004) point to resources as a source of armed conflict.

2.1. Institutions and economic growth. The other popular explanation of why natural resources have a negative effect on growth is the political and institutional explanation (Caselli and Cunningham, 2009; Ploeg and Poelhekke, 2010; Ramsay, 2011; Ploeg, 2011; Williams, 2011; Sala-i-Martin, and Subramanian, 2012). This literature suggests a number of channels through which natural resources could affect the functioning of a political system. One such channel is rent-seeking. This has been explored in depth by a number of authors as highlighted above. A good explanation is found in the papers of Lane and Tornel (1999). They managed to develop theoretical models of rent seeking. Their main argument is that a high level of resource abundance creates incentives for rent-seeking behavior. Also, Isham et al. (2005) argue that natural resources can affect a country's social structure by creating wealthy elite who are less likely to support economic and political reforms. Such rentier effects may undermine economic development in a country. In contrast, Rosser and Andrew (2004) present evidence that the curse could not be generalized, especially for Indonesia. This finding is based on the fact that while Indonesia is blessed with natural wealth, it has been experiencing moderate economic performance. This fact could be explained from the higher economic growth during 1967-2000 relative to the other oil exporting countries. Rosser and Andrew (2004) suggest that Indonesia's success stemmed from two factors, the policies and institutions employed by the New Order era and the nature of Indonesia's geo-political and geo-economic environment.

2.2. Measuring natural resources. More recently, papers have questioned the use of SXP as an appropriate measure of resource abundance. For example, a paper by Ding and Field (2005) distinguishes between resource abundance and resource dependence and argues that primary exports as a proportion of GDP (SXP) measures resource dependence rather than resource abundance. Therefore, instead of using SXP as a measure of resource abundance, the authors constructed two new measures.

The "newest" measures of natural resource capital are based on the World Bank's estimates of agricultural land, pasture land, forests, protected areas, metals, coal, oil, and natural gas. Resource dependence is then measured as a ratio of natural-resource capital to total capital while resource abundance is measured as natural-resource capital per head population. After controlling for income, investment rate, openness, and rule of law, the authors find that resource abundance has a positive impact on economic growth whereas resource dependence has a negative impact on economic growth. Following Sachs and Warner (1997, 2001), the most common proxy is the ratio of natural resource exports to GDP at a specific historical point, often 1970. This is a year mostly used in literature as a base year. Similarly, Papyrakis and Gerlagh (2004) use mineral production in GDP and Iimi (2006) uses natural resource exports per capita.

These proxies suffer from a generic problem – as measures of resource dependence they reflect the outcome of multiple political and economic processes and, thus, not a good proxy for the level of development. A stylized fact of less developed countries is their heavy reliance on raw primary commodity exports alongside a weak manufacturing sector. Hypothetically, two countries with an equal flow of rents from natural resources would differ on dependence measures owing to differences in national income and/or the extent to which resources are used as intermediate inputs into domestic production. Thus, these kinds of proxies may be endogenous for regression purposes and it is doubtful whether they accurately capture the underlying variable of interest.

2.3. Models for resource curse analysis. Robinson, Torvik and Verdier (2003) constructed a model of clientelism where inefficiency stems from the existence of a patron-client relationship between politicians and voters, politicians offer voters public employment in return for their votes. The effect of a resource boom is twofold, on the one hand, it makes governments attach greater value to being in office, and therefore more willing to dispense public sector jobs for votes, on the other hand, it makes the extraction path of resources more efficient. A boom is therefore more likely to lead to a decrease in overall income the more able is the incumbent to affect election outcomes through the promise of public sector employment. Furthermore, a resource boom has unequivocal "corrupting" effects.

Recent research suggests that Sachs and Warner's (2001) measure of resource endowment may be an imperfect measure of resource abundance, we use this as our preferred measure of natural resource endowment. One reason is that this measure is widely used in literature Kolstad (2007) used the same measure of "resource abundance." Moreover, data is available on this measure since 1980. However, in keeping with literature that distinguishes between resource abundance and resource dependence, we shall refer to the measure of resources, SXP, as a proxy for resource abundance.

3. Econometric method

The study builds upon traditional neoclassical growth models for estimating economic growth. It follows the model used by other researchers for instance Barro and Sala-i-Martin (1992) on testing the curse of natural resources. Most of the researchers interested on resource curse investigation were following the methodology used by Sachs and Warner (1995) but only differing on the proxies for measuring resource abundance. The control variables used in the regression model are generally the same with only some differences on the other variables peculiar to the country being studied. The core determinants of growth are basically the same. Human capital development, population, investments are some of the determinants mostly used in the study of resource curse. An ordinary least squares method is employed in the analysis because it suffices to show the relationship between the variables of interest. It is also used by most researchers doing this analysis as well. The variables for inclusion in the model come from theoretical literature and country growth experiences.

3.1. Model specification.

$$LGDPCPTA = \beta_0 + \beta_1 (SXT) + \beta_2(RMING) + \beta_3(RAG) + \beta_4(RMG)\ \beta_5(DENROLL) + \beta_6(DPOP) + \beta_7(PROPERTYR) + \beta_8(POLITICALR) + \beta_9(FDIG) + \varepsilon$$

ε is the error term.

Resource abundance in this study refers to a country's dependence upon minerals, the area of particular focus, the proxy for resource dependence are the ratio of mineral exports to total exports (*SXT*) and the average real growth in the mining sector (*MING*) from 1970 to 2008. Sachs and Warner (1995) used the share of mineral exports to gross domestic product as the proxy for resource dependence. Subsequent work for instance by Leamer and Edwards (1984), argued that this was not an appropriate measure for resource dependence since it has some caveats. The issue is that the measure does not capture the minerals which are used domestically. Though this measure poses such caveats it is still being widely used in analyzing the resource curse in other situations. This study used the share of mineral exports to total exports and the growth in the mining sector as the measures for resource dependence. This study opted for the total share of mineral exports to total exports because primary products exports are mainly exported. This is because in Zimbabwe, there is not much of value addition to the minerals resource but actually they drive the economy through the export sector.

Literature has shown that the share of primary product exports to GDP or GNP (SXP) has been widely used mainly because of the availability of data. Since the inaugural work on this subject by Sachs & Warner in 1995, this measure has continued to be the favorite for most recent papers as well (for instance, Mehlum et al., 2006; Kolstad, 2007). Another estimate of a country's wealth in natural resources is natural – resource capital as a percentage of total capital or as a percentage of the population. This data for resource abundance is taken from the World Bank's estimation of natural capital. Although these proxies to measure resource abundance are used widely they also have their own caveats. The work by Brunnschweiler (2006), questions the correlation between resource abundance and natural resource exports highlighting the existence counter-examples of resource rich countries with relatively low primary exports for instance Germany. Furthermore, another argument by Ding and Field (2005) is that SXP mainly captures the importance of primary industries in terms of exports. In this regard, one is bound to make a blunder of classifying an economy with a large mineral sector as a resource-abundant country when using SXP. Ding and Field argue that it is possible for a resource-abundant country like the United States not to depend heavily on exports of primary products and for countries that do not have abundant natural resources to depend on primary products for instance a country like Tanzania.

In the specified model, β_1 and β_2 measure the resource curse. If the coefficients $\beta_1 < 0$ and $\beta_2 < 0$, then this implies that (controlling for other factors) resource dependence in a country is associated with a decline in economic growth. If the coefficients $\beta_1 > 0$ and $\beta_2 > 0$, then this implies that resource dependence in a country is associated with an increase in economic growth. If the variable in not significant it confirms that the country is not resource dependence.

The property right index is an index which is used to rate the level and development of property rights for a given country Gwenhamo (2009). The index ranges from 0 to 100. If the score is higher say close

to 100 it signifies that the property rights are more secure and if the rating is close to zero it shows that the property rights are not secure. Property rights are used in this study to measure the impact of institutions on the growth of the economy. A positive coefficient on the property rights variable therefore indicates that property rights index is associated with economic growth in the presence of abundant mineral resources.

The secondary school enrollment is the one used as a proxy for human capital. Most of the people who are employable especially in industries would need to have completed secondary school. Enrollment helps to capture even those individuals who would have not completed the syllabus but are involved in employment. Data for this variable were obtained from ZIMSTAT. For population, the study uses the growth in population between 1970 and 2008 (ΔPOP) and data used was obtained from ZIMSTST. Agriculture is an important sector to the performance of the economy. That is agriculture is the mainstay of the economy. It is important to include real agriculture growth (*RAG*) in the model since for the period under study agriculture has been playing a pivotal role to the growth of the economy.

Growth in the mining sector (*MING*) is an important measure that explains growth of the economy especially in a country with abundant mineral resources. In this study, this variable is used as a proxy for resource dependence and as such it assists in concluding on the resource curse in Zimbabwe. The mining sector growth is expected to have a positive sign if it betters the economy. If it has a negative sign it implies that the growth of mining sector reduces economic growth.

Real manufacturing growth (*RMG*) is another determinant for growth of the economy and it is important to include it in the model. The growth of the manufacturing sector is good for the performance of the economy. Thus a positive sign is expected. Foreign direct investment (*FDIG*) is also an important determinant for growth. Developing countries get a boast of the investment from other developed countries through foreign direct investments. Foreign direct investments are considered to be good for economic growth and as such a positive sign is expected.

3.2. Unit root testing with intercept and trend. Stationarity tests are done for individual time series of *LGDPPCT* which is gross domestic product per capita, *DENROLL* which is secondary school enrollment, *DPOP* which is the population of the country, *RAG* which is real agriculture growth, *RMG*, which is real manufacturing growth, *RMING*, which is mining growth rate, *FDIG* which is growth in foreign direct investments and *PROPERTR* which is property rights index and *POLITICALR* which is Political rights index. The Augmented Dickey-Fuller (ADF) is used in testing for the presence of a unit root and Phillips-Perron test was used for comparative purposes.

We run the ADF test with the most parameterized specification, with intercept and trend and lagged values of the dependent variable in the model. As defined by model (1) below.

$$\Delta GDP_t = a + \beta T + \gamma GDP_{t-1} + \sum_{j=1}^{p-1} \varnothing j \Delta GDP_{t-1} + \varepsilon_t \,. \quad (1)$$

Where GDP_t is the variable that we want to test for stationarity, T is the time trend and ε_t is a random variable assumed to be 'white noise'.

Cointegration can exist only if the variables under consideration are stationary of the same order. Two main processes to test for cointegration are the Engel Granger (1987) two step procedure and the Johansen test (1988) and Johansen and Juselius (1990). The Johansen and Juselius approach (1990) is a multivariate autoregressive approach. It considers a model where we have a vector of exogenous variables which are also endogenous (a vector autoregressive specification). This is different from our model specification hence it is not used in this study.

4. Empirical results on link between economic development, natural resource curse and institutions

This section gives the results of the research findings based on the estimation of the economic growth model. The discussion begins with an analysis of the time series properties of the data used in the estimation exercise. First of all, an analysis of the descriptive statistics of the variables used in the study is done and a correlation test matrix is presented. This is followed by stationarity tests and the results are presented on tables in appendix section. The results of the estimated economic growth model are also presented and discussed in this section.

The correlation test assists in showing how the variables in the model vary with each other and how they are related. The importance of the test is that it reveals those variables which are perfectly correlated. The variables which will be perfectly correlated would then be dealt with before the regression analysis. It also helps to determine the degree of strength of the variables in explaining growth. Appendix 5 presents the correlation matrix for the economic growth model function. The correlation matrix shows that there is generally a positive correlation between most of the variables shown except for

foreign direct investments and real mining growth which exhibits negative correlation with other variables. There are other variables which also have negative correlation. There is no evidence of the problem of multicollinearity. Thus the study proceeds to test for stationarity using the ADF test.

Testing for stationarity was done using the Augmented Dickey-Fuller (ADF) and Phillips-Perron test (PP) which test for unit root in the series. The results show that the gross domestic product per capita (*LGDPPCT*), resource abundance (*SXT*), Property rights index *PROPERTYR* and political rights index *POLITICAL*, Growth in secondary school enrollment (*DENROLL*), population growth (*DPOP*), foreign direct investments growth (*FDI*) are integrated of order 1, I(1), real mining growth (*RMING*) and real agriculture growth (*RAG*) are integrated of order zero, I(0). The variables are not integrated of the same order and there is therefore no need to carry out the cointegration test. The study proceeds to do the ordinary least squares (OLS) regression analysis after testing for unit root. Since the variables are stationary in different levels, we will include variables in the regression model only in stationary state. The variables that become stationary after 1st difference were regressed as differenced variables whilst *RAG* and *RMING* were included as variables in levels. The results of the unit root test are in Appendix and the results of the regression are in Table 3.

The results in Table 3 show that the variables used as the proxies to measure resource dependence are all statistically significant though at different levels of significance. Share of mineral exports to total exports (*SXT*) has a negative impact on gross domestic per capita. In this regard, the results point out that a 1% increase in share of minerals exports to total exports will lead to a decline of gross domestic product per capita by 0.61% holding other things constant. Also critical to note from the results is that the impact of share of mineral exports to total exports is greater compared to the real growth of the mining sector. This point out that the country heavily relies on exports of minerals generate foreign currency reserves through exports, this makes it more vulnerable to the resource curse trap.

Table 2. OLS regression results

Variable	Coefficient	Std. error	t-statistic	Prob.
DSXT	-0.61	0.19	-3.19	0.005**
DENROLL	0.021	0.057	0.37	0.718
DPOP	-0.18	0.06	-3.03	0.007**
DFDI	0.021	0.0013	2.28	0.034**
DPOLITICALR	0.0008	0.0013	0.63	0.534
DPROPERTYR	0.0046	0.0016	2.93	0.009**
RAG	-0.0003	0.001	-0.33	0.745
DRMG	0.0022	0.0016	1.34	0.197
RMING	-0.20	0.91	-2.21	0.039**
DINSTITU-TIONS	0.045	0.012	3.82	0.001**
C	6.376525	0.131470	48.50184	0.0000

Notes: Adjusted *R*-squared 0.74, Mean *VIF* = 1.57 Durbin-Watson stat 1.932, where***, **,* imply significance at 1%, 5% and 10% respectively.

The growth in the mining sector variable *RMING* also shows that there is a negative relationship between the mining sector growth and gross domestic product per capita. A 1% increase in mining growth will lead to a decline in the gross domestic product per capita by 0.20% holding other things constant. This shows that the mining sector has a strong negative impact on the growth of the economy. There is an overall negative relationship between gross domestic per capita and the variables used as proxies for resource dependence. This shows evidence of the resource curse in the mining sector in Zimbabwe. The hypothesis that mineral resources negatively impact economic growth cannot be rejected and the conclusion is that there is a resource curse in the mining sector. Thus the study accepts the null hypothesis.

For instance Botswana which has an economy which is underpinned by the diamonds, the contribution of the mining sector to economic growth according to the Botswana Central Statistics Office for the period 1980-2005 was 37.7%. This cannot be compared with the contribution of Zimbabwe's mining sector to GDP which averages around 4% for the period under review according to ZIMSTAT statistics during the same period and this might also point to potential trade misinvoicing of mineral exports and smuggling in Zimbabwe.

Mining in Zimbabwe requires huge capital injection as the equipment that is required to do the mining is very expensive. The country in a bid to boost mining sector investments provides special treatment to investors in this portfolio. The investors get a five year tax holiday, during this period it will not be paying any taxes to the government. After the tax holiday period elapses the company purports to be making losses which is a way of evading taxi payment.

PROPERTYR, the index of property rights has a positive and statistically significant effect on the growth of the economy as shown by the results. The variable has a positive coefficient of 0.0046. This shows that the more the secure the property rights the greater the economic growth the economy experiences. This shows that good institutions are critical for the development and growth of the economy in

the presence of abundant resources. This can be explained by the ease of planning and long-term investments plans which investors will have if the property rights are more secure. We used principal component analysis to construct a composite index for institutions by combining political and property rights. This new measure has a robust and higher level (4.5% compared to 0.46% of property rights) of relationship with economic development growth rate. This means both economic and political institutions matter for economic growth in Zimbabwe.

There is some evidence of the existence of a resource curse in Zimbabwe. This resource curse means that having more mineral resources could be viewed as an advantage by others but these resources could be actually leading to low economic growth. In addition, the role of institutions has been proved to be critical if the country is to develop and grow in the presence of abundant mineral resources. Theories on the existence of a resource curse have abounded for decades. The main sources which lead to a resource curse that have been identified in the literature include but are not limited to the Dutch disease, human capital, corruption, rent seeking, political liberty, investment and savings, debt overhang, openness to trade and terms of trade. Research work that was done before ours showed that there is a direct link between natural resources, governance issues and economic growth. Literature has shown that rent-seeking is one of the major problems which explain the relationship between abundance of resources and economic growth. Fiscal linkages influence economic growth through natural resources. The next section has conclusion and policy implications.

Conclusion and policy implications

These conclusions are inferred from the estimation results presented in earlier section. This part also provides policy implications based on the econometric methodology employed in view to come up with policy implication/s to ensure that the current and future generation enjoys the economic benefits from the mineral resources. The major objective of the study was to analyze the nexus between resource abundance and economic growth. It sought evidence to shed light on the significance of mineral resources to the overall performance of the economy. The underlying purpose was to test whether Zimbabwe was under a resource curse between the periods under review. Another important dimension of the study was to get an appreciation of the role of institutions in cushioning the country from experiencing the resources curse and whether these institutions exist and whether they are powerful. The study estimated the economic growth model using the ordinary least squares method over the period of 1970 to 2008. The key drivers of economic growth in Zimbabwe were found to be Foreign Direct Investment (FDI) flows, and good property rights.

The study concludes that there is a negative relationship between the mineral resources which is the resources dependence/abundance proxy and economic growth. Thus for the period under consideration one can conclude that Zimbabwe was under the resource curse trap. The mining sector contribution to the economy is export oriented giving other countries growth impetus. The outward orientation and concentration of the activities in the mining sector compromises the inward contribution to meaningful economic benefits. There is therefore little impact when it comes to employment creation, value addition/beneficiation, and fiscal benefits. One of the problems could be with the investment policies within the sector which can be explained by lack of a minerals charter to govern the proceedings in the extraction, security and sale of the mineral resources. The mining sector is also susceptible to rent seeking and smuggling activities, where some of the minerals are exported through unscrupulous means. There is no statistical evidence which quantifies the amount of smuggling of minerals out and the trends of trade misinvoicing in mineral sector of Zimbabwe and this is one area which needs to be researched on. Property rights and political rights are critical for economic development and growth.

In addition, there is need to put in place a mechanism which will allow beneficiation and value addition of mineral resources if the sector can be used as an impetus for economic growth and development. Given that the mining sector dominates the export sector, value addition of the minerals is crucial if the mining sector is to induce economic growth and generate higher level of foreign reserves. Zimbabwe exports unprocessed gold, nickel, copper, diamonds and many other metals and minerals and these earn little revenue compared to processed jewellery and other equipments which developed countries export and earn more. The country needs to develop industrial policy and a framework which supports the development of industries which process the raw materials from mining sector. This will also improve the manufacturing sector thereby strengthening its linkages with other sectors.

The country can adopt the Hartwick rule as highlighted by Hartwick (1977) where the country can introduce a special purpose vehicle targeting those sectors with long term benefits to the economy. Proceeds from mining can be used to bolster both human and physical capital. Other sectors which need capital injection gained from mineral resource to boost their production which has a long term impact to sectors such as agriculture and manufacturing. The country can also ensure that it maintains a competitive exchange rate regime. This will curb the effects of the Dutch disease.

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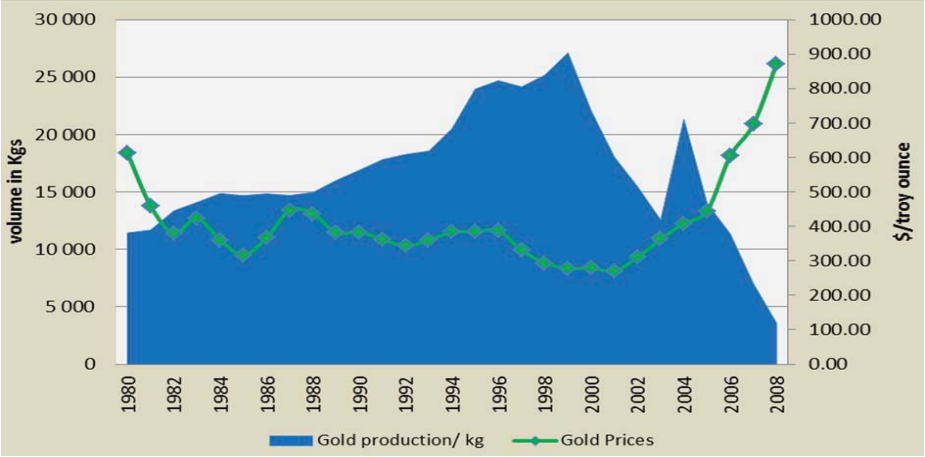
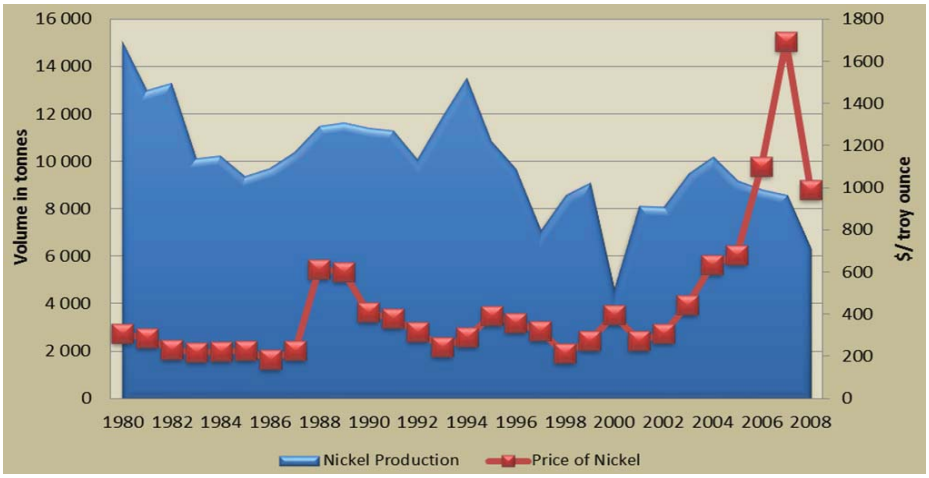
Appendix



Source: Chamber of Mines of Zimbabwe.

Fig. 1. Trends in gold production and gold prices 1980-2008



Source: Chamber of Mines of Zimbabwe.

Fig. 2. Trends in nickel production and prices 1980-2008

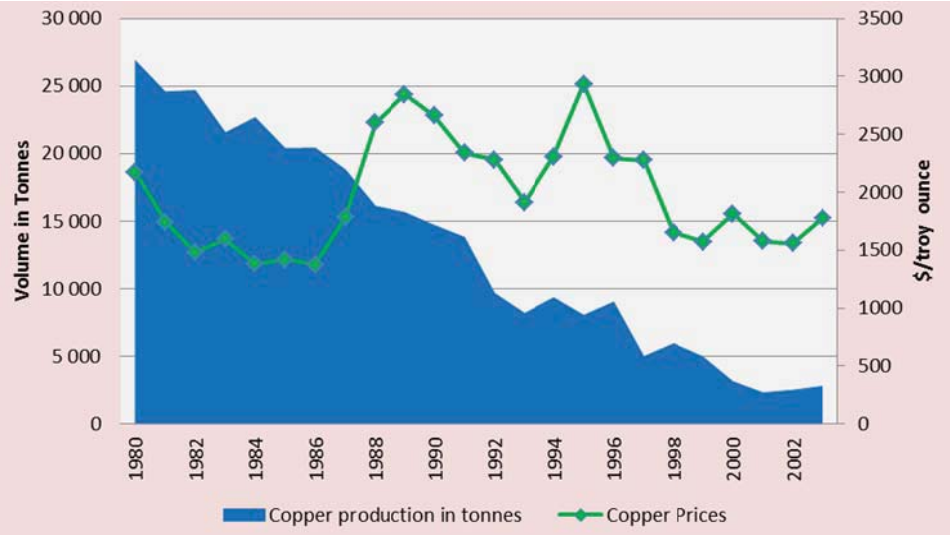


Fig. 3. Trends in copper production 1980-2008

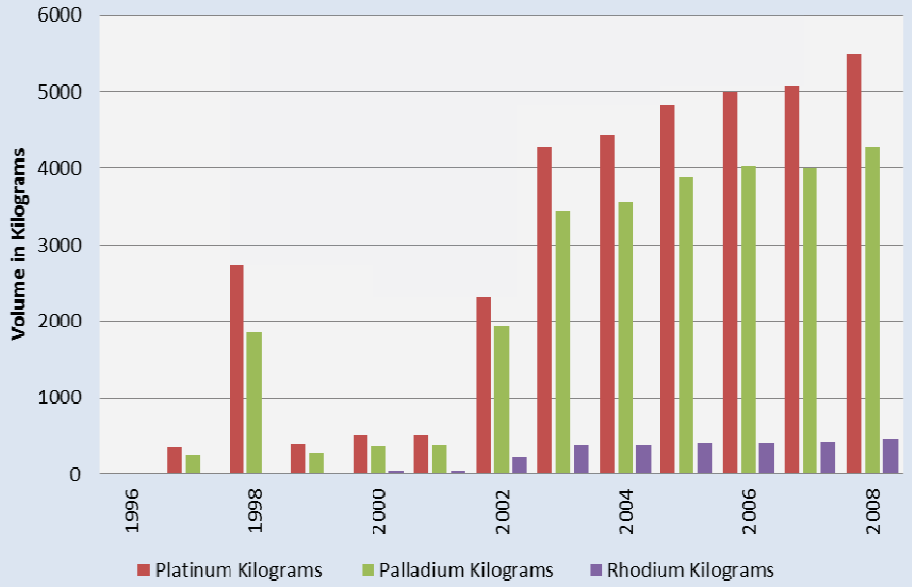


Fig. 4. Trends in platinum group metals 1980-2008

Table 3. Unit root tests – Augmented Dickey-Fuller and Phillips-Perron

Variable	Levels ADF	1st difference ADF	Levels PP	1st difference PP	Level of integration
LGDPPCT	-1.10	-4.15	0.51	-4.14	I(1)
DENROLL	-1.65	-3.03	-1.51	-2.98	I(1)
DPOP	-1.99	-3.71	-1.77	-3.73	I(1)
PROPERTYR	0.70	-3.80	0.12	-3.74	I(1)
SXT	-1.70	-4.99	-2.02	-4.93	I(1)
RAG	-7.51		-7.66		I(0)
RMING	-3.12		-3.18		I(0)
RMG	-2.29	10.07	-2.16	10.36	I(1)
FDI	-1.92	-6.49	-1.78	-6.40	I(1)
POLITICALR	-1.17	-5.11	-1.40	-5.13	I(1)
Institutions	-0.06	-4.22	-0.55	-4.22	I(1)
	Augmented Dickey-Fuller (DF)	10% critical value = 2.61	Phillips-Perron (PP)	10% critical value = 2.62	

Table 4. Correlation matrix

	LGDCPTA	*DENROLL*	*DPOP*	*FDIG*	*POLITICALR*	*PROPERTYR*	*RAG*	*RMG*	*RMING*	*SXT*
LGDCPTA	1.000	0.223	0.313	-0.440	0.395	0.814	0.240	0.754	-0.661	-0.518
DENROLL	0.223	1.000	0.287	-0.227	0.537	0.281	0.144	0.148	-0.267	-0.008
DPOP	0.313	0.287	1.000	-0.396	0.366	0.497	0.139	0.319	0.178	0.366
FDIG	-0.440	-0.227	-0.396	1.000	-0.347	-0.459	-0.094	-0.159	0.269	0.217
POLITICALR	0.395	0.537	0.366	-0.347	1.000	0.631	0.196	0.352	-0.500	-0.010
PROPERTYR	0.814	0.281	0.497	-0.459	0.631	1.000	0.276	0.643	-0.609	-0.282
RAG	0.240	0.144	0.139	-0.094	0.196	0.276	1.000	0.245	-0.263	-0.153
RMG	0.754	0.148	0.319	-0.159	0.352	0.643	0.245	1.000	-0.458	-0.277
RMING	-0.661	-0.267	0.178	0.269	-0.500	-0.609	-0.263	-0.458	1.000	0.591
SXT	-0.518	-0.008	0.366	0.217	-0.010	-0.282	-0.153	-0.277	0.591	1.000